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⑤④ **Apparatus and method for assembling terminated wires into electrical connectors to form harnesses.**

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US-A-4 043 017

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Description

The present invention relates to apparatus and method for assembling terminated wires into electrical connectors to form harnesses and concerns apparatus and method for the manufacture of electrical cable harnesses of the type including a connector electrically connected to a plurality of discrete wire conductors, the connector having a housing with a plurality of terminals mounted therein, the terminals having insulation displacing slot means for termination with said wire conductors.

In order to conduct electrical signals between printed circuit board assemblies or components by means of electrical conductors in electrically operated equipment and products, it is common to employ a harness of terminated wires assembled into a connector at least one end, the wires being also terminated at their other ends.

US-A-4,043,017 describes apparatus for precisely positioning the end portions of each of a plurality of wires at spaced apart locations for insertion into wire receiving portions of contact terminals contained in an electrical connector, in the manufacture of electrical harnesses of this type.

EP-A1-63 908 describes apparatus for identifying individual wires of a group of randomly ordered wires and terminating the identified wires in selected terminals of an electrical connector.

Applicants' Mini Cam III Insulating Displacement Single Wire Terminating Machine is an apparatus for the manufacture of electrical cable harnesses of the type described, comprising a termination station, means for indexing the connector in an "X" direction to present the terminals of said connector one at a time to said termination station, means for aligning in a "Y" direction the free end of a wire conductor with a terminal presented to said termination station, and a terminator at said insertion station including a wire insertion blade for inserting said wire conductor free end in said insulation displacing slot means, said blade being mounted for movement along an insertion stroke of predetermined length in a "Z" direction perpendicular to said "X" and "Y" directions.

This apparatus has to be fed with discrete wire conductors by an operator positioning the free ends of the conductors in the "Y" direction one at a time at the termination station for alignment by the aligning means, the operator then operating the terminator to terminate the conductor in the connector in the "Z" direction.

The object of the present invention is to provide apparatus and method for assembling discrete wire conductors into a connector, one at a time, and at different levels in the connector to form a cable harness of the type described.

An apparatus and a method according to the present invention are disclosed in claims 1 and 5 respectively.

Thus, proceeding from the known Mini Cam III

apparatus described above, the apparatus of the present invention is characterised in that said terminals of said connector are arranged in two rows extending in said "X" direction and spaced apart from each other in said "Y" and said "Z" directions, with the terminals of one row being offset from the terminals of the other row in said "X" direction; said indexing means including an indexable nest movable in said "X" and said "Y" directions, for receiving at least one of said connectors; means for selectively moving said indexable nest in said "X" and said "Y" directions to present a predetermined sequence of terminals one at a time to said termination station; and said insertion blade having at least two insertion strokes of different lengths, one stroke for each row of terminals, for inserting the free end of a wire conductor in said insulation displacing slot means of each terminal located in each of said rows.

The method of the present invention comprises the steps of presenting said connector at a termination station, indexing the connector in an "X" direction to present a terminal of one row of the connector at said termination station, aligning the free end of a wire conductor at a predetermined point over said terminal, and inserting the wire free end in said insulation displacing slot means of said terminal, and is characterised by the further steps of providing a connector with a second row of preloaded terminals, said first and second rows each extending in an "X" direction and spaced apart from each other in "Y" and "Z" mutually perpendicular directions with the terminals of one row being offset from the terminals of the other row in said "X" direction, indexing the connector in both said "X" and said "Y" directions to present another terminal taken from the second row at the termination station; and inserting another wire free end in said insulation displacing slot means of said other terminal.

Specific embodiments of the present invention embodying both its method and apparatus aspects will now be described by way of example and not by way of limitation with reference to the accompanying drawings in which:

FIG. 1 shows part of an automatic machine for assembling terminated wires into a connector to form a harness;

FIG. 2 is a front elevation;

FIG. 3 is an end view showing the secondary wire gripper unit;

FIGS. 4, 5 and 6 are diagrammatic views showing a sequence of wire insertion steps, and

FIG. 7 is a cross-sectional view of part of the machine.

With reference now to the accompanying drawings, and first with reference to Figs. 1, 2 and 7, the machine comprises a horizontal wire feed unit 9 including a wire straightener 10 for wire 11 fed from a reel (not shown), a wire length encoder wheel 12 and a wire presser wheel 14 and wire feed drive rolls 16. The wire feed unit 9 further includes an encoder and stepping motor

and control and wire processing printed circuit boards, the latter permitting two functions:

(a) 35 (minimum) different lengths of wire, that can be programmed in sequence with termination after each wire.

(b) the same as above but with step feed operation: i.e. (i) a predetermined portion A1 of wire length A, e.g. 50 mm; (ii) operation of optional individual rotatable or retractable termination unit (not shown); (iii) wire clamp unit described below in semi-open (feed) position; (iv) remainder A2 of wire length A.

