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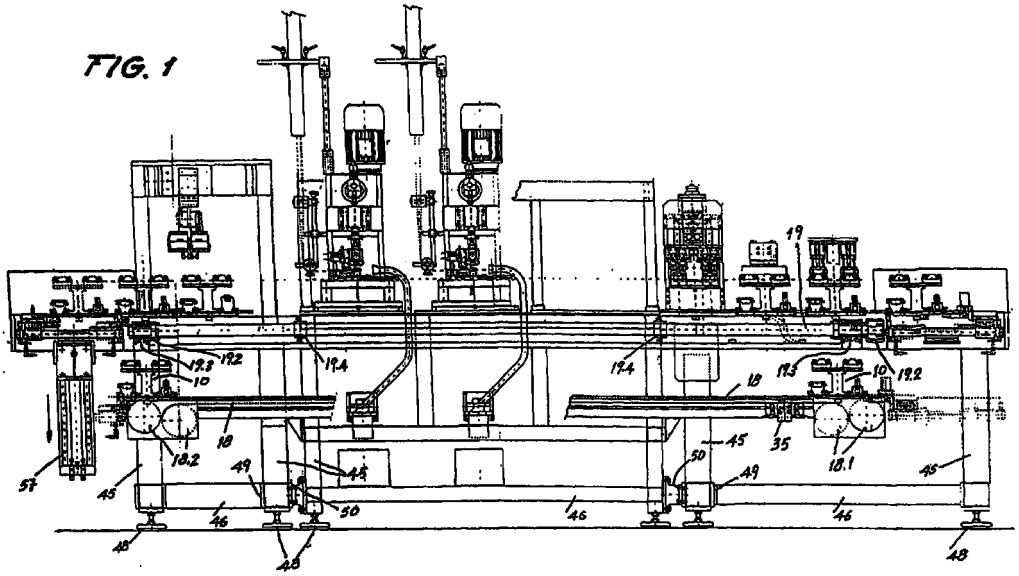
(54) MACHINE FOR MACHINING SPECIAL CABLES FOR AUTOMOBILES

(57) The Invention relates to a machine especially designed to carry out the following functions: straightening conductors; stripping the ends of cables; putting rubbers on said ends; setting the conductors; mounting the cable with its rubber and terminal in the corresponding connector. All said functions are performed in a cycle of approximately 16 seconds. To carry out said functions, the machine has been configured with a series of stations such as loading where the operator will be normally located to mount the cables and connectors, cable straightening that will operate automatically, cutting to cut the ends of said cables and strip the sheath, which will be done automatically, inserting automatically rubbers in the ends of the stripped and cut cables, automatic setting, assembly of terminals with the set cable ends in the connectors.

FIG. 1



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Description

[0001] A cable is to be understood as far as the present invention is concerned as a cord formed by several conductors mutually insulated and shielded by a dielectric casing providing the necessary flexibility and strength for use. The machine of the present invention is used for mechanizing braided cables having a cross section of up to 0,22 mm^2.

[0002] More specifically, the invention relates to a machine specially designed to carry out the following functions:

- Straightening of the conductors.
- Peeling the ends of the cables.
- Inserting rubbers in said ends.
- Crimping of the conductors.
- Fitting the cable with the rubber and the terminal into the corresponding connector, in a cycle of about 16 seconds.

[0003] To carry out said functions the machine has been provided with a series of stations or modules, such as:

- A loading module where the operator is usually located placing the cables and the connectors.
- A module for straightening the cables which operation is completely automatic.
- A module for cutting the ends of the cables and peeling the casing thereof, said operations being automatically performed.
- A module for automatic introduction of rubbers in the ends of the cables once they have been already peeled and cut.
- Automatic crimping.
- Assembly of the terminals crimped at the ends of the cables inside the connectors.

[0004] As said machine is configured as a modular assembly it can comprise more than one station for crimping, placing rubbers and straightening, whilst the station for loading and assembling the terminals which are crimped at the ends of the cables in the connector will be a single station.

[0005] Such machine is semiautomatic needing a single operator who places the connectors and the cables manually in the load station. The machine has a high flexibility due to its configuration and it is easy to be programmed using a computer. The inner conveyor system is a linear conveyor system using pallets in conjunction with a longitudinal shaft located horizontally at the inner part of the machine. Said pallets are reusable and quickly removed. They are provided with cradles to place the connectors and the cables therein.

[0006] The inner conveyor system with pallets is driven by a longitudinal shaft provided with a labyrinth at the surface thereof mounted inside the machine and driven by an electromotor at the output shaft of which there is a torque reducer servomotor. Movement from the shaft of the reducer is transmitted to the shaft by means of the corresponding belt.

[0007] The lateral surface of the driving shaft works in collaboration with the corresponding cams or flanges of the pallets, determining stop positions as they pass before the stations for loading, straightening, cutting and peeling, introducing rubbers and crimping and assembling the connectors, and continuing forward as these stations have concluded their work. This is helped by position sensors.

[0008] Due to the above mentioned system, the pallets describe a closed circuit moving horizontally when empty through the lower part of the machine driven by endless belts or straps. They are subsequently raised up vertically by means of elevators to the upper part of the machine where they follow the horizontal movement in an opposed direction driven by the above mentioned shaft, until they arrive at the end of the machine where they are descended to the endless belt by means of another elevator.

[0009] In the loading station, which is the first station where pallets pass, the cradles thereof receive the cables each having two conductors. Each of the cables are disposed in a funnel and they are hold in place by means of mechanical and pneumatic means after its presence has been detected and they have been properly positioned. Likewise in this station the corresponding connectors are placed in their cradles which have been designed so that the backpieces can be removed and they can be quickly disposed on said cradles. There are provided pneumatic control pistons directly acting on said cradle and moving backwards to others on undergoing a certain resistance as the connector takes up the corresponding cradle precluding movement of the pallet until each cradle is not occupied by its connector. Due to the features of the backpiece, a single connector can only take up a correct position.

[0010] In the straightening station, each conductor comes previously deformed as it was braided forming a cord. Said conductor is then forced to be extended and completely straightened perpendicular to the ideal longitudinal axis of the machine driving shaft. This is carried out by means of pneumatic cylinders provided with grippers which advance and close on the conductor thus stretching them backwards and forcing them to straighten out, opening up said grippers subsequently and moving laterally to repeat the operation on the other conductor of the cord.

[0011] In the cutting and peeling station, the pallet coming from the previous straightening station is stopped having the four ends corresponding to the two cables held in place at the cradles thereof. The cables are released from said cradles by actuators and held by manipulators forcing them to be moved up vertically and to advance forward until they become aligned with two cutting heads provided with the corresponding double

blades. One pair of such cutting heads advances converging on the conductors by means of two pneumatic cylinders to peel the conductor leaving the copper or aluminium wire naked. The other pair of blades cuts the conductor as the actuators are moving horizontally backwards to cause the conductor to be peeled as it is fastened by the two peeling blades. The conductor is then moved backwards and vertically down until it is disposed again by manipulators in the cradle thereof and held in place therein.

[0012] The crimping and rubber insertion stations are not described as they comprise presses and conventional devices not being the object of the present invention, In any case, pallets stop at said stations and the cables held in the cradles receive the rubbers and terminals. Movements and parts used to place these conductors in the crimping presses are of the same nature that those used in the cutting and peeling station.

[0013] Finally, once the conductors have been straightened, cut, and with their ends peeled and crimped by rubber and terminals, they come through the conveying pallets to the station previous to the assembling station. Assembly is carried out by an arm robot which movements herein described are determined by computer means that sets the appropriate coordinates in accordance with the specific features of the connector. When the pallet arrives at this station and it is stopped, the robot goes to the connector cradle advancing to catch the connector by the corresponding grippers. After going backwards, the actuators of the station simultaneously release the conductors from the cradles thereof and fit the terminal raising it vertically, advancing the robot again and entering the terminal inside the cavity of the connector. The terminal remains fixed inside the cavity of the connector by the retention means of the connector itself. The connector is then moved away horizontally and backwards by the robot arm in order to check that the terminal is not mislocated relative to the connector. The previous operations are repeated as many times as necessary so that all the cavities of the connector are occupied by terminals. Finally the operator then removes the connector with the terminals and cables already mounted. The defective pieces are previously discarded into their corresponding ramps with the good ones being previously separated therefrom. The pallets descend by the elevator located at one end of the machine and travel horizontally through the inner part thereof driven by two endless belts. The ends of said endless belts press a stump arranged at the inner part of the pallet until it has been disposed at the opposed end thereof where, by means of a further elevator, is positioned at the upper part of the machine. The cycle of the machine then is being started at the loading station.

[0014] Further details and features of the present patent application will be apparent from the following description, which refers to the accompanying drawings that schematically represent the preferred details. These details are given by way of example, which refer to a possible case of practical embodiment, but it is not limited to the details disclosed herein; therefore this description must be considered from an illustrating point of view and without any type of limitations.

