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(54) Machine for programmed electric wire cutting, tip stripping, and terminal clamping.

(57) The present invention relates to a machine for programmed electric wire cutting, tip stripping, and terminal clamping. The machine is of the type which comprises a unit for feeding the wire by traction, a cutting and stripping unit with three consecutive pairs of blades, and, upstream and downstream of the cutting and stripping unit, rotating units that are suitable to respectively move the leading and trailing ends of the cut portions towards corresponding terminal clamping presses. According to the invention, the blades of the stripping pairs, between which the cutting pair is interposed, are slideable on guides that belong to respective supports, are parallel to the wire advancement direction, and are associated with first motorized actuation means which are suitable to adjust their position. At least one of the blades of each pair is rigidly coupled, together with its support, independently of the cutting motion, so that it slides at right angles to the preceding pair and is associated with second motorized actuation means for adjusting its position.

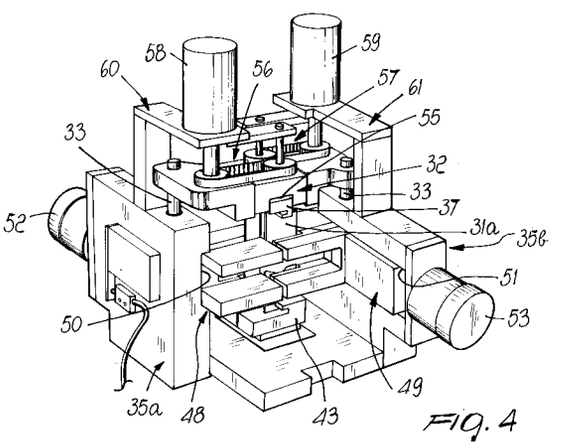

FIG. 4

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The present invention relates to an improved machine for programmed electric wire cutting, tip stripping, and terminal clamping.

Insulated electric wires provided, at their tips, with clamped-on terminals of various shapes and types, to be used for wiring, are currently in widespread use especially in the case of mass-produced equipment.

In order to automatically perform the operations for cutting, stripping and clamping electric wires, machines have been produced and are currently used which are substantially composed of a unit for the traction feeding of the wire, a cutting and stripping unit with three consecutive sets of blades, and rotating units, located upstream and downstream of said cutting unit, which respectively move the leading and trailing ends of the cut portions towards corresponding terminal clamping presses.

As regards the cutting and stripping unit, whereas the blades of the central cutting pair are in a fixed position and are actuated so that their cutting edges cut the wire completely, the blades of the stripping pairs must have an adjustable spacing from the blades of the central pair, according to the intended stripping length, and must be restrained in their cutting motion so as to cut only the sheath that covers the electric wire.

Therefore the cutting depth must also be adjusted appropriately according to the diameter of the wire and to the thickness of the sheath.

The distances of the pairs of stripping blades from the central cutting pair are currently adjusted manually by interposing appropriately gauged spacers after a troublesome disassembly and reassembly of the parts.

The same holds for the adjustment of the cutting depth, for which there are shims to be placed between the blades and the corresponding supports.

The aim of the present invention is to provide a machine for programmed electric wire cutting, tip stripping, and terminal clamping, in which the position of the stripping blades with respect to the cutting blades and the cutting depth of said blades can be adjusted automatically without having to disassemble and reassemble parts.

A consequent primary object is to considerably reduce the time required to adapt the machine to production changes.

Another object is to facilitate use on the part of the user.

Another object is to provide a fully automatic machine that operates autonomously, without requiring the presence of operators, once it has been set.

This aim, these objects, and others which will become apparent hereinafter are achieved by an improved machine for programmed electric wire cutting, tip stripping, and terminal clamping, of the type which comprises a unit for feeding the wire by traction, a cutting and stripping unit with three consecutive pairs of blades, and, upstream and downstream of said cutting and stripping unit, rotating units that are suitable to respectively move the leading and trailing ends of the cut portions towards corresponding terminal clamping presses, said machine being characterized in that the blades of the stripping pairs, between which the cutting pair is interposed, are slideable on guides that belong to respective supports, are parallel to the wire advancement direction, and are associated with first motorized actuation means which are suitable to adjust their position, at least one of the blades of each pair being rigidly coupled, together with its support, independently of the cutting motion, so that it slides at right angles to the preceding pair and is associated with second motorized actuation means for adjusting its position.