The machine further comprises a fixture unit 20 including a nest or fixture plate 21 to accommodate a horizontal feed at right angles to the wire feed, e.g. of a linked chain 23 (see Fig. 2) of insulation displacement terminal (IDT) connectors 24 formed as plug sockets and constructed as described in our EP-A-0 145 152. In this case, two extra machine units (not shown) are necessary, first a connector chain feed unit, off reel, and secondly, a connector separator unit which is placed on the opposite side of the machine to the connector chain feed unit outside of the wire insertion area described below. The connectors come off the reel placed flat, with their terminal locating grooves and terminal, wire receiving slots, opening vertically upwardly.

Loose piece connectors such as 24 may alternatively be hand fed into the nest 21.

The fixture unit 20 further comprises an "X" movement table 25 mounted on a "Y" movement table 26. The nest 21 is mounted on the "X" movement table which is displaceable on an "X" axis in the direction of the connector feed. The "Y" movement table is displaceable on a "Y" axis at right angles to the direction of connector feed. Two cams 50 and 51 operate the "X" and "Y" tables respectively, the cams being mounted on a common shaft and operated by a stepping motor 53 (e.g. 8 x 45° intervals) under the control of the control printed circuit board incorporated in the unit 9.

Connectors 24 are advanced in turn along the nest 21 to a "start" position or termination station in which the first of an upper tier 30 (see Fig. 4) of terminal wire receiving slots 31 is at an insertion station vertically below a vertically displaceable, "Z" movement wire insertion blade 33. The insertion blade is arranged to be driven downwardly by a pneumatically operable insertion cylinder 35 with a movable stop for two heights (or depths) of insertion of the blade, one of which is illustrated in Fig. 5 (blade inserted in upper tier 30) of connector and the other of which is illustrated in Fig. 6 (blade inserted in lower tier 37) of connector. The terminal wire receiving slots 31 are all uniquely positioned along the tiers 30, 37 in the "X" direction and adjacent slots 31 are positioned in the two tiers 30, 37 respectively. Following insertion of a wire in the first slot 31 the "X" table is stepped one slot by its cam 50 and the "Y" table is shifted by its cam 51 to align the next adjacent slot 31 in the lower tier 37 in the insertion station, and so on, the "X" table being shifted stepwise in

a forward direction only, to carry terminated wires clear of the insertion station, and the "Y" table being shifted to and fro successively to align the upper and lower tiers of terminal wire receiving slots in the insertion station.

A wire feed guide 40 is incorporated on the wire feed side of a wire cutter blade 42 operated by the insertion cylinder each time the insertion blade 33 is driven downwardly.

In order to control the wire for cutting and each cut wire length for insertion and termination in the connector, the machine further comprises a wire gripper 45, details of which are shown in Fig. 3. The unit 45 is carried with the insertion blade 33 from the insertion cylinder 35 and has a closed- (wire gripping) position, a semi-open (wire guiding) position and a fully open (wire disengaging) position. The wire gripper 45 comprises an upper jaw member 47 which is fixed relative to the insertion blade 33, a lower pivoted jaw member 48 which swings away from the fixed jaw member, first to the semi-open and then to the fully open position, and a duplex pneumatic piston and cylinder arrangement generally indicated at 50 for activating the clamp between its closed, semi-open and fully open positions. Air under pressure is supplied to opposite sides of the main piston 51 to close and fully open the clamp respectively. In the clamp closed position, air under pressure supplied to the underside of piston 51 holds a secondary piston 52 displaced in a cylinder 53 against springs 54 acting on the upper side of the piston 52. Reduction of the pneumatic closing force below the force of the springs 54 opens the clamp a predetermined amount controlled by the downward movement permitted to the piston 52. The piston 52 is held in engagement with the piston 51 by the springs 54. Air under pressure to fully open the clamp is supplied to the cylinder 53 and is communicated with the upper side of the piston 51 through a fluid port in the piston 52.

The cycle sequence of the machine is as follows.

A connector 24 is fed to position the first terminal wire receiving slot 31 at the insertion station. The wire gripper 45 is moved to its semi-open position. Wire feed is provided by the unit 9 for the first wire either in one single length A or in lengths A1 and A2 for termination of the leading end of the wire in an individual, rotatable or retractable termination unit (not shown) rotatable or retractable to enable the wire feed A2 to take place. The wire gripper 45 is then closed. The wire cutter blade 42 is then actuated and the wire is transferred and inserted by the insertion blade whilst being held by the wire gripper 45. The wire gripper 45 is then moved to its fully open position and the connector 24 is displaced by movement of the "XY" tables to align the second terminal wire receiving slot at the insertion station and the machine resets to repeat the cycle of operations described, the wire gripper 45 moving to its semi-open i.e. feed position, to receive and guide the next wire length.

After six wire lengths have been stitched to the connector in this fashion, the chain 23 of connectors is fed forward to align a fresh connector at the insertion station. At the same time or intermittently a finished harness is chopped from the harness chain.