[0015] A detailed list of the various parts cited in the present patent application is given below: (10) pallet, (10.1) platform, (11) stump, (12) support, (12.1) fasteners, (12.2) screws, (13) support, (13.1) fasteners, (13.2) screws, (14) support, (14.1) catches, (14.2) springs, (14.3) pivot point, (14.4.) edge of support (13), (14.5) edge of support (14), (15) cable support, (15.1) catches, (15.2) springs, (15.3) pivot point, (15.4) edge, (15.5) edge of cable support (15), (16) platform, (17) elevator, (18) endless belt, (18.1) pulleys, (18.2) pulleys, (19.2) support, (19.3) bearings, (19.4) intermediate support, (19.5) pulley, (20) motor, (21) torque reducer, (21.1) pulley, (22) funnel, (23) cable, (23.1) conductor, (23.2) insulator, (23.3) copper or aluminium wire, (24) suction device, (24.1) conductor, (25) piston, (26) pressing member, (27) manipulator, (28) grippers, (29) actuator, (30) actuator, (31) cutting blades, (32) peeling blades, (33) blade support, (34) spring, (35) plates, (36) stand, (37) support, (38) pneumatic cylinders, (39) plate, (40) stem, (41) reinforcing member, (42) stand, (43) support, (44) straightening station, (45) struts, (46) longitudinal members, (47) crosspieces, (48) feet, (49) support, (50) screws, (51) plates, (52) longitudinal members, (53) U-shaped crosspieces, (54) reinforcing member, (54.1) side plates, (55) handrails, (56) belt, (57) elevators, (58) profiles, (58.1) openings, (59) handrails, (60) side plates, (61) pneumatic cylinders, (62) gripper, (63) cylinders, (63.1) stem, (63.2) plate, (63.3) displaced stem, (64) gripper, (65) robot, (66) support, (67) column, (68) machine, (68.1) loading station, (68.2) connector assembly station, (68.3) connector straightening station, (68.4) cutting and peeling station, (68.5) crimping station, (69) sensor element for connector control, (70) vertical post, (70.1) side plates, (71) horizontal support, (71.1) side plates, (72) support, (73) linear actuator, (74) vertical post, (74.1) horizontal extension, (74.2) it supports, (75) horizontal stand, (76) support, (77) stands, (77.1) handrails, (78) sensor element for cable control, (79) sensor element, (80) pneumatic piston, (81) containers, (81.1) gripper, (81.2) jaws, (82) actuators, (83) angular support, (84) actuators, (84.1) grippers, (84.2) jaws, (85) angular support, (86) strip, (6.1) support, (87) manipulator, (88) air chamber, (89) position sensor element for control of grippers (64), (90) shaft, (91) lateral surface of shaft (90), (92) labyrinth.

Figure n^{o} 1 is an elevational end view of the machine for mechanizing cables.

Figure n° 2 is a side elevational view of the machine of the invention.

Figure n° 3 is a top plan view of the machine of the invention.

Figure n° 4 is an elevational side view of the loading

module of the machine.

Figure n° 5 is an elevational end view of the loading module of the machine with the pallet stopped in front of the module.

Figure n° 6 is a top plan view of the loading module with a pallet (10) stopped in front of it, with supports (14) and (15) separately trapping the cables (23) and the conductors (23.1).

Figure n° 7 is an elevational side view of the straightening module with a pallet (10) stopped in front of it with a cable (23) trapped in the supports (14) and (15).

Figure n° 8, is a top plan view of the straightening module with the pallet (10) stopped in front of him.

Figure n° 9 is an elevational side view of the crimping module.

Figure n^{o} 10 is an elevational end view of the crimping module.

Figure n° 11 is an elevational side view of the cutting and peeling module.

Figure n° 12 is an elevational end view of the cutting and peeling module.

Figure n° 13 is an elevational side view of the cutting and peeling module.

Figure n° 14 is a closer, fragmentary sectional top plan view of the robot part.

Figure n° 15 is an elevational side view of the shaft (90).

Figure n° 16 is a longitudinal section taken along 16-16', according to figure n° 15.

[0016] In one of the preferred embodiments of what is the object of the present invention and as it can be seen from figures n° 1, 2 and 3, the machine for mechanizing cables is built on a frame by assembling struts (45) perpendicular to longitudinal members (46) and crosspieces (47), which, in turn, are perpendicular to the longitudinal members (46). The frame rests on the ground through height adjustable feet (48) allowing to even out the machine. Struts (45), longitudinal members (46) and crosspieces (47), are made from conventional profiles and they are designed to fit in supports (49) and held by means of screws (50).

[0017] The machine (68) of the invention comprises a loading station (68.1) and a connector assembling station (68.2) between which one or more additional stations could be fitted, such as:

- A straightening station (68.3).
- A cutting and peeling station (68.4).
- A rubber and terminal crimping station (68.5).

[0018] At the upper part of the frame, see figures n° 1 and 2, there is a structure for conveying the pallets (10) which configuration will be detailed below. This structure comprises horizontal plates (51) joining the struts (45) on which longitudinal members (52) are mounted reinforced by handrails (55). U-shaped crosspieces (53) are screwed perpendicular to handrails (55). The crosspieces (53) are secured in struts (45) and reinforcing members (54) provided with side plates (54.1), see figure n° 13.

[0019] On such structure pallets (10) slide driven by a labyrinth (92) in the shaft (90) fitted inside this structure, see figures n° 1 and 2. Said shaft (90) rests on the corresponding supports (19.2) located at their ends provided which the corresponding bearings (19.3) and other intermediate supports (19.4), see figure n^{o} 1.

[0020] Under this structure, the empty pallets (10) advance. The upper part of the structure is communicated with the lower part thereof by means of elevators (57) located at the ends of the machine (68).

[0021] As it can be seen from figure n° 2, shaft (90) is driven by an electromotor (20) coupled to a servomotor which, in turn, is coupled to a torque reducer (21) which shaft is provided with a pulley (21.1) which also transmits movement to pulley (19.5) fitted at the end of shaft (90) by means of a belt (56).

[0022] Advancing of the pallets (10) inside the machine (68) is ensured by two endless belts (18) rotating about pulleys (18.1) and (18.2). The endless belts (18) rest on profiles (58) provided with openings (58.1) for fitting and guiding of the endless belts (18). These profiles (58) are formed by profiles and handrails (59) resting on reinforcing side plates (60), see figure n^{o} 2.

[0023] Pallets (10) are trapped between the edges of the endless belts (18) and the stump (11) arranged at the inner part thereof and the ends of the endless belts (18) are held in plates (35) as it can be seen from figure n^{o} 1.

[0024] The pallet (10), as shown in figure n^{o} 5, comprises two platforms (10.1) and (16) separated by a stand (42). The supports (12), (13) are arranged on the first platform (10.1) and they are provided with backpieces to fasten the corresponding connectors. The supports (14-15) for cables (23) are mounted on the second platform. They are provided with a device to fasten the cables (23) and the conductors (23.1) separately.

[0025] Said device is formed by the U-shaped supports (14-15) between the vertical portions of which there are gaps in the form of a funnel (22) where catches (14.1-15.1) are provided. Said catches (14.1-15.1) are pivotally mounted around the pivot point (15.3-14.3) against the expansible action of an horizontally mounted spring (14.2-15.2), forming the edge (14.4-15.4) of the catches (14.1-15.1) and the edge (14.5-15.5) of the supports (14-15) a funnel (22), see figure n° 5.

[0026] As it can be seen from figure n° 4, the loading module or station (68.1) is integrally formed on the frame of the machine and it is hung on the stand (36) and the horizontal extension thereof (36.1). Such station (68.1) is secured to the structure by means of the side plate (41). The stand (36) supports two pneumatic cylinders (38) each provided with two stems (40) guided

through the plate (39) that is provided with pistons (25) at the end thereof.

[0027] There are provided control means which cooperate to the operation of the loading station comprising:

- A sensor element (78) for cable presence sensing.
- A control cell (69) for connector presence sensing.

[0028] Operation of the loading station (68.1) is as follows: the operator separates the conductors (23.1) from the cable (23) and places them into the funnel (22) of the cable supports (14) and (15) then acting the pistons (25).

[0029] When conductors (23.1) contact the stop of the sensor element (78), see figure n° 4, they force the pressing members (26) to descend which, in turn, forces to descend the catches (14.1-15.1) pivoting around the pivot point (14.3-15.3) and trapping said conductors (23.1) in the funnel (22). Simultaneously, the cells (69) control that the corresponding connectors are occupying the supports (12) and (13) placed manually therein by the operator in their respective backpieces.

[0030] As the pallet (10) has been loaded with the conductors (23.1) and the opportune connectors have been secured in the supports (12-13-14-15), it continues advancing on the upper part of the machine (68) to the straightening module (68.3).

[0031] As shown in figure n° 7, the straightening station (68.3) is mounted on a vertical stand (70) and on another horizontal support (71) both reinforced by side plates (70.1) and (71.1). On said vertical stand (70) a pneumatic piston (80) is secured provided with a stem at the end of which there is a handrail like pressing member (26) which width is generally similar to that of the platform (16) of the pallet (10), see figure nº 8. On the stand (71) pneumatic cylinders (61) are secured with the support (72) which stem acts on a manipulator (27) which acts, in turn, on grippers (28).

[0032] The grippers (28) along with the manipulator (27) and the pneumatic cylinder (61) can move horizontally from right to left by a linear actuator (73) resting on the stand (71), see figure n° 7.

[0033] Likewise, the straightening station, as shown in figures n° 7 and 8, is provided with pressing members (26) pneumatically driven by the corresponding cylinders (80) which hold the conductors (23.1) between them and the support (43). Grippers (28) then actuate, sees figure n° 8, swooping down on the conductors (23.1) as the robots (27) advance driven by the pneumatic cylinders (61).

[0034] Once the grippers (28) have trapped the conductors (23.1), they stretch them slightly backwards to straighten their ends, opening up the grippers (28) rotating 180°, repeating the same operation in the second conductor (23.1) of the cable (23).

[0035] The cutting and peeling station (68.4), see figure n° 11, is supported by vertical stands (74), at the ends of which a horizontal extension (74.1) is attached, see figures n° 11 and 12. On such horizontal extension (74.1), there are arranged two vertical action pneumatic cylinders (63) and two linear actuators (30) which are fastened on a linear support (74.2) in the stand (74). At the end of the stem (63.1) there is a plate (63.2) which is provided with a further displaced stem (63.3) having supports (33) of cutting blades (31) and peeling blades (32). The actuators (30) are driven in a combined vertical movement by actuators (29) and transmit a vertical and horizontal movement to the gripper (62) holding the support (76) with the catches thereof.

[0036] The cutting and peeling station (68.4) is provided, at the lower part thereof, with further two pneumatic cylinders (63) which stem (63.1) is vertically guided up and supports by means of a plate (63.2) another displaced stem (63.3) which is provided with blades (31) and (32) and the support (33).

[0037] The cutting and peeling module is as shown in figures n° 11 and 12. It is provided with a manipulator of the cable (23) helped by a gripper (62), see figure n° 11, collecting the cable (23) and the supports (14) and (15) raising them in a vertical upward movement after they have been released from the catches (14.1-15.1). Then, they are caused to advance horizontally to the cutting and peeling station (68.4). This is carried out by actuators (29) and (30). The station includes two pneumatic cylinders (63) provided with blades (31) and (32) at the ends thereof which are mounted in the supports (33). Retraction is assured by springs (34) with the blades (31) and (32) swooping down on the conductors (23.1) which is moved backwards by the actuator (30) causing insulation or casing (23.2) of the conductors (23.1) to be removed and causing the copper or aluminium wire (23.3) to be cut, (the four ones at the same time). Subsequently, the descending vertical movement of the gripper (62) occurs until conductors (23.1) have been placed into the funnels (22), and being trapped again by means of the catches (14-15.1). The pallet (10) continues its path to the next station to proceed with the crimping operation.