Further characteristics and advantages of the invention will become apparent from the detailed description of an embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a schematic top view of the machine;

figure 2 is a schematic side view of the machine;

figure 3 is a schematic top view of a detail of a rotating unit that is suitable to move the trailing or leading ends of the cut portions towards a terminal clamping press;

figure 4 is a perspective view of the cutting and stripping unit;

figure 5 is a front view of the cutting and stripping unit;

figure 6 is a partially exploded perspective view of the cutting and stripping unit;

figure 7 is a top view of the cutting and stripping unit without the upper block;

figure 8 is a side view of the three sets of blades with the associated supports during the cutting and stripping of an electric wire.

With reference to the above figures, a machine according to the invention comprises a unit for feeding the wire 10 which is generally designated by the reference numeral 11 and is constituted by a wire straightener 12 followed by a double traction device 13 with two opposite belts 13a and with opposite rollers 13b which are mostly keyed on the same axes as the belt transmission pulleys, by a cutting and stripping unit, generally designated by the reference numeral 14, and rotating units 15 and 16 which are located upstream and downstream of the cutting and stripping unit and are suitable to move respectively the leading and the trailing ends of the cut portions towards corresponding terminal

clamping presses 17 and 18.

According to the type of wire 10, it is possible to choose advancement with belt-driven or roller-driven traction; direction-selecting units 13c and 13d are provided for this purpose upstream and downstream of the unit 13.

In particular, the rotation of the units 15 and 16 is provided by means of a kinematic system shown schematically in figure 3 and in which the output shaft of a gearmotor 19 has a disk 20 keyed to it; said disk is associated, by means of a connecting rod 21, with a first pulley 22 having a larger diameter that said disk.

A crank system is thus formed in which the parts are mutually arranged so that the continuous rotation of the disk 20 produces a reciprocating semi-rotary motion of the first pulley 22.

A second pulley 24 is connected to the first pulley 22 by means of a belt 23 and has a smaller diameter than the first pulley (force-multiplying transmission).

Both pulleys 22 and 24 are rotatably coupled to a fixed support 25, and the second pulley is kinematically connected, by means of a transmission, not shown, which is contained inside it, to an element 26 which is articulated thereto with one end and to which a clamp is fixed; said clamp is designated by the reference numeral 27 in the case of the unit 15 and by the reference numeral 28 in the case of the unit 16, and grips the leading or trailing end of the portion, moving it towards the press 17 or 18.

The oscillating motions of the support 26 occur between two stroke limit positions which correspond to said positions of the clamps 27 or 28.

Each one of the clamping presses 17 and 18 is mounted on a table, not shown for the sake of simplicity, which is connected to a step motor suitable to adjust its position according to the type of clamping to be performed.

As regards the cutting and stripping unit 14, said unit includes, in succession, three pairs of blades: a first stripping pair with blades 29a and 29b, a second cutting pair with blades 30a and 30b, and a third stripping pair with blades 31a and 31b.

The blades, which have a V-shaped cutting edge, are arranged vertically, and the upper first blades of each pair are rigidly coupled to a block 32 that is vertically slideable along rod-like guides 33 and is motorized in a known manner so as to perform reciprocating translatory motions, whereas the lower second blades are coupled to a pneumatic actuator, which is not shown in the figures and makes them slide vertically, and are guided by a fixed block 34.

Two shoulders 35a and 35b extend laterally from the block 34 and support the guides 33.

The upper blade 30a is blocked between two aligned supports, respectively 36 and 37, which are supported by the movable block 32; each support is shaped, in a downward region, so as to form a longitudinal guide, respectively 38 and 39, which has a substantially hook-like cross-section.

The two guides 38 and 39 are arranged mirror-symmetrically with respect to one another, and complementarily shaped ends 40a and 41a of the blades 29a and 31a are rigidly coupled on said guides so that the blades can slide.

In the same manner, the lower cutting blade 30b is blocked between aligned sliding supports 42 and 43 that are guided by the fixed block 34 and are shaped, in an upward region, so as to form hook-shaped longitudinal guides 44 and 45 which are arranged mirror-symmetrically with respect to one another and with which complementarily shaped ends of the stripping blades 29b and 31b engage; only the end 41b is shown in the figures.

Each blade of each stripping unit is arranged without plays between oppositely arranged walls of a vertical slot, respectively 46a, 46b for the first pair and 47a, 47b for the second pair, which is formed on a corresponding sliding block 48 or 49 that is slideable along guides which are parallel to the advancement axis of the wire 10, respectively 50 or 51, of each shoulder 35a or 35b.

Each slider 48 and 49 is connected, for example by means of a screw-and-nut mechanism which is not shown in the figures and is arranged inside the corresponding shoulder 35, to a respective step motor 52 or 53.