The "XY" movement tables, coupled with the dual height insertion unit, can be used on a "Megomat" ASM 1000 in the same manner as a standard press, substituting the ASM 1000 special right hand wire gripper for the wire gripper 45 described.

The "XY" movement tables 24, 25 coupled with the dual height insertion unit 35 and wire gripper 45 may be used with the wire feed and measure unit 9 (Megomat) described to produce single harnesses and jack harnesses automatically or semi-automatically.

Use of the split wire feed feature as described permits the use of a supplementary stripper/crimper unit for individually terminating the individual opposite ends of harness wires or the use of an IDT press for double ended IDT.

All the harnesses will use wire lengths cut from one single wire. To identify the different wire lengths a wire marking unit may be incorporated.

Whilst an automatic machine has been described, it will be appreciated that discrete wire conductors may be manually fed by an operator in the "Y" direction, one at a time, to the termination station for termination in successive slots 31 in the upper and lower tiers of each connector if desired, the successive slots 31 being aligned at the termination station and the wires terminated in the connector by operating the machine.

Claims

1. Apparatus for the manufacture of electrical cable harnesses of the type including a connector (24) electrically connected to a plurality of discrete wire conductors, the connector having a housing with a plurality of terminals mounted therein, the terminals having insulation displacing slot means (31) for termination with said wire conductors, said apparatus comprising:

a termination station,

means (25) for indexing the connector in an "X" direction to present the terminals of said connector (24) one at a time to said termination station,

means (26) for aligning in a "Y" direction the free end of a wire conductor with a terminal presented to said termination station,

a terminator (35) at said insertion station including a wire insertion blade (33) for inserting said wire conductor free end in said insulation displacing slot means, said blade (33) being mounted for movement along an insertion stroke of predetermined length in a "Z" direction perpendicular to said "X" and "Y" directions,

characterised in that

said terminals of said connector (24) are arranged in two rows (30, 37) extending in said "X" direction and spaced apart from each other in said "Y" and said "Z" directions, with the ter-

minals of one row being offset from the terminals of the other row in said "X" direction;

said indexing means including an indexable nest (21) movable in said "X" and said "Y" directions, for receiving at least one of said connectors (24);

means (50, 51, 53) for selectively moving said indexable nest (21) in said "X" and said "Y" directions to present a predetermined sequence of terminals one at a time to said termination station; and said insertion blade (33) having at least two insertion strokes of different lengths, one stroke for each row of terminals, for inserting the free end of a wire conductor in said insulation displacing slot means (31) of each terminal located in each of said rows (30, 37).

2. Apparatus as claimed in claim 1, further including means (9, 42) for feeding a predetermined length of said wire conductor in said "Y" direction mutually perpendicular to said "X" and "Z" directions and for cutting said wire conductor adjacent said termination station to form said wire free end, said moving means (50, 51, 53) being operable to align each terminal to said wire free end.

3. Apparatus as claimed in claim 1 or 2, wherein said indexing means includes an "X" table (25) movable in an "X" direction, mounted on a "Y" table (26) movable in a "Y" direction.

4. Apparatus as claimed in any preceding claim, wherein said predetermined sequence comprises a succession of terminals taken alternately from said two rows (30, 37).

5. A method of manufacturing an electrical cable harness of the type including a connector (24) electrically connected to a plurality of discrete wire conductors, the connector having a housing with a row (30) of preloaded terminals mounted therein, the terminals having insulation displacing slot means (31) for termination with said wire conductors, said method comprising the steps of presenting said connector (24) at a termination station,

indexing the connector (24) in an "X" direction to present a terminal of one row of the connector at said termination station,

aligning the free end of a wire conductor at a predetermined point over said terminal, and

inserting the wire free end in said insulation displacing slot means (31) of said terminal,

characterised by the further steps of providing a connector (24) with a second row (37) of preloaded terminals, said first and second rows (30, 37) each extending in an "X" direction and spaced apart from each other in "Y" and "Z" mutually perpendicular directions with the terminals of one row (30) being offset from the terminals of the other row (37) in said "X" direction,

indexing the connector (24) in both said "X" and said "Y" directions to present another terminal taken from the second row (37) at the termination station; and

inserting another wire free end in said insulation displacing slot means (31) of said other terminal.

6. The method of claim 5 further comprising the step of feeding a predetermined length of said wire conductor in a "Y" direction mutually perpendicular to said "X" and said "Z" directions, and cutting said wire adjacent said termination station to form said wire conductor free end at said predetermined point.

7. The method of claim 5 further comprising the step of alternately presenting the terminals of one row (30) and the terminals of the other row (37) for termination as said connector is advanced in said "X" direction.