[0038] In the crimping module, see figures n° 9 and 10, two conventional presses are fitted which structure and operation are not described herein as not being part of the present invention. However, feeding of this presses is carried out by a manipulator of identical features to those previously described other than the gripper (62) is double as shown in figure n° 9, to catch the conductors (23.1) through two points. The presses are provided with suction devices (24) having passages (24.1) to collect waste of the operation and crushing it by means of blades shown in the figures. Waste is then thrown into containers (81) located inside the machine.

[0039] The connector assembling station, as it can be seen from figures n° 13 and 14 comprises stands (77) and handrails (77.1) on which actuators (82) are fitted. Actuators (82) drive the actuators (84) through an angular support (83), said actuators (84) being provided

with grippers (84.1) holding the angular support (85) between their jaws (84.2). At the lower part of the machine and on the struts (45) there is a support (86.1) of the strip (86) for vertical and horizontal adjustment and on which the conductor (23.1) and the corresponding terminal are disposed.

[0040] The robot (65) is located onto the side of the strut (45) and it is allowed to be vertically or horizontally moved by stroke supports (65-67), as well as around itself. The stroke support (65) is provided with grippers (64). Upon grippers (64) become adjusted on the corresponding connector, they are slightly moved backwards by an air chamber (88) arranged in the manipulator (87).

[0041] In connector assembling module, see figures nº 13 and 14, cables (23) already crimped along with the terminals are placed in the previous station into the cavities formed inside the connector. This is helped by the same manipulator as described hereinbefore when disclosing the previous modules. Conductors (23.1) are then released and upwardly raised in a vertical movement held through two points and positioned facing to a gripper (64) advancing towards the connector located in the support (12) and (13). The connector is caught between the jaws of the gripper and then is moved backwards again by the robot (65), which is moved vertically as the supports (66) thereof are sliding on the column (67), as it can be seen from figure n° 13. When the connector is already held by the grippers (64), the robot (65) forces it to advance again aligning it with the conductor (23.1) and its terminal, which enters inside the connector (65) moving backwards again a short length to prevent the terminal from being mislocated. This is helped by the air chamber (88) acting in conjunction with a sensor (89) for controlling the position of the grippers (64). Operation is repeated until the connectors of the pallet (10) are provided with the corresponding terminals.

[0042] Once the invention has been sufficiently described in accordance to the enclosed drawings, it is understood that any modification can be introduced as appropriate, provided that variations may alter the essence of the invention as summarised in the appended claims.

Claims

1. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" comprising a series of modules, each performing a specific function and being allowed to carry out some of the following operations by manual or automatic means: loading of cables and connectors, cutting and peeling of cables, insertion of rubbers and crimping of terminals at the ends of said cables, characterized in that the machine (58) comprises a frame provided with struts (45) fastened on longitudinal members (46) and crosspieces (47), said frame resting on height adjustable feet (48) to even out the machine; the struts (45), the longitudinal members (46) and the crosspieces (47) being formed from profiles fitted in supports (49) and being held in place by screws (59); a loading station (68.1), a straightening station (68.3), a cutting and peeling station (68.4) and a rubber and terminal crimping station (68.5) being arranged at the upper part of said frame, as well as a structure for supporting pallets (10) comprising horizontal plates joining the struts (45) on which the longitudinal members (52) are mounted; U-shaped crosspieces (53) and reinforcing members (54) being screwed perpendicular to both said struts (45) and longitudinal members (52); said reinforcing members (54) being provided with side plates (54.1); said pallets (10) sliding on said structure driven by a labyrinth (92) arranged at the side surface of the shaft (90) fitted inside this structure; movement of the mentioned pallets (10) inside the machine (68) being provided by two endless belts (18) rotating around pulleys (18.1) and (18.2) supported on profiles (58) having openings (58.1) to fit the guides of said endless belts (18) which ends are held by means of plates (35).

2. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim, characterized in that the machine (68) comprises a loading station (18.1) and a connector assembling station (68.2) between which there are provided one or more of the following stations:

   - Straightening station (68.3).
   - Cutting and peeling station (68.4).
   - Rubber and terminal crimping station (68.5).

3. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim 1, characterized in that supports (19.2) are located at the ends of the shaft (90) provided with the corresponding bearings (19.3) and other intermediate supports (19.4) which side surface being provided with cams (19.1) that, in conjunction with the stumps (11) of the pallet (10), is driving said pallet (10) through the upper part of the machine (68).

4. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim 1, characterized in that the edges of the endless belts (18) trap the pallets (10) and its stump (11) arranged at the lower part thereof forcing them to be moved through the lower part of the machine (68).

5. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claims 1 and 4, characterized in that the pallet (10) is provided with platforms (10.1) and (16) separated by a stand (42); supports (14-15) provided with a

corresponding device to separately hold the cables (23) and the conductors (23.1) being arranged on a platform (10,1); supports (12-13) provided with backpieces to hold connectors placed manually by the operator being arranged on a platform (16).

6. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim 5, characterized in that the device for holding the conductors (23.1) comprises catches (14.1-151) pivotally mounted around a pivot point (14.3-15.3) against the expansible action of a horizontally mounted spring (14.2-15.2); the edge (14.4-15.4) of the catches (14.1-15.1) and the edge (14.5-15.5) of the supports (14-15) forming a funnel (22).

7. MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claims 1 and 2, characterized in that the loading station (68.1) is attached to the frame of the machine and it is hung on the stand (36); the horizontal extension (36.1) thereof being secured to this structure by side plates (41); said stand (36) supporting two pneumatic cylinders (38) each having two stems (40) at the end of which there are pistons (25).

8. MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claims 1 and 7, characterized in that at the loading station (68.1) the operator separates the conductors (23.1) from the cable (23) and places them into the funnel (22) of the supports for the cable (14-15) then acting the pistons (25) so that when conductors (23.1) placed in the corresponding supports contact the stop of the sensor element (78) pressing members (26) are forced to descend and, in turn, the catches (14.1-15.1) are forced to descend pivoting around the pivot point (14.3-15.3) and trapping said conductors (23.1) in the funnel (22); cells (69) controlling that the corresponding connectors are occupying the supports (12-13) placed manually therein by the operator in their respective backpieces.

9. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim 1, characterized in that the straightening station (68.3) is mounted on a vertical stand (70) and on a further horizontal support (71) both reinforced by side plates (70.1) and (71.1); a pneumatic piston (80) being secured on said vertical stand provided with a stem at the end of which a handrail like pressing member (26) is provided which width is generally similar to that of the platform (16) of the pallet (10); pneumatic cylinders (61) being secured on the stand (71) with the support (72) which stem acts on a manipulator (27) acting, in turn, on grippers (28).

10. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claims 1 and 9, characterized in that the straightening station is provided with pressing members (26) pneumatically driven by the corresponding cylinders (80) which hold the conductors (23.1) between them and the support (43); grippers (28) then being actuated swooping down on the conductors (23.1) as the robots (27) advance driven by the corresponding pneumatic cylinders (61); once the grippers (28) have trapped the conductors (23.1), they stretch them slightly backwards to straighten their ends, open up the grippers (28) rotating 180° and repeating the same operation in the second conductor (23.1) of the cable (23).

11. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim 1, characterized in that the cutting and peeling station (68.4) is supported by vertical stands (74) provided with a horizontal extension (74.1) at the upper end thereof; two vertical action pneumatic cylinders (63) and two linear actuators (30) being provided on such horizontal extension (74.1); said cylinders (63) and actuators (30) being fastened on a support (74.2) in the stand (74); a plate (63.2) provided with a further displaced stem (63.3) being arranged at the end of stem (63.1); said plate (63.2) having supports (33) for cutting blades (31) and peeling blades (32); said actuators (30) being driven in a vertical movement by means of actuators (29) transmitting a vertical and horizontal movement to gripper (62) holding the support (76) with the catches thereof; the cutting and peeling station (68.4) being provided with further two pneumatic cylinders (63), which stem (63.1) is vertically facing, supports, by means of a plate (63.2), another displaced stem (63.3) which end is provided with blades (31) and (32) and the support (33).

12. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claims 1 and 11, characterized in that the cutting and peeling module (68.4) is provided with a manipulator of the cable (23) having a gripper (62) to collect the cable (23) and the supports (14-15) raising them in a vertical upward movement after they have been released from the catches (14.1-15.1), cables (23) being then caused to advance horizontally to the cutting and peeling station (68.4) by actuators (29-30); said station including two pneumatic cylinders (63) provided with blades (31-32) at the ends thereof which are mounted in the supports (33); retraction being performed by springs (34) with the blades (31) and (32) swooping down on the con-

ductors (23.1) which move backwards by the actuator (30) causing insulation or casing (23.2) of the conductors (23.1) to be removed (the four ones at the same time; descending vertical movement of the gripper (62) continuing until conductors (23.1) have been placed into the funnels (22), and being trapped again by means of the catches (14-15.1) and the pallet (10) continuing its path to the next station to proceed with the crimping operation.

13. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claim 1, characterized in that the connector assembling station (68.2) comprises stands (77) and handrails (77.1) on which the actuators (82) are fitted driving the actuators (84) through an angular support (83); said actuators (84) being provided with grippers (81.1) holding the angular support (82) between their jaws (81.2); a support (86.1) of the strip for vertical and horizontal adjustment (86) being arranged at the lower part of the machine and on the struts (45) on which the conductor (23.1) and the corresponding terminal are disposed; a robot (65) being located onto the side of the strut (45) being allowed to be vertically or horizontally moved by stroke supports (65-67), as well as around itself; said stroke support (65) being provided with grippers (64); said robot (65) being slightly moved backwards by an air chamber (88) arranged in the manipulator (87) upon grippers (64) become adjusted on the corresponding connector.