The actuation of the step motors varies the distance of the stripping blades from the cutting blades.

As regards the adjustment of the cutting depth, the supports 36 and 37 are vertically slideable in corresponding seats 54 and 55 of the block 32 and are associated, for example by means of a screw-and-nut mechanism not shown in the figures, with belt transmissions, respectively 56 and 57, which are arranged on the block 32 that connects them to respective step motors 58 and 59 which are mounted on frames 61 and 62 extending from the shoulders 35a and 35b.

The belt transmissions 56 and 57 move together with the block 32, and connection to the respective motors 58 and 59 can be provided for example by means of a slotted coupling with the output shafts of said motors.

Therefore, the rotation of the motors 58 and 59 changes the distance of the cutting edges of the blades 29a and 31a from the block 32 and therefore changes the cutting depth.

Of course, there is an appropriate electric/electronic circuit with buttons or other actuation devices for driving the motors.

In practice it has been observed that the intended aim and objects of the present invention have been achieved.

By means of the simple actuation of the motors it is in fact possible to vary the cutting depth for stripping and to vary the stripping length.

All this considerably facilitates and quickens the operations linked to production changes.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Improved machine for programmed electric wire cutting, tip stripping, and terminal clamping, of the type which comprises a unit for feeding the wire by traction, a cutting and stripping unit with three consecutive pairs of blades, and, upstream and downstream of said cutting and stripping unit, rotating units that are suitable to respectively move the leading and trailing ends of the cut portions towards corresponding terminal clamping presses, said machine being characterized in that the blades of the stripping pairs, between which the cutting pair is interposed, are slideable on guides that belong to respective supports, are parallel to the wire advancement direction, and are associated with first motorized actuation means which are suitable to adjust their position, at least one of the blades of each pair being rigidly coupled, together with its support, independently of the cutting motion, so that it slides at right angles to the preceding pair and is associated with second motorized actuation means for adjusting its position.

2. Machine according to claim 1, characterized in that said first and second motorized actuation means are constituted by step motors, one for each movement.

3. Machine according to one or more of the preceding claims, characterized in that said blades are vertically aligned with respect to the first upper blades of each pair, which are rigidly coupled to a movable block that is vertically slideable on rod-like guides and is motorized so as to perform reciprocating translatory cutting motions, whereas the second lower blades are slidingly movable on a fixed block from which shoulders extend laterally and support said guides.

4. Machine according to one or more of the preceding claims, characterized in that the upper cutting blade is blocked between two aligned supports which are supported by said movable block, each one of said supports being shaped, in a downward region, so as to form a longitudinal guide to which a corresponding complementarily shaped end of one of the stripping blades is slidingly coupled, the cross-section of said guide being such that the corresponding blade hangs down from it.

5. Machine according to one or more of the preceding claims, characterized in that the lower cutting blade is blocked between aligned supports which are vertically slideable along said fixed block, are associated with a motion actuator, and are configured, in an upward region, so as to form longitudinal guides with which complementarily shaped ends of the lower stripping blades engage.

6. Machine according to one or more of the preceding claims, characterized in that each blade of each stripping unit is arranged without plays between oppositely arranged walls of a vertical slot formed on a corresponding sliding block that is slideable on guides which are parallel to the wire advancement axis and is connected to one of said step motors.

7. Machine according to one or more of the preceding claims, characterized in that said upper supports of said stripping blades are vertically slideable in corresponding seats of said upper movable block and are associated, by means of kinematic transmissions, with respective said step motors.

8. Machine according to claim 1, characterized in that each one of said rotating units is associated with a kinematic system in which the output shaft of a gearmotor has a disk keyed thereto, said disk being associated, by means of a connecting rod, with a first pulley having a larger diameter than said disk, so as to form a

crank system in which the parts are mutually arranged so that the continuous rotary motion of said disk causes a reciprocating semi-rotary motion of said first pulley.

9. Machine according to claim 8, characterized in that said first pulley is connected, by means of a belt transmission, to a second smaller pulley (force-multiplying transmission), both pulleys being rotatably coupled to a fixed support, the second pulley being connected, by means of a kinematic transmission, to an element which is articulated to said support with one end, a clamp suitable to grip the leading or trailing end of the portion being fixed to said element.

10. Machine according to claim 1, characterized in that said feeder unit is double and comprises a traction device with opposite belts and a traction device with opposite rollers, direction-selecting devices being present in order to guide the wire towards one traction device or the other.

11. Machine according to claim 1, characterized in that each one of said clamping presses is mounted on a table that is connected to at least one step motor for position adjustment.