Patentansprüche

1. Vorrichtung zur Herstellung elektrischer Kabelbäume derjenigen Art, die einen Verbinder (24) aufweist, der mit einer Mehrzahl einzelner Leiterdrähte elektrisch verbunden ist, wobei der Verbinder ein Gehäuse mit einer Mehrzahl in diesem angebrachter Anschlüsse aufweist und die Anschlüsse eine Schlitzeinrichtung (31) zur Isolierungsverdrängung für eine Anschlußverbindung mit den Leiterdrähten aufweisen und wobei die Vorrichtung

eine Anschließstation,

eine Einrichtung (25) zum Vorschalten des Verbinders in einer X-Richtung, um die Anschlüsse des Verbinders (24) der Anschließstation einzeln darzubieten,

eine Einrichtung (26) zum Ausrichten des freien Endes eines Leiterdrahtes mit einem der Anschließstation dargebotenen Anschluß in einer Y-Richtung und

eine AnschlieÙvorrichtung (35) in der Einsetzstation mit einem Drahteinsatzblatt (33) zum Einsetzen des freien Endes des Leiterdrahtes in die Schlitzeinrichtung zur Isolierungsverdrängung umfaßt, wobei das Blatt (33) entlang einem Einsetzhub von vorbestimmter Länge in einer Z-Richtungsenkrecht zu der X- und der Y-Richtung bewegbar ist,

dadurch gekennzeichnet, daß

die Anschlüsse des Verbinders (24) in zwei Reihen (30,37) angeordnet sind, die sich in der X-Richtung erstrecken und mit Abstand voneinander in der Y-Richtung und der Z-Richtung angeordnet sind, wobei die Anschlüsse der einen Reihe von den Anschlüssen der anderen Reihe in der X-Richtung versetzt sind,

die Vorschaltvorrichtung eine vorschaltbare Aufnahme (21) aufweist, die in der X- und der Y-Richtung zur Aufnahme zumindest eines der Verbinder (24) bewegbar ist,

eine Einrichtung (50,51,53) zum wahlweisen Bewegen der vorschaltbaren Aufnahme (21) in der X- und der Y-Richtung, um eine vorbestimmte Folge von Anschlüssen einzeln der Anschließstation darzubieten, und

das Einsatzblatt (33) zumindest zwei Einsetzhübe unterschiedlicher Länge, und zwar einen Hub für jede Reihe von Anschlüssen, zum Einsetzen des freien Endes eines Leiterdrahtes in die Schlitzeinrichtung (31) zur Isolierungsver-

drängung jedes in jeder der Reihen (30,37) angeordneten Anschlusses aufweist.

2. Vorrichtung nach Anspruch 1, des weiteren mit einer Einrichtung (9,42) zum Vrbewegen einer vorbestimmten Länge des Leiterdrahtes in der Y-Richtung zweiseitig senkrecht zu der X- und der Z-Richtung und zum Abschneiden des Leiterdrahtes an der Anschließstation zur Bildung des freien Drahtendes, wobei die Bewegungseinrichtung (50,51,53) zum Ausrichten jedes Anschlusses mit dem freien Drahtende betätigbar ist.

3. Vorrichtung nach Anspruch 1 oder 2, bei der die Vorschaltvorrichtung einen in einer X-Richtung bewegbaren X-Tisch (25) aufweist, der auf einem in einer Y-Richtung bewegbaren Y-Tisch (26) angebracht ist.

4. Vorrichtung nach einem der vorhergehenden Ansprüche, bei der die vorbestimmte Folge eine Aufeinanderfolge von abwechselnd aus den beiden Reihen (30,37) entnommenen Anschlüssen aufweist.

5. Verfahren zur Herstellung eines elektrischen Kabelbaumes derjenigen Art, die einen Verbinder (24) aufweist, der mit einer Mehrzahl einzelner Leiterdrähte elektrisch verbunden ist, wobei der Verbinder ein Gehäuse mit einer Reihe (30) in diesem angebrachter vorgespannter Anschlüsse aufweist und die Anschlüsse eine Schlitzeinrichtung (31) zur Isolierungsverdrängung für ein Anschließen an die Leiterdrähte aufweisen und wobei das Verfahren die Schritte umfaßt, daß

ein Verbinder (24) an einer Anschließstation dargeboten,

der Verbinder (24) in einer X-Richtung zur Darbietung eines Anschlusses einer Reihe des Verbinders an der Anschließstation vorgeschaltet,

das freie Ende eines Leiterdrahtes an einem vorbestimmten Punkt über dem Anschluß ausgerichtet und

das freie Drahtende in die Schlitzeinrichtung (31) des Anschlusses zur Isolierungsverdrängung eingesetzt wird,

gekennzeichnet durch die weiteren Schritte, daß

ein Verbinder (24) mit einer zweiten Reihe (37) vorgespannter Anschlüsse versehen wird, die erste und die zweite Reihe (30,37) jeweils in einer X-Richtung verlaufen und in zweiseitig senkrechten Y- und Z-Richtungen mit Abstand voneinander angeordnet sind, wobei die Anschlüsse der einen Reihe (30) von den Anschlüssen der anderen Reihe (37) in der X-Richtung versetzt sind,

der Verbinder (24) sowohl in der X- als auch in der Y-Richtung zur Darbietung eines weiteren, aus der zweiten Reihe (37) entnommenen Anschlusses in der Anschließstation vorgeschaltet und

ein weiteres freies Drahtende in die Schlitzeinrichtung (31) des weiteren Anschlusses zur Isolierungsverdrängung eingesetzt wird.