14. "MACHINE FOR MECHANIZING SPECIAL CABLES FOR MOTOR VEHICLES" as claimed in claims 1 and 13, characterized in that in the connector assembling module, cables (23) which are already crimped along with the terminals are placed in the previous station into the cavities formed inside the connector so that as conductors (23.1) are released, they are upwardly raised in a vertical movement held through two points and positioned facing to a gripper (64) advancing towards the connector located in the support (12-13); the connector being caught between the jaws of the gripper and then is moved backwards again by the robot (65), which is moved vertically as the supports (66) thereof are sliding on the column (67) in such a way that when said connector is already held by the grippers (64), the robot (65) forces it to advance again aligning it with the conductor (23.1) and its terminal, which enters inside the connector (65) moving backwards again a short length to prevent the terminal from being mislocated, said operation being repeated until the connectors of the pallet (10) are provided with the corresponding terminals.

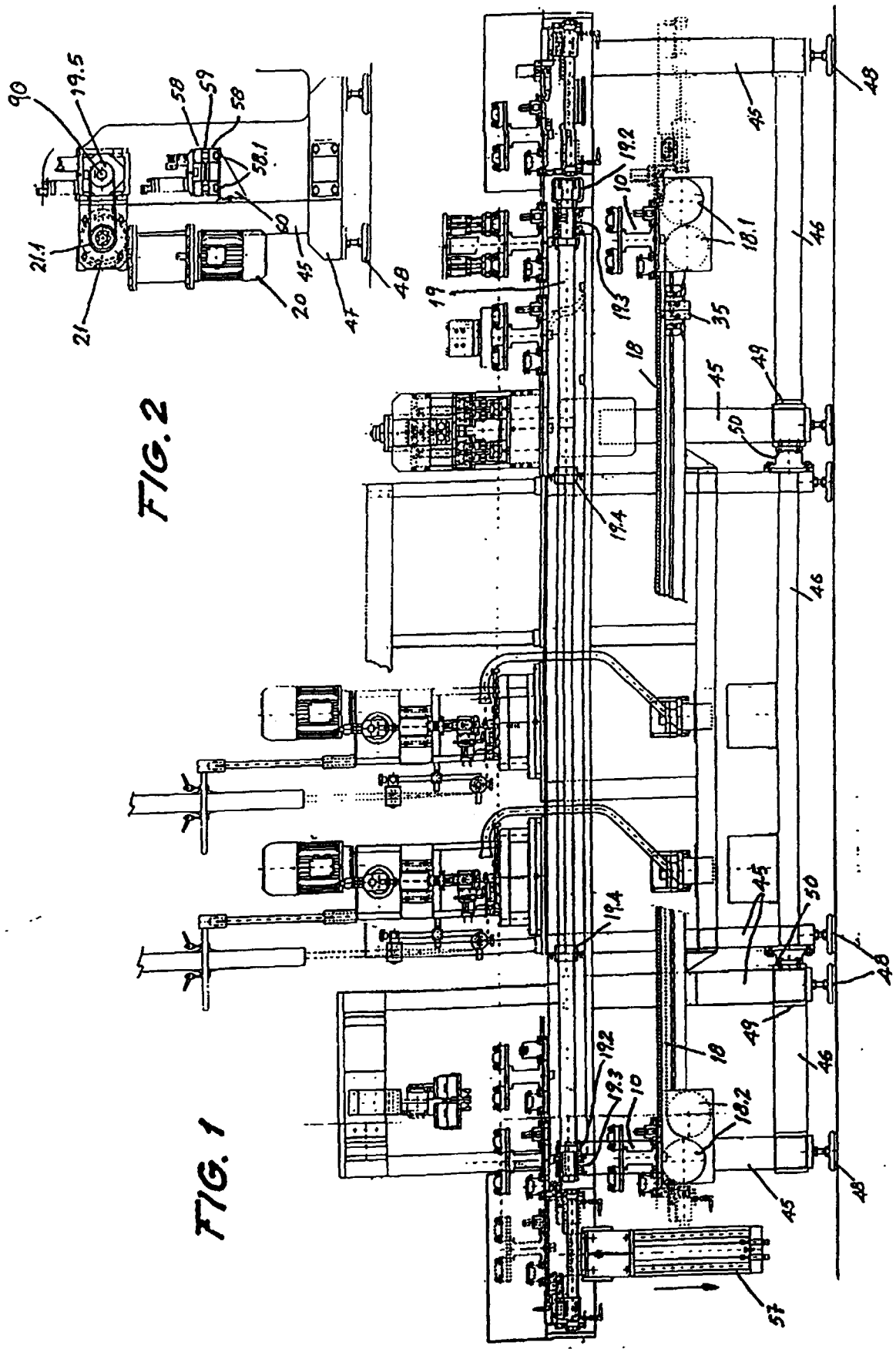
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FIG. 2