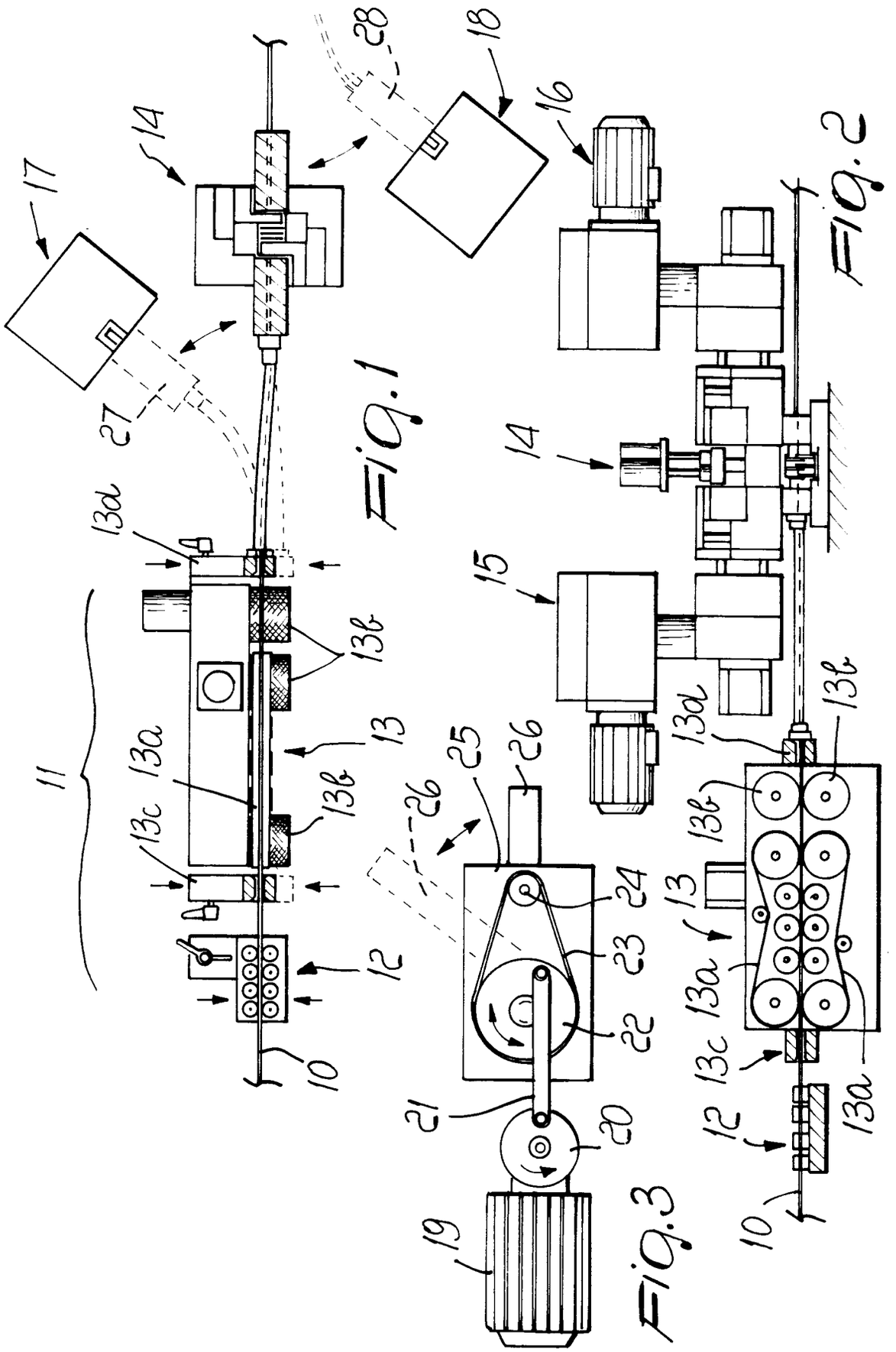


Fig.1

Fig.2

Fig.3