6. Verfahren nach Anspruch 5, mit dem wei-

teren Schritt, daß eine vorbestimmte Länge des Leiterdrahtes in einer Y-Richtung zweiseitig senkrecht zu der X- und der Z-Richtung vorbewegt wird und der Draht an der Anschlußstation zur Bildung des freien Leiterdrahtendes an dem vorbestimmten Punkt abgeschnitten wird.

7. Verfahren nach Anspruch 5, mit dem weiteren Schritt, daß die Anschlüsse der einen Reihe (30) und die Anschlüsse der anderen Reihe (37) abwechselnd für das Anschließen beim Fortschreiten des Verbinders in der X-Richtung dargeboten werden.

Revendications

1. Appareil pour la fabrication de faisceaux de câbles électriques du type comportant un connecteur (24) connecté électriquement à une pluralité de fils conducteurs discrets, le connecteur comportant un boîtier dans lequel sont disposés une pluralité de bornes, ces bornes ayant des fentes de déplacement d'isolation (1) pour se connecter avec lesdits fils conducteurs, l'appareil comprenant un poste de raccordement, des moyens (25) pour indexer le connecteur dans une direction "X" pour présenter les bornes du connecteur (24), une à la fois, au poste de raccordement, des moyens (26) pour aligner, dans une direction "Y", l'extrémité libre d'un fil conducteur avec une borne présentée au poste de raccordement, un organe d'achèvement du raccordement (35) du poste de raccordement comprenant une lame d'insertion de fil (33), pour insérer l'extrémité libre du fil conducteur dans une des fentes de déplacement d'isolation, la lame (33) étant montée de façon qu'elle puisse effectuer une course d'insertion sur une longueur prédéterminée dans une direction "Z", perpendiculaire aux directions "X" et "Y" caractérisé en ce que les bornes du connecteur (24) sont disposées sur deux rangées (30,37) s'étendant dans la direction "X" et espacées l'une de l'autre dans les directions "Y" et "Z", les bornes d'une rangée étant décalées par rapport aux bornes de l'autre rangée dans la direction "X", les moyens d'indexation comprenant un logement (21) indexable et déplaçable dans les directions "X" et "Y", pour recevoir au moins l'un des connecteurs (24), des moyens (50,51,53) pour déplacer, de façon sélective, le logement indexable (21) dans les directions "X" et "Y" de façon à présenter les bornes, une à la fois, dans un ordre prédéterminé, au poste de raccordement, et la lame d'insertion (33) ayant au moins deux courses d'insertion, de longueurs différentes, à raison d'une course pour chaque rangée de bornes, pour insérer l'extrémité libre d'un fil conducteur dans la fente de déplacement d'isolation (31) de chaque borne située dans chacune des rangées (30,37).

2. Appareil suivant la revendication 1 caractérisé en ce qu'il comprend des moyens (9,42) pour fournir une longueur prédéterminée de fil conducteur, dans la direction "Y" perpendiculaire à la

fois aux directions "X" et "Z", et pour couper le conducteur en un point adjacent à ce poste de raccordement, pour former l'extrémité libre du fil, les moyens de déplacement (50,51,53) étant actionnables pour aligner chaque borne avec l'extrémité de fil libre.

3. Appareil suivant l'une quelconque des revendications précédentes caractérisé en ce que les moyens d'indexation comprennent une table (25), mobile dans la direction "X", laquelle est montée sur une table (26) mobile dans la direction "Y".

4. Appareil suivant l'une quelconque des revendications précédentes caractérisé en ce que l'ordre prédéterminé des bornes comprend une succession de bornes faisant partie alternativement des deux rangées (30,37).

5. Procédé de fabrication d'un faisceau de câbles électriques du type comportant un connecteur (24) connecté électriquement à une pluralité de fils conducteurs discrets, le connecteur comportant un boîtier et ayant une rangée (30) de bornes préchargées montées dans celui-ci, ces bornes ayant des fentes de déplacement d'isolation (31) pour se connecter avec lesdits fils conducteurs, ce procédé comportant les étapes consistant à présenter ledit connecteur (24) à un poste de raccordement, indexer le connecteur (24) dans une direction "X" pour présenter une borne d'une rangée du connecteur au poste de raccordement, aligner l'extrémité libre d'un fil conducteur en un point prédéterminé, au-dessus de la borne, et insérer l'extrémité libre du fil dans la fente de déplacement d'isolation (31) de la borne, caractérisé en ce qu'il comporte les étapes additionnelles consistant à prévoir le connecteur (24) avec une seconde rangée (37) de bornes préchargées, les première et seconde rangées (30,37) s'étendant chacune dans une direction "X" et étant espacées l'une de l'autre dans des directions "Y" et "Z" perpendiculaires, les bornes d'une rangée (30) étant décalées par rapport aux bornes de l'autre rangée (37) dans la direction "X", indexer le connecteur (24) à la fois dans la direction "X" et dans la direction "Y" pour présenter, au poste de raccordement, une autre borne prise sur la seconde rangée (37), et insérer une autre extrémité de fil libre dans la fente de déplacement d'isolation de cette autre borne.