FIG. 1

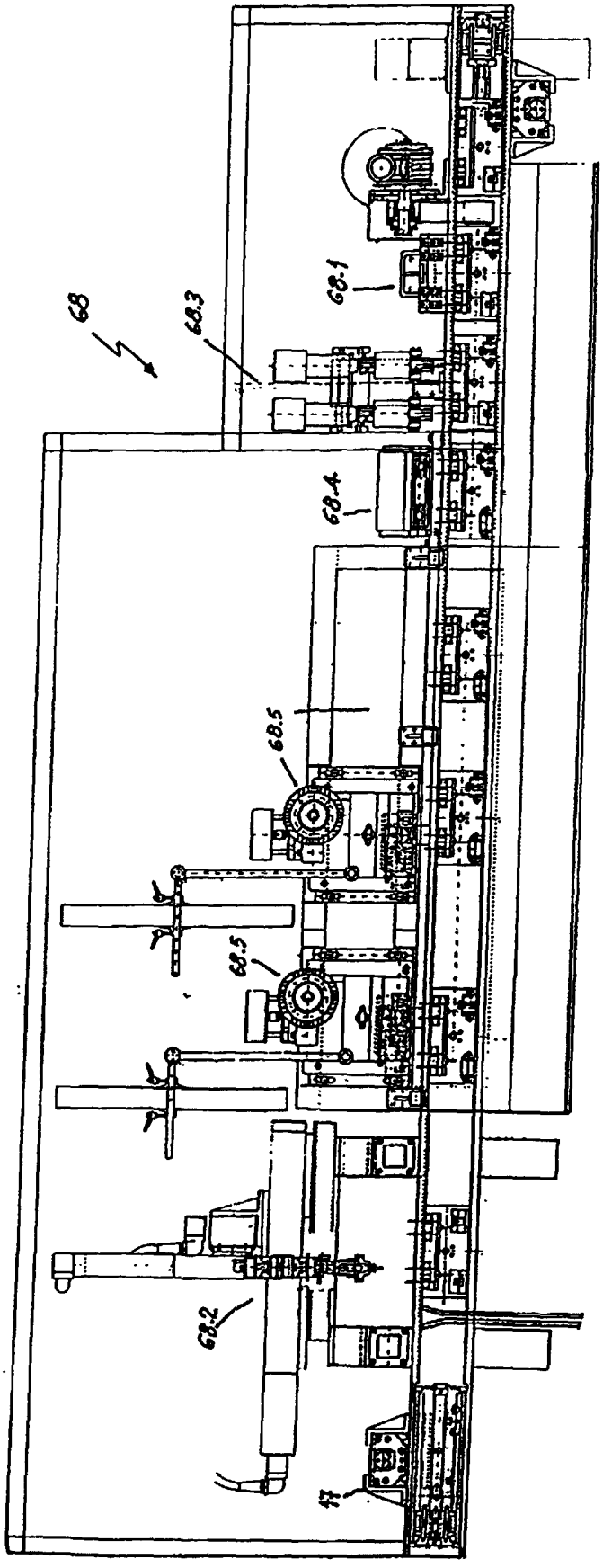


FIG. 3

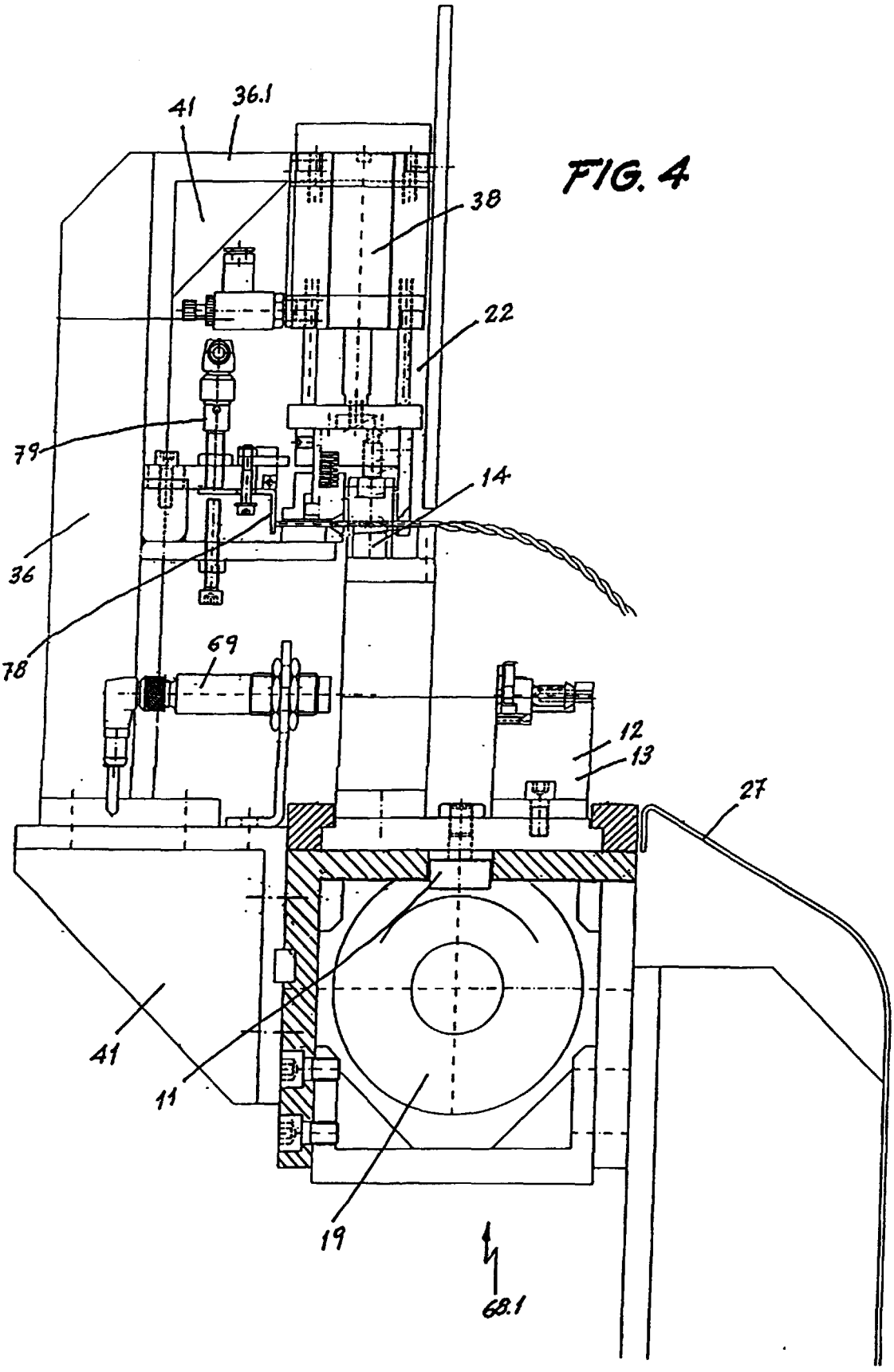
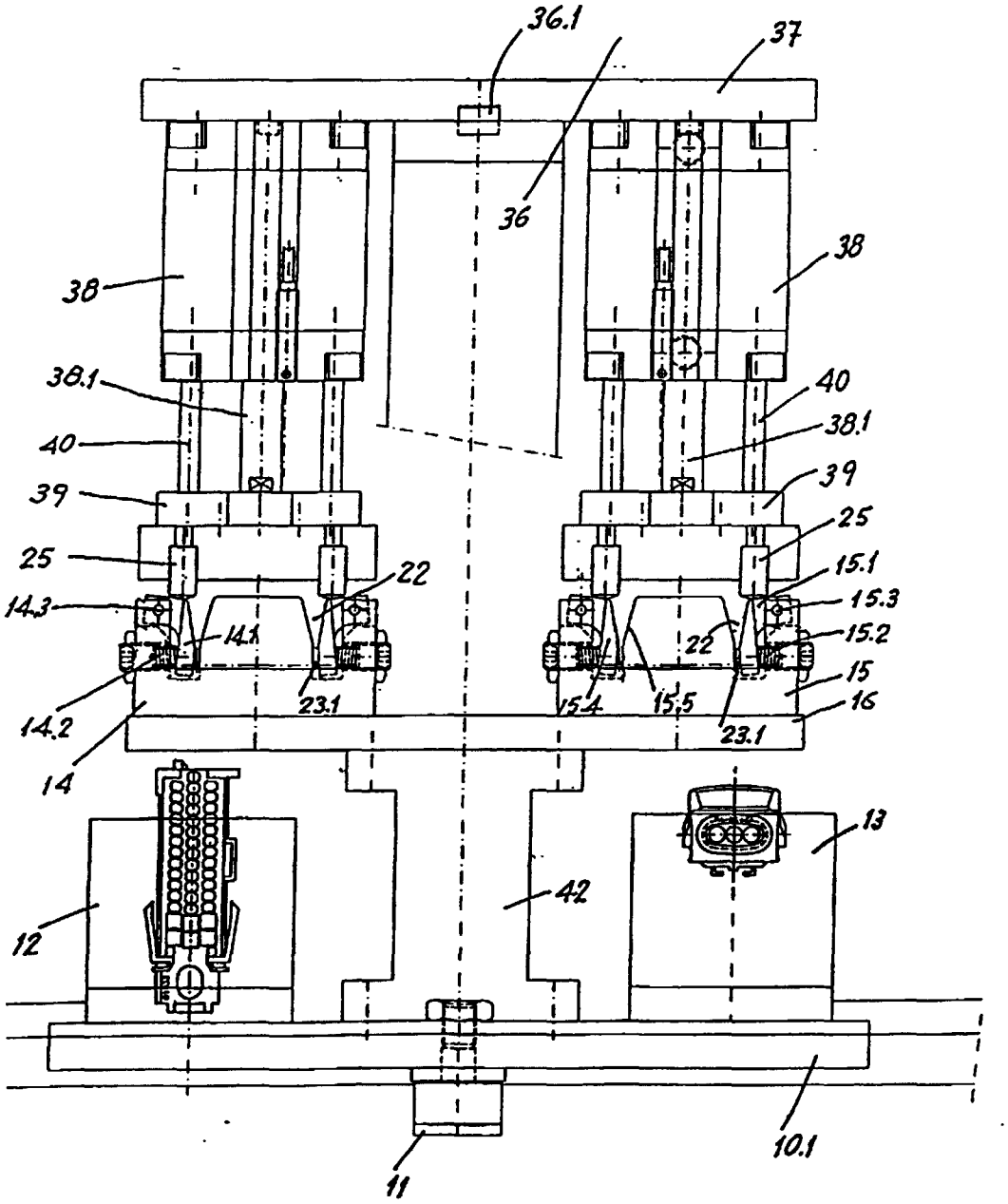


FIG. 4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15.2
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15.4
15.5
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14.2
23.1
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10.1
11