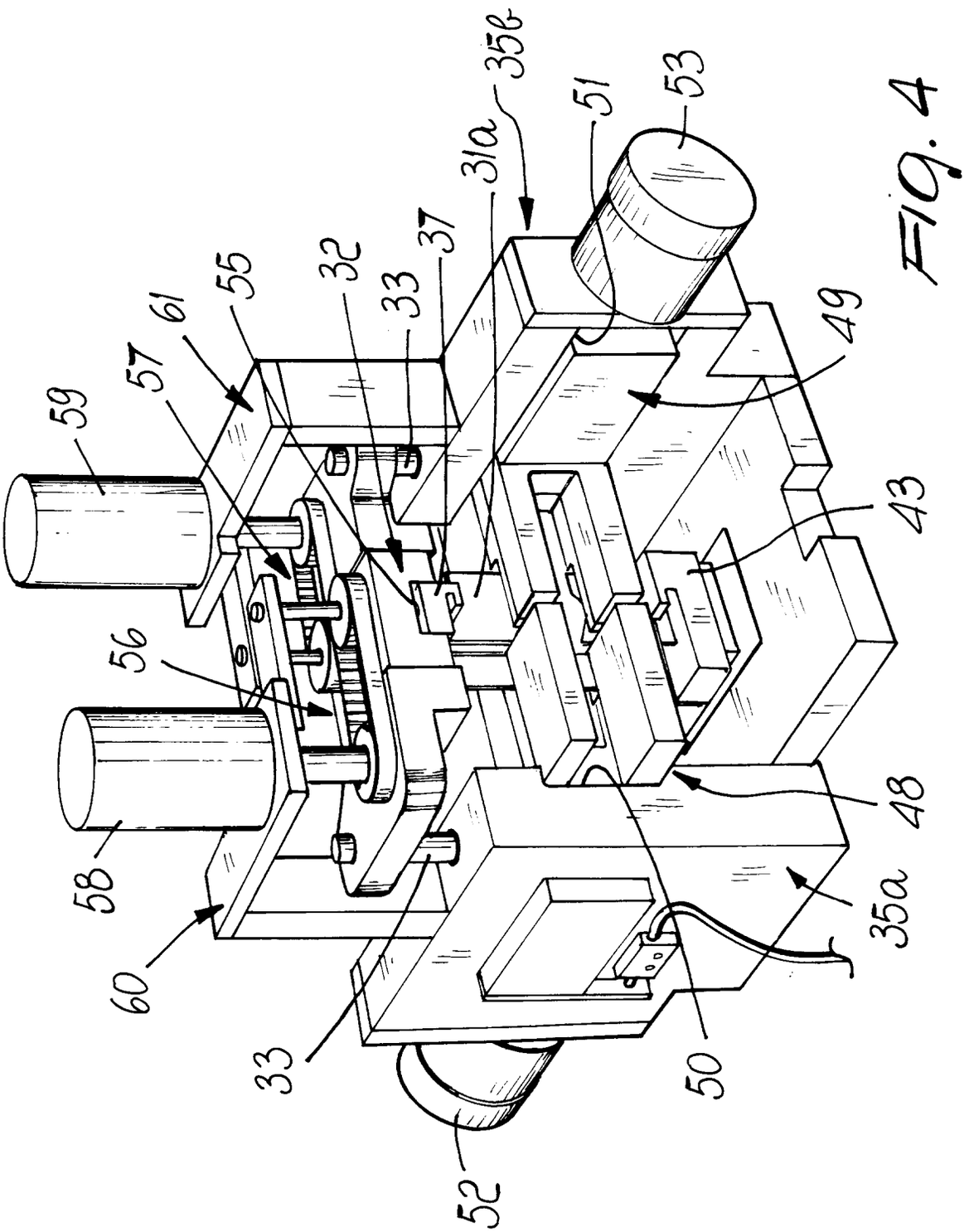
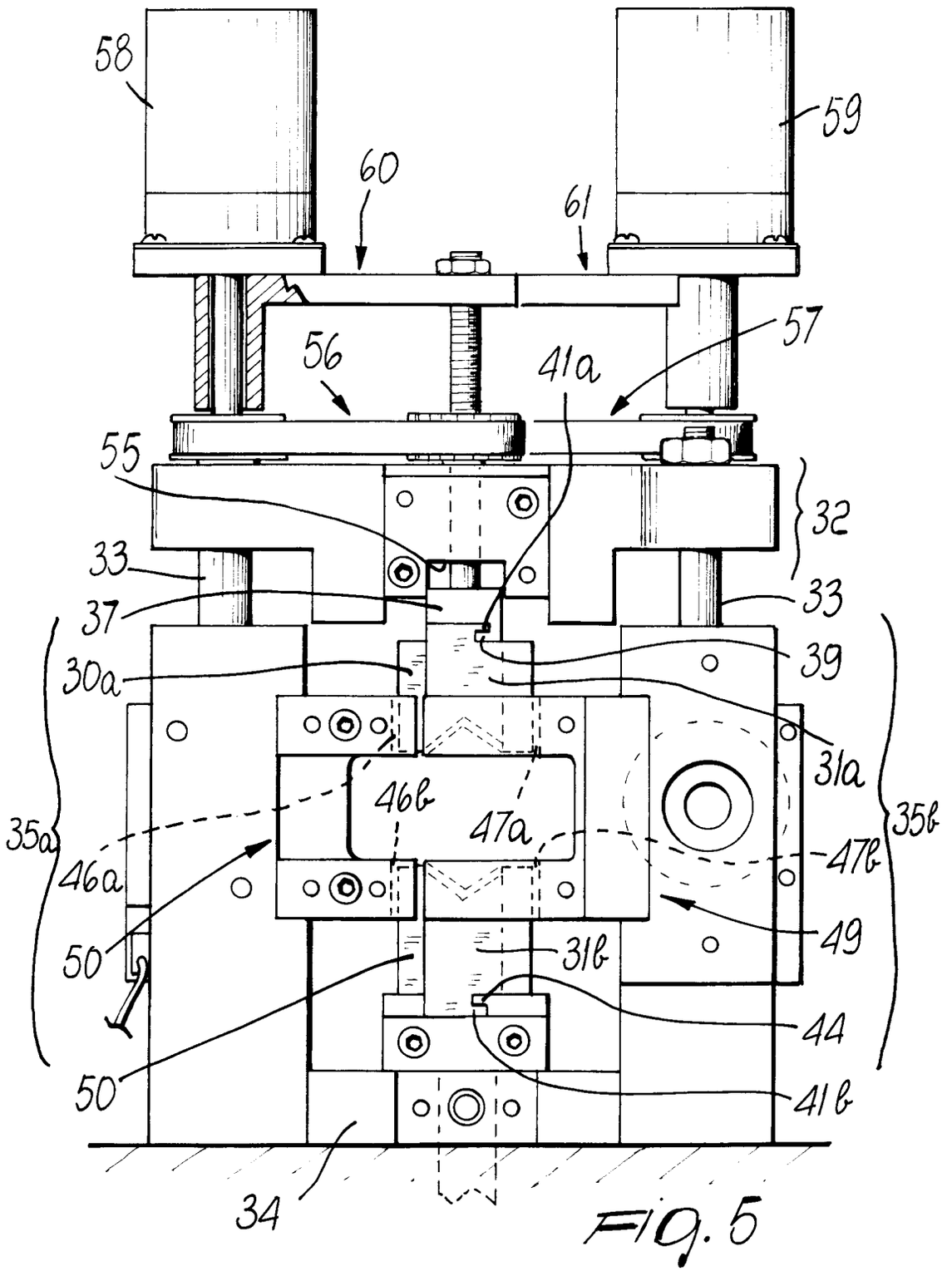