6. Procédé suivant la revendication 5 caractérisé en ce qu'il comprend les étapes consistant à alimenter une longueur prédéterminée de fil conducteur dans une direction "Y" perpendiculaire à la fois aux directions "X" et "Z", et à couper le fil en un point adjacent au poste de raccordement de façon à former l'extrémité libre du fil conducteur en un endroit prédéterminé.

7. Procédé suivant la revendication 5 caractérisé en ce qu'il comprend l'étape consistant à présenter alternativement les bornes d'une rangée (30) et les bornes de l'autre rangée (37) pour leur connexion lorsque le connecteur est avancé dans la direction "X".

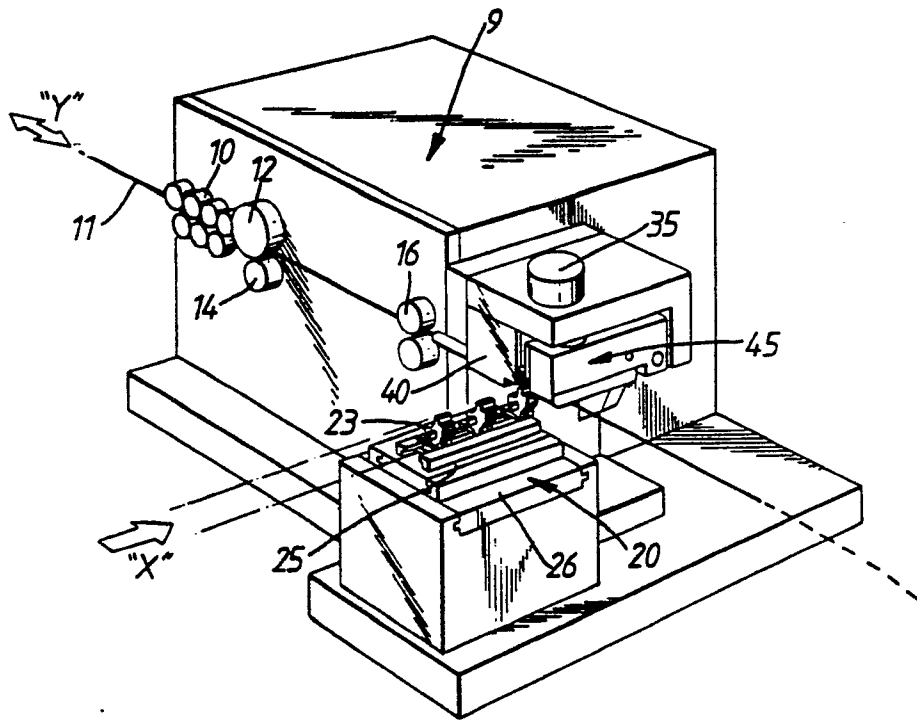


FIG. 1.