FIG. 5

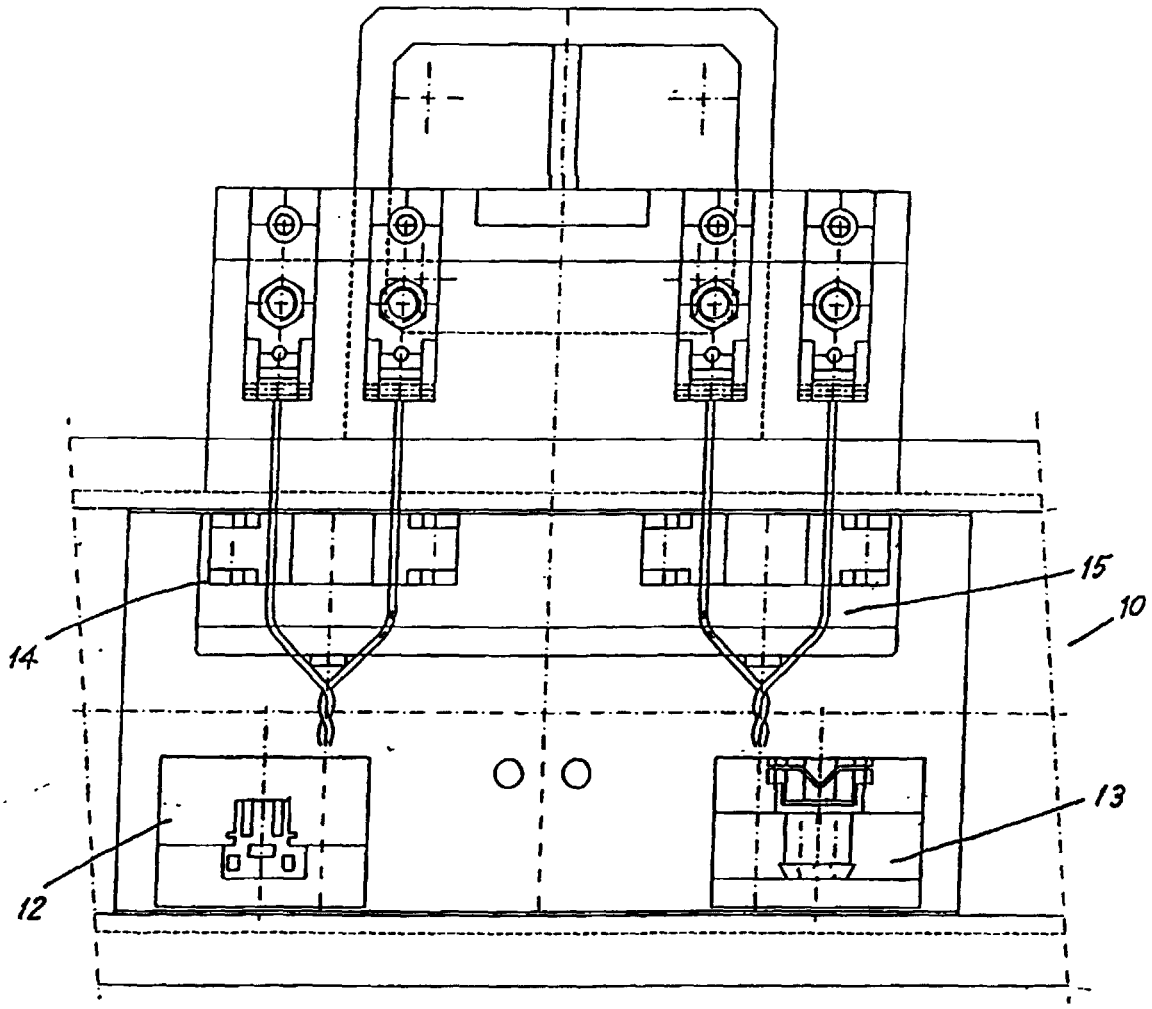


FIG.6

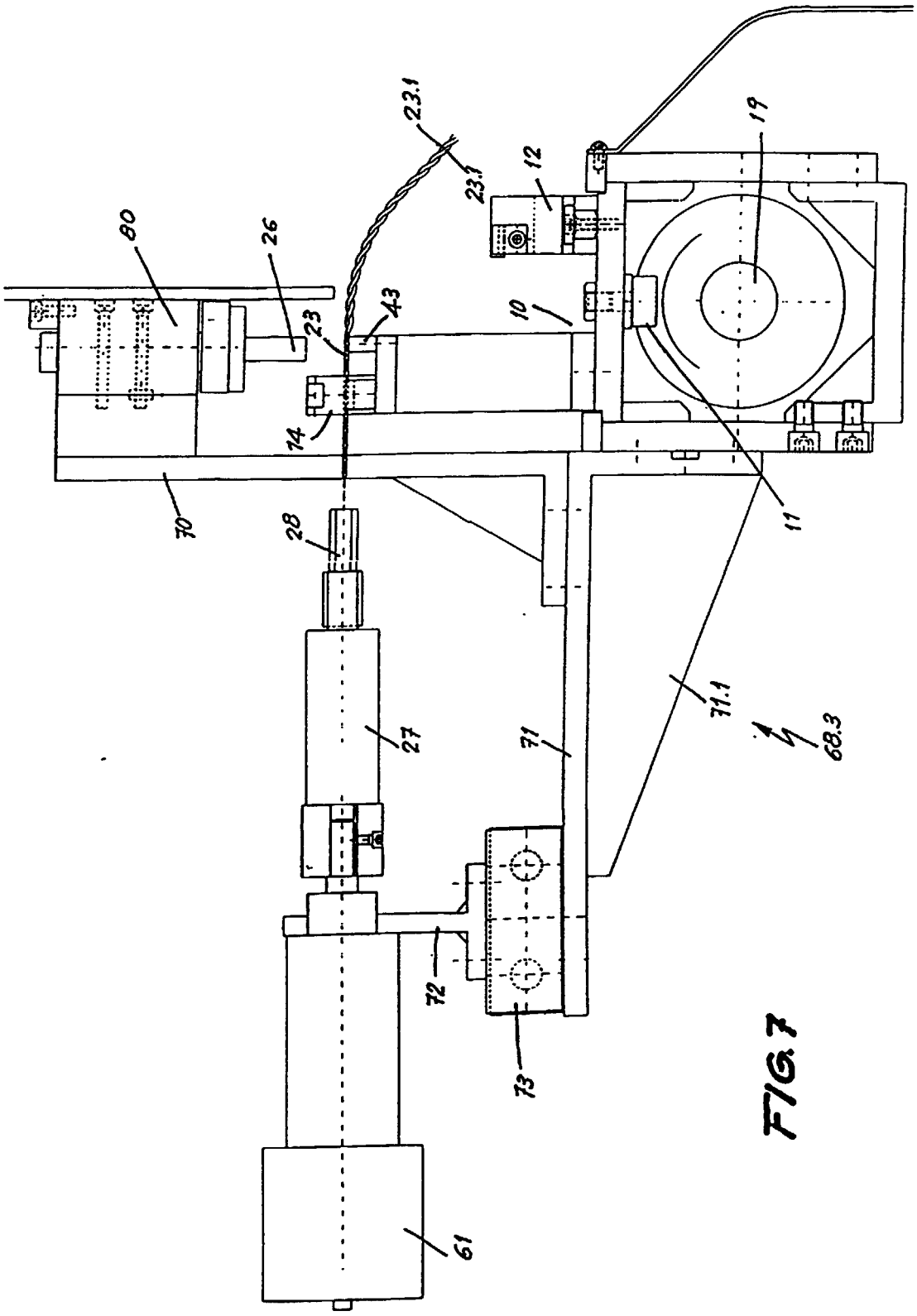
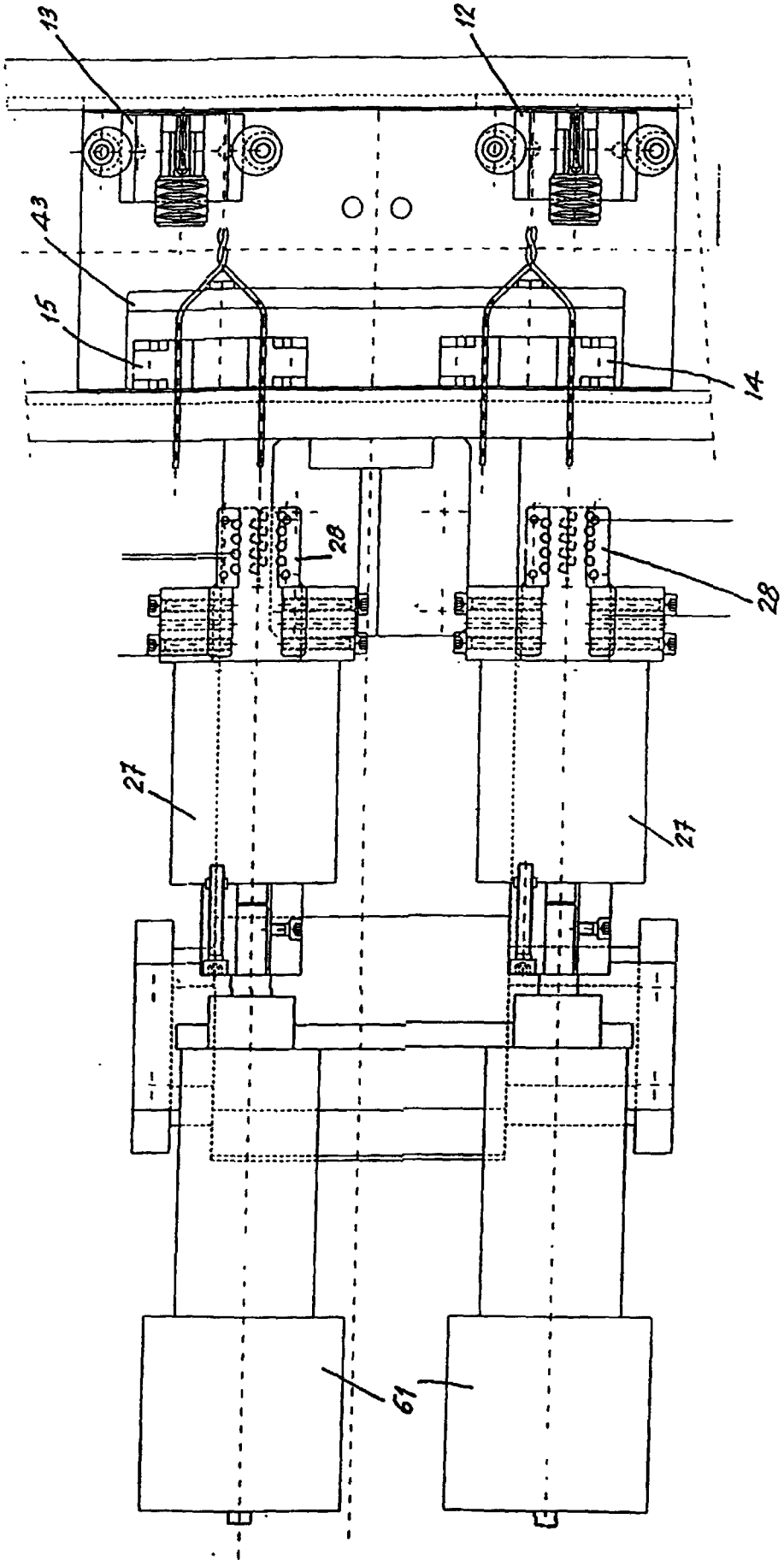