FIG. 4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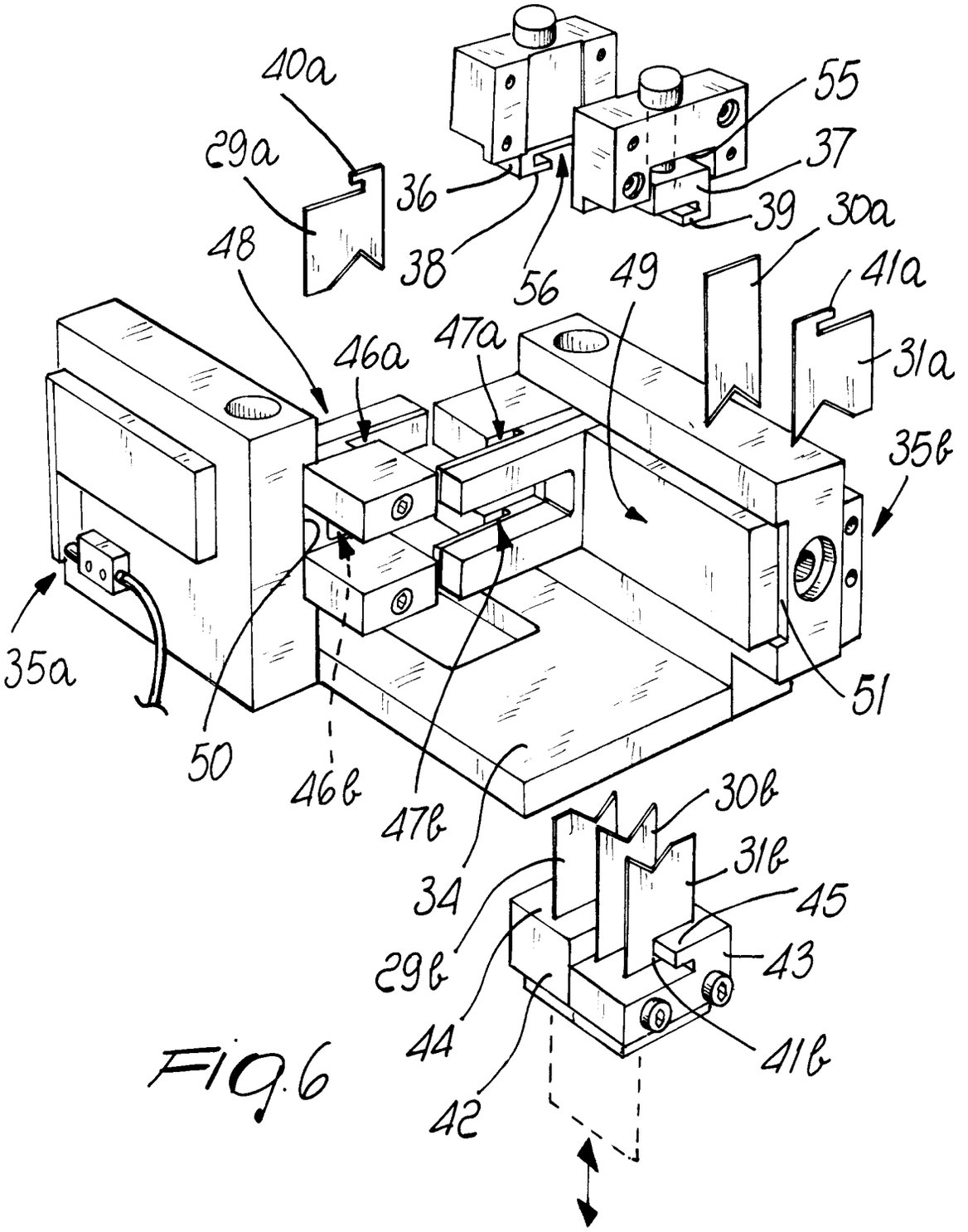
50
31b
44
50
41b
34