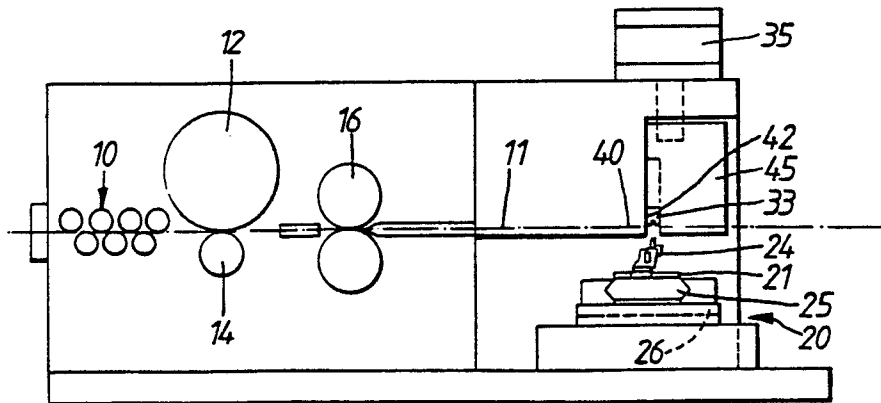
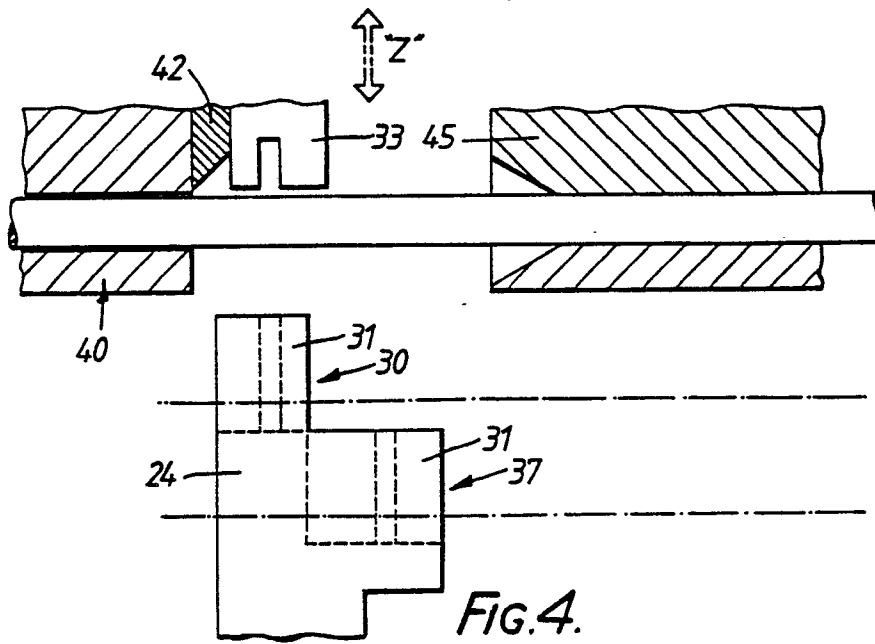
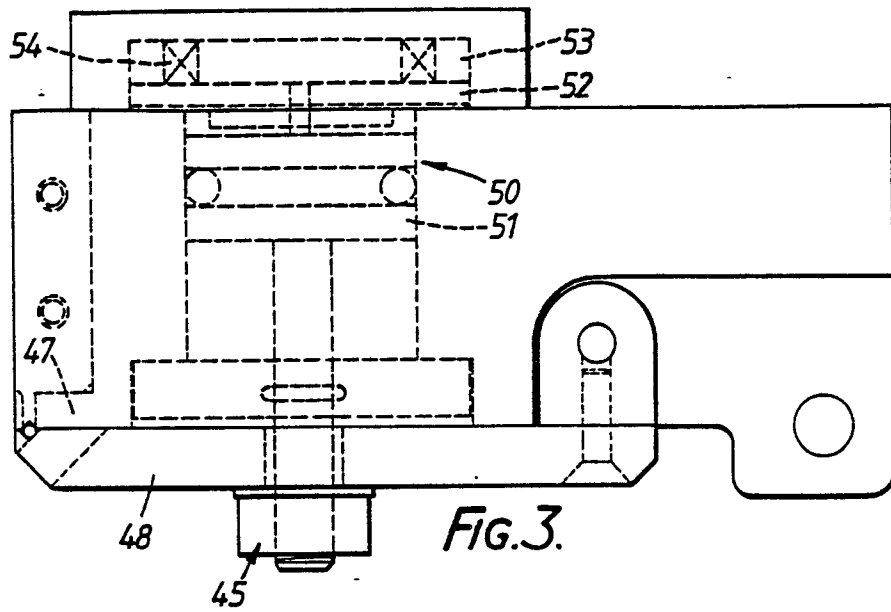


FIG. 2.



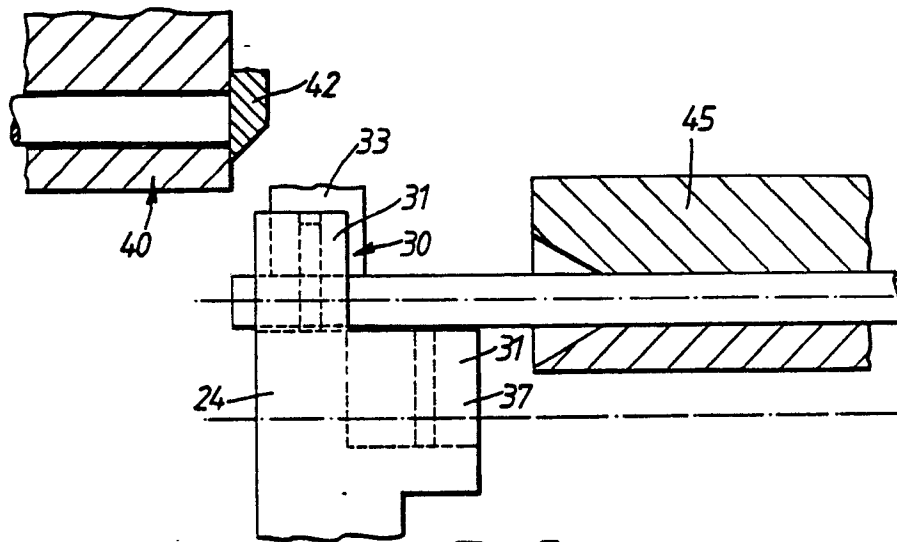


FIG. 5.