FIG.7

FIG. 8



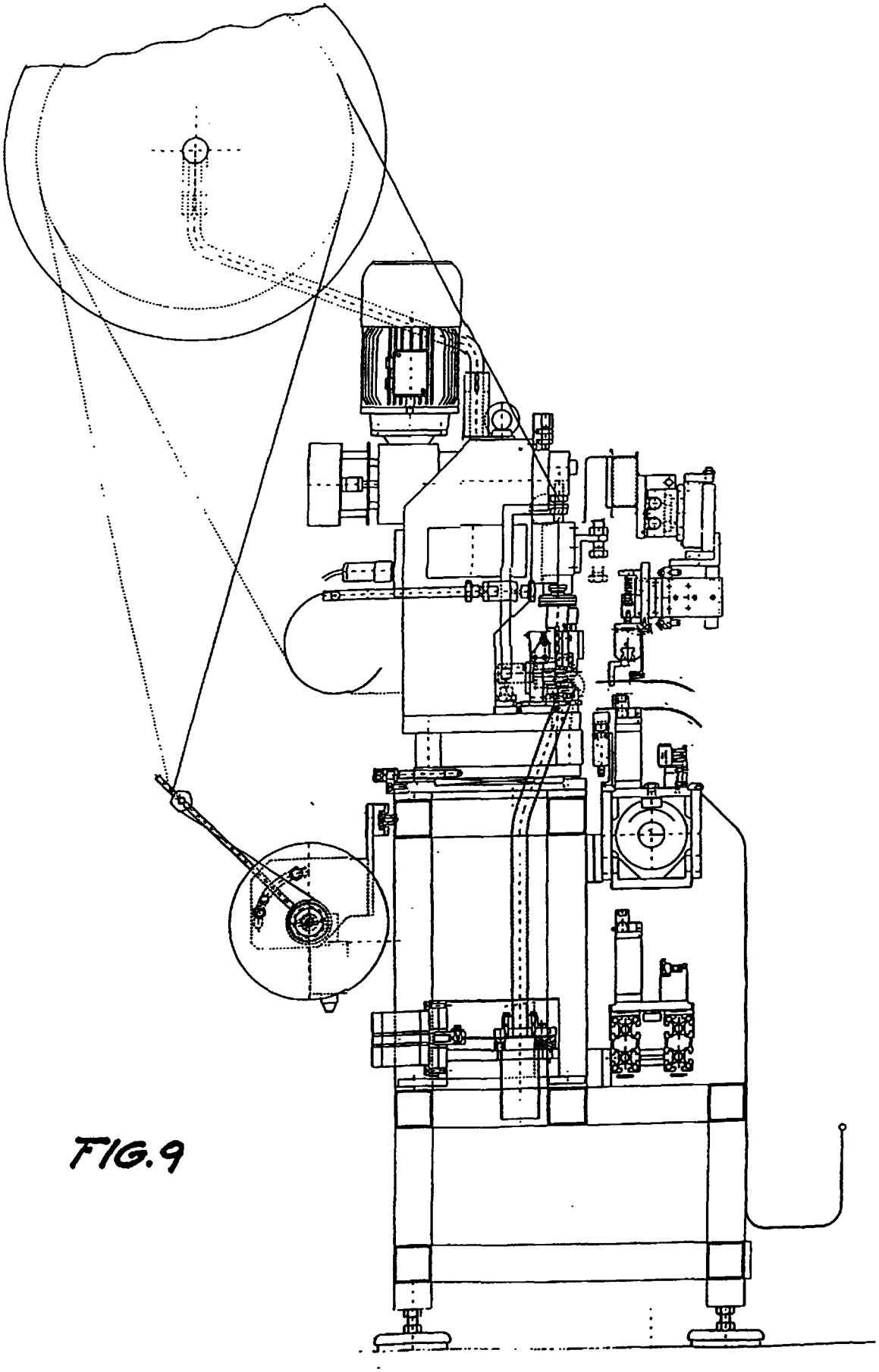


FIG.9

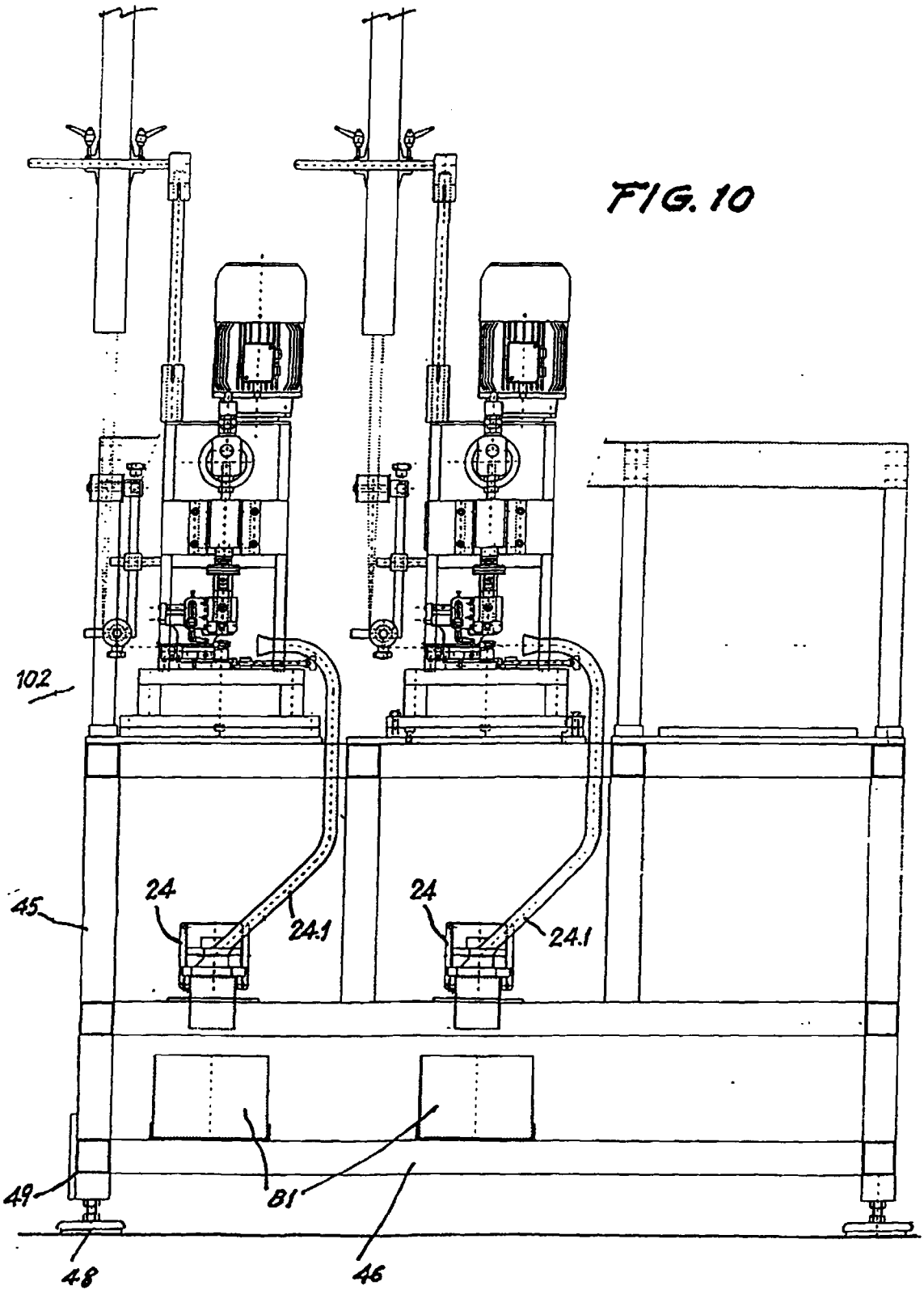


FIG. 10

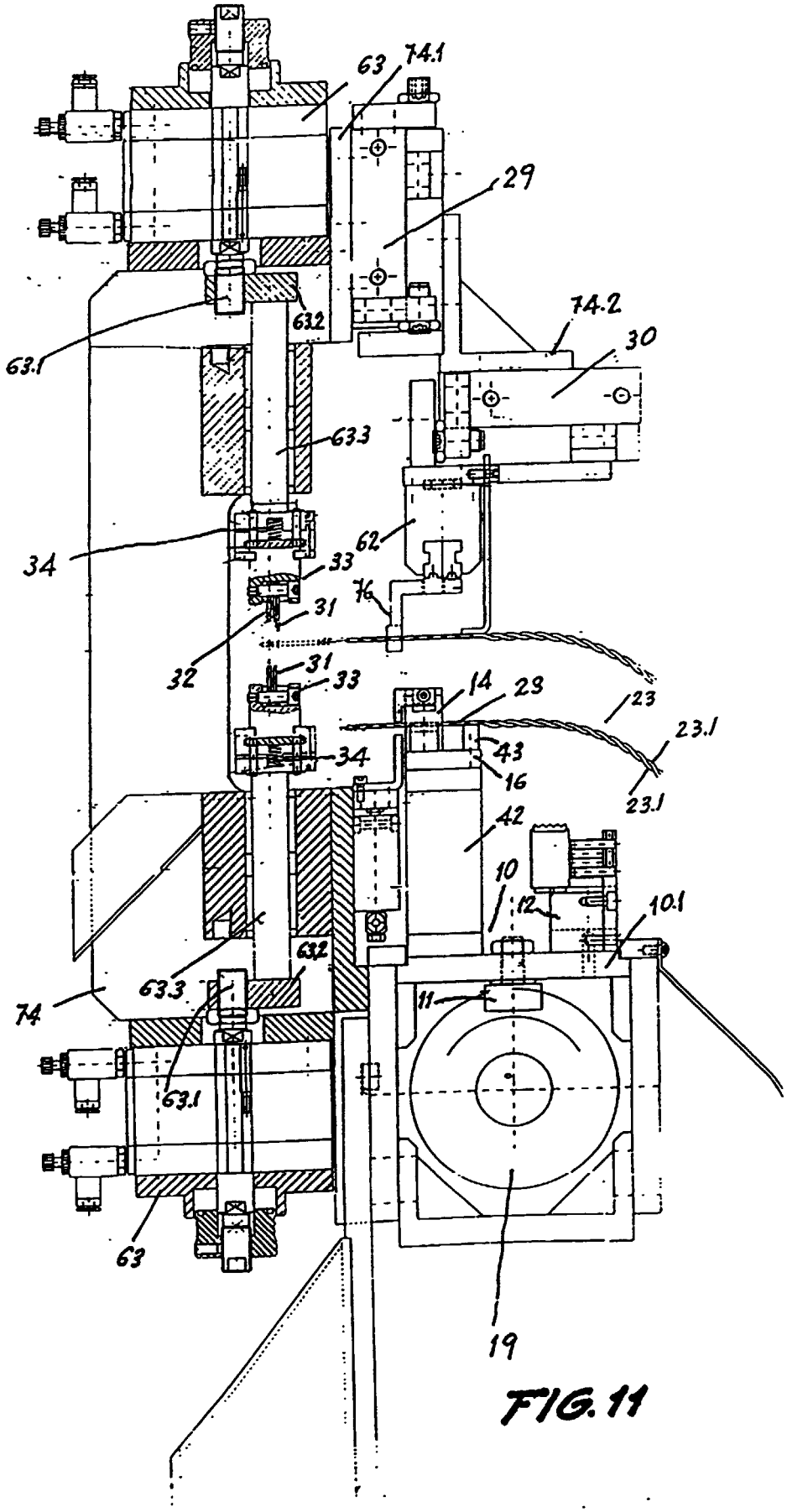

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FIG. 11

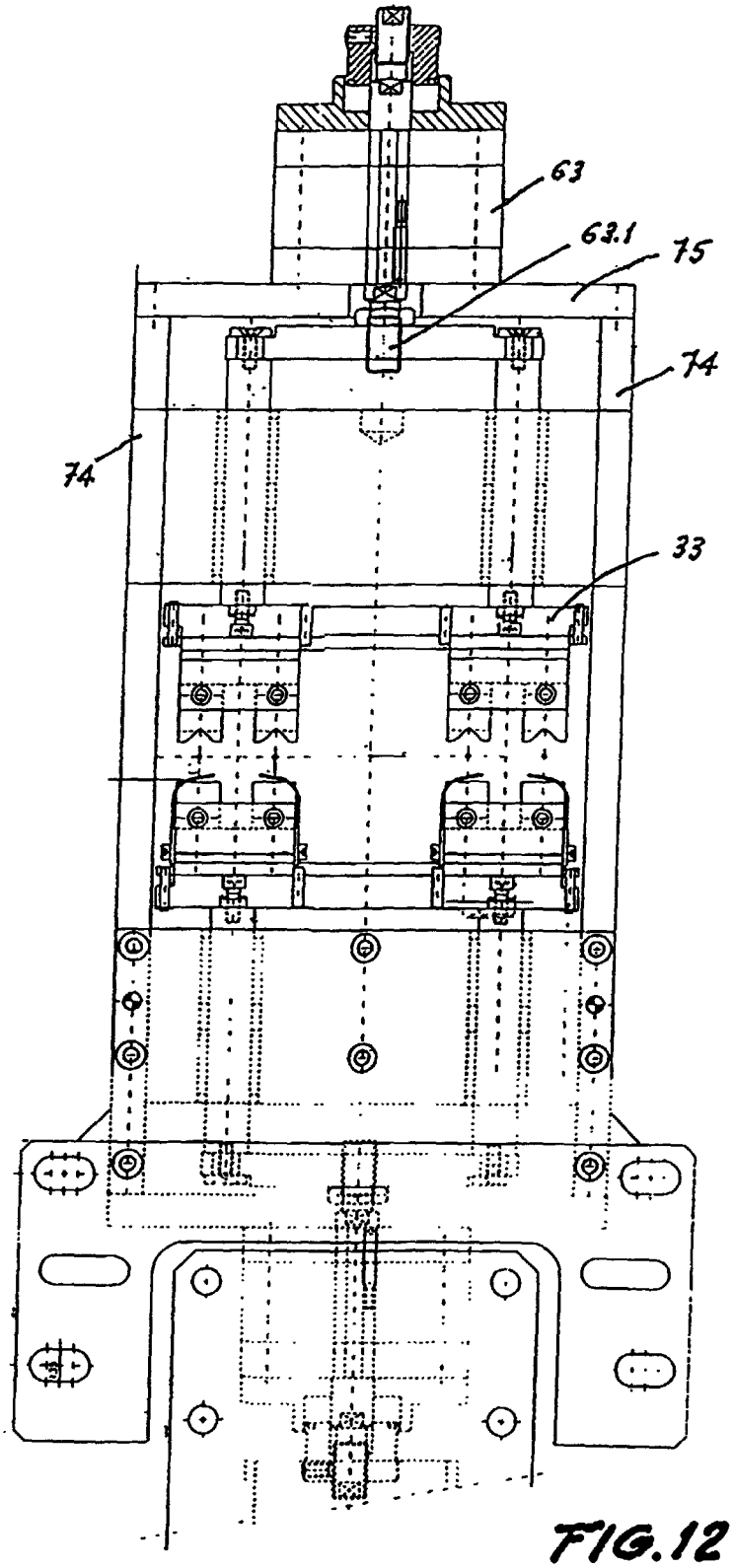

FIG.12

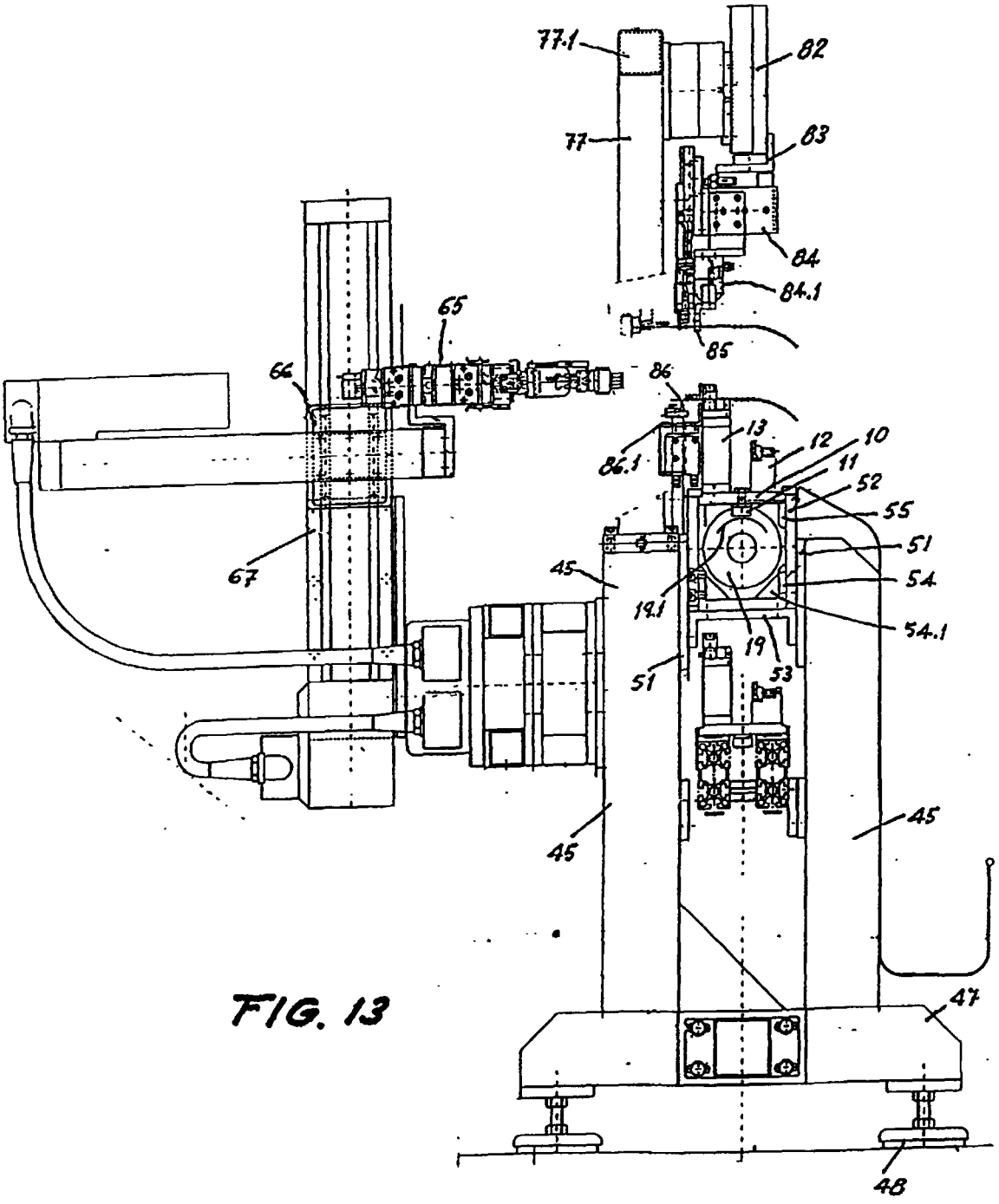
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FIG. 13

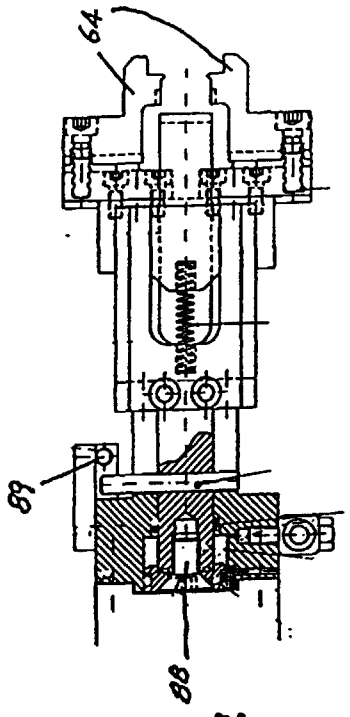

FIG. 14

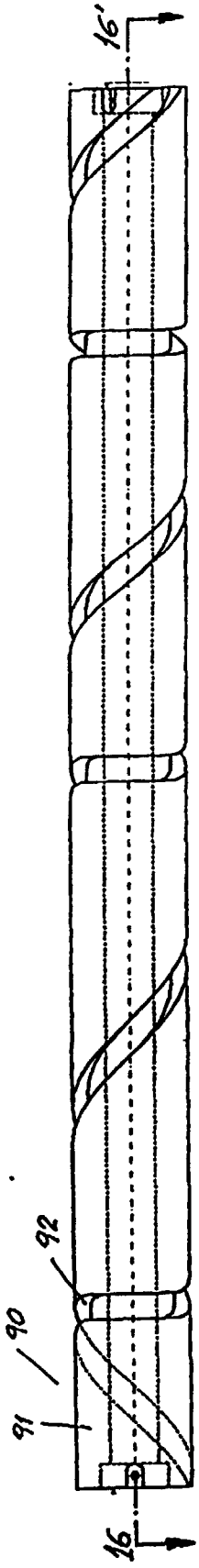

FIG. 15

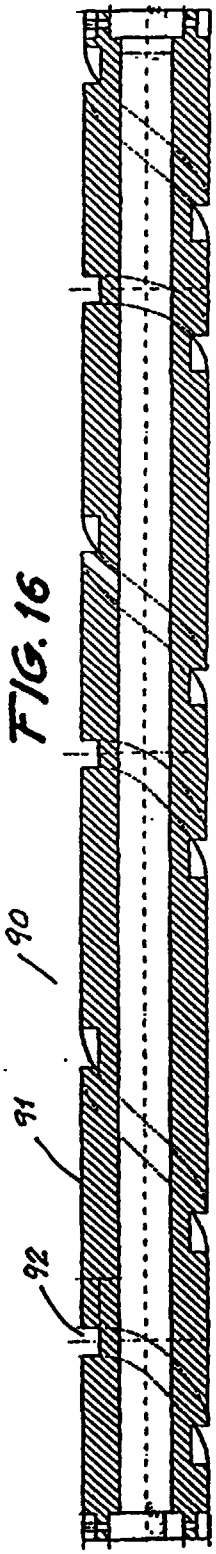

FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 00/00039

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 : H01R 43/05; H01B 13/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 : H01R 43/00; H01B 13/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPODOC, WPI, PAJ, CIBEPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4561155 A (RANDAR et al.) 31 December 1985 (31.12.85) the whole document	1-3,6,8,13
A	FR 2596233 A1 (PRECISION MECANIQUE LABINAL) 25 September 1987 (25.09.87) page 1, line 1 – page 19, line 37; page 23, line 18 – page 26, line 29, figures 1-25	1,3,5,11
A	ES 2048771 T3 (CLAUDE RICARD) 01 April 1994 (01.04.94) column 1, line 1 – column 8, line 26; column 10, line 53 - column 11, line 1; figures 1-5	1-5
A	US 5119546 A (CAMERON et al) 09 June 1992 (09.06.92) column 7, line 9 – column 9, line 30; column 12, line 38 – column 13, line 52; figures 1-12	1,3,5,7
A	ES 8602308 A1 (SUMITOMO ELECTRIC INDUSTRIES, LTD.) (Y TOKAI ELECTRIC WIRE COMPANY LIMITED) 01 November 1985 (01.11.85) page 2, line 2 – page 4, line 25; page 5, line - 26 page 9, line 4; figures 1-6	1,3,11

☒ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 April 2000 (05.04.00)	12 April 2000 (12.04.00)
Name and mailing address of the ISA/ S.P.T.O.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 99/00039

C. (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5365659 A (VEDA et al.) 22 November 1994 (22.11.94) column 1, line 47 – column 10, line 9; figures 1-6	1,2,3,5

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/ ES 00/00039

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		JP 6005132	14.01.1994
		JP 6103842	15.04.1994
		DE 69302860	04.07.1996

Form PCT/ISA/210 (patent family annex) (July 1992)