FIG. 5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29a
48
36
38
56
55
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41a
31a
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46b
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30b
31b
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29b
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41b
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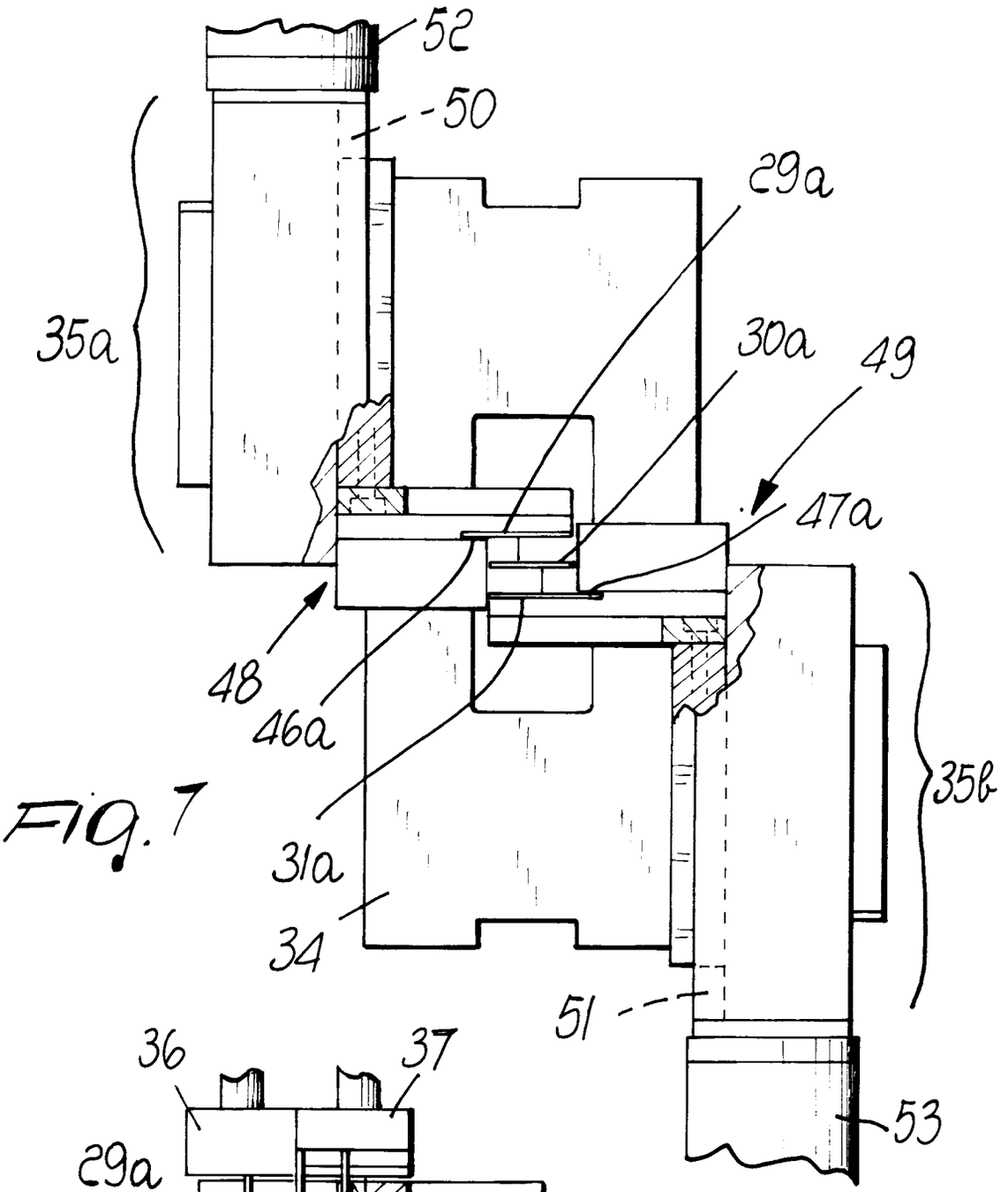
FIG.6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29a
35a
30a
49
47a
48
46a
35b
31a
34
51
53