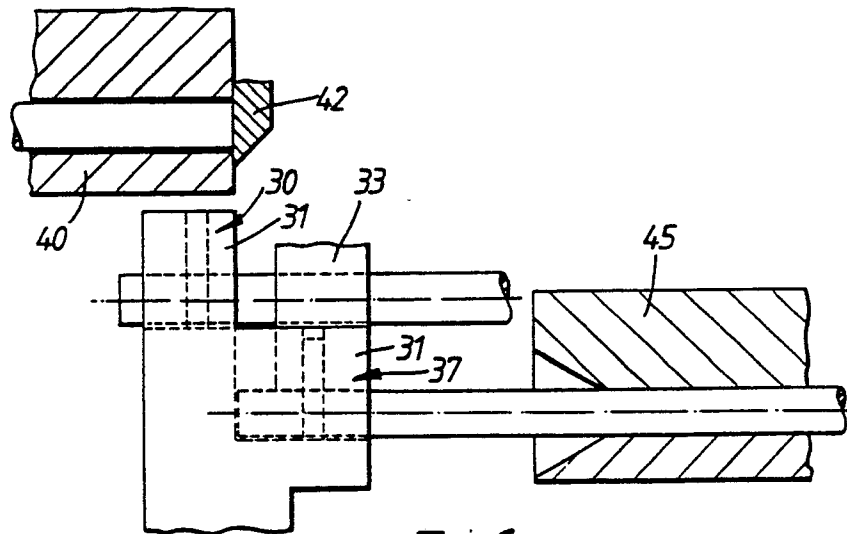


FIG. 6.

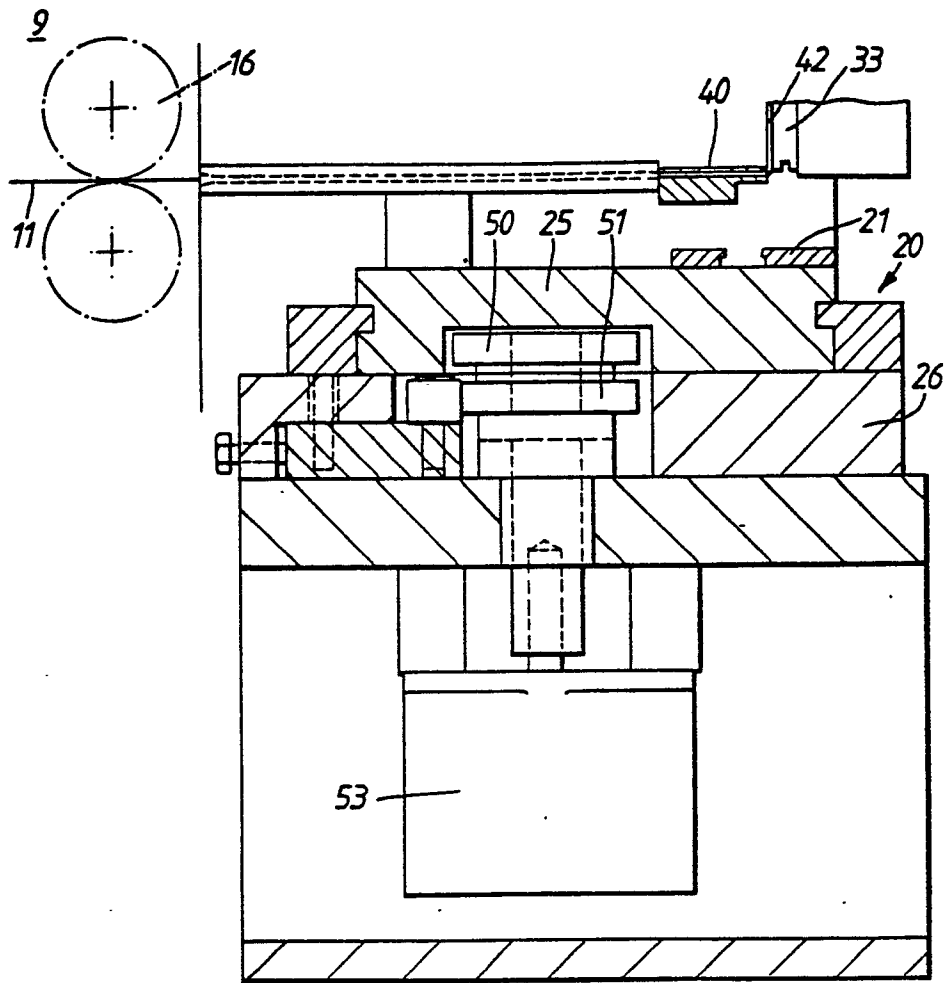


FIG. 7.