FIG. 7

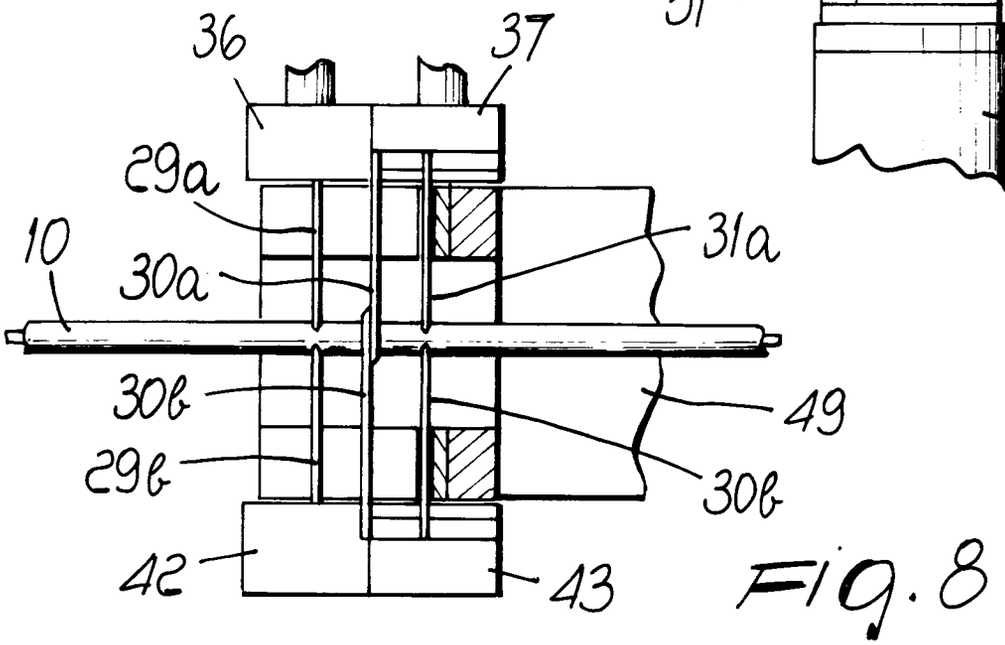
36
37
29a
31a
10
30a
30b
49
29b
30b
42
43

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 11 5061

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US-A-4 961 357 (JOHN D.BUTLER) * abstract; claims; figures *	1-6	H01R43/05
A	US-A-5 067 379 (JOHN D.BUTLER) * abstract; claims; figures *	1-6	
A	US-A-4 091 695 (JACK F.FUNCIK) * claims; figures *	1	
A	US-A-3 839 776 (RANDALL H.ANDERSON) * abstract; figure 1 *	1	
A	US-A-2 934 982 (FLOYD G.EUBANKS) * claims; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) H01R H02G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 January 1995	Durand, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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