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(54) **Electro-hydraulic device with an electronic control for deforming fastening elements**

Elektrohydraulische Vorrichtung mit elektronischer Steuerung zur Verformung von Nietmuttern

Dispositif électro-hydraulique avec contrôle électronique pour déformer des écrous à river

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(56) References cited:
WO-A-2008/132576 FR-A- 2 779 670

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Description

[0001] The invention relates to the technical sector of riveting pistols, with special reference to servo-assisted pistols, used for rivets having a cylindrical shape, a partially-threaded axial hole, an abutment collar at a head thereof and a specially-weakened portion at which the plastic deformation will occur.

[0002] The rivets are destined to join two walls stably, for example in place of spot-welding, or for constituting a threaded anchoring bush of an adequate sturdiness, for structures made of too-soft or too-thin materials for fashioning sufficiently-resistant threads.

[0003] The above-described rivets can be of considerable dimensions, and for their application it is necessary to avail of the necessary equipment, which must be able to exert thereon a high compression force.

[0004] A known-type riveting pistol, constructed by the same applicant in accordance with an Italian patent application for industrial invention no. BO2007A000311 (family member of WO 2008/132576), comprises a body and a grip wherein are housed:

a pneumatic motor, for rotating a threaded rod either right-wise or left-wise, respectively for engaging or disengaging the rod from the threaded axial hole of one of the rivets;

a hydraulic system for impressing an axial translation on the motor-rod group, for causing plastic deformation of a predetermined portion of the rivet, such as to block the rivet to a structure;

a pneumatic thrust amplifier, activating a piston for compressing the fluid of the hydraulic system;

a pneumatic system, in which are comprised: an auxiliary valve activated to open by the rod; a main valve, activated to open by a trigger;

a hydro-pneumatic exchange valve, connected to the hydraulic and pneumatic systems, comprising: first organs for detecting a pressure of the hydraulic fluid; second organs for switching delivery of compressed air from the pneumatic thrust amplifier to the pneumatic motor, upon reaching a predetermined maximum pressure of the hydraulic fluid;

an emergency control for setting the pneumatic motor in left-wise rotation.

[0005] The pistol functions as follows:

the rivet is arranged in the hole afforded for it in the structure, with the relative collar contacting thereon, or, alternatively, the rivet is manually positioned before the rod of the pistol;

the rod is placed in the axial hole of the rivet, up to the start of the thread thereof, thus determining an axial thrust on the rod towards the body of the pistol, which causes the opening of the auxiliary valve, which auxiliary valve enables compressed air to be

sent to the motor, setting it in right-wise rotation in order to screw in the rivet; when the collar thereof strikes against the front head of the body, the auxiliary valve is automatically closed and the motor stopped;

by pressing the trigger the main valve is opened, which enables sending compressed air to the thrust amplifier, through the hydro-pneumatic exchange valve, with a consequent increase in pressure of the hydraulic fluid and a starting of the axial translation of the motor-rod group;

by keeping the trigger pressed, the translation proceeds, causing a progressive compression of the rivet which is thus deformed in an external direction, in the weakened portion, defining an annular edge that adheres to the surface of the opposite structure to the structure on which the collar rests, thus determining the blocking of the rivet;

still by keeping the trigger pressed, on reaching the maximum pressure determined for the hydraulic fluid, the second organs of the hydro-pneumatic exchange valve intervene and interrupt the inflow of compressed air towards the thrust amplifier and send it to the pneumatic motor, setting the motor in left-wise rotation; at the same time the air contained in the thrust amplifier is discharged to the outside;

the left-wise rotation of the motor is transmitted to the threaded rod which unscrews from the rivet, now blocked to the structure;

the operator releases the trigger when the rod is disengaged from the rivet. The riveting pistol described above functions excellently, but requires a compressed air source to which it can be collected; it cannot therefore be used when the air source is not available.

[0006] Document FR2.779.670 discloses an electro-hydraulic pistol device according to the preamble of claim 1.

[0007] The aim of the present invention is to provide an electro-hydraulic pistol device having an electronic control for deforming the fastening element, which therefore does not require a connection with a source of compressed air.

[0008] A further aim of the invention is to provide an electro-hydraulic pistol device which exhibits an operating logic which is entirely similar to that of the known pistol described in the preamble hereto.

[0009] A further aim of the invention relates to the desire to provide an electro-hydraulic pistol device which can be realised in numerous variant embodiments, different in the type of electrical supply provided and/or in the constructive design, with components that can be

housed in the body and the grip, or that can be external thereof.

[0010] A further aim of the invention consists in the possibility of offering versions of the electro-hydraulic pistol device which are particularly compact and light, thanks to the external location of components.

[0011] The characteristics of the invention will better emerge from the following description of preferred embodiments thereof, in agreement with what is set out in the appended claims and with the aid of the accompanying figures of the drawings, in which:

figure 1 illustrates an embodiment of the electro-hydraulic pistol device of the invention, in a sectioned schematic lateral view;

figure 2 is a section made along plane II-II of figure 1; figure 3 is a section made along plane III-III of figure 1;

figures 4 from 11 illustrates views similar to figure 1, with the electro-hydraulic device in the most important operating stages.

[0012] With reference to the figures of the drawings, 100 denotes a first embodiment of the electro-hydraulic pistol device of the invention, in its entirety; in the following description, for the sake of simplicity, the device 100 will be known simply as a pistol.

[0013] The pistol 100 comprises a body 101 and a grip 102 in which the following are housed:

a first electric micro-motor 5, a second electric micro-motor 1 and a hydraulic system 4, the second electric micro-motor 1, for rotating leftwise or rightwise, via first transmission organs 11, a threaded rod 2, respectively for engaging or disengaging the rod 2 in the threaded axial hole 3A of one of the rivets 3, the hydraulic system 4 comprising a cylinder 51, containing a fluid F and connected to a chamber 41, in which a cursor 40 slides, the cursor impressing an axial translation to the rod 2, in order to determine plastic deformation of a predetermined portion of the rivet 3, such as to block it to a corresponding wall P, and the first electric micro-motor 5, for commanding, by means of second transmission organs 52, an outward and return run of a piston 50, which compresses, during the outward run, the fluid F of the hydraulic system 4 in the cylinder 51;

an electric circuit 6, comprising the following: a control unit 60; a first micro-switch 61, activated by the rod 2 to switch the second micro-motor 1 such that the rod 2 rotates towards the right; a second micro-switch 62 activated by a trigger 63, for activating the first micro-motor 5 first in one direction and then in the other and, in a phase relation determined by the control unit 60, for activating the second micro-motor 1 in left-wise rotation;

batteries 7, associated to an ON/OFF switch, not illustrated, for supplying electrical energy to the electric circuit 6 and, via this, to the first and second micro-motor 5, 1.

[0014] The pistol 100 further comprises an emergency button control, not illustrated in detail but preferably arranged with a position and/or conformation protected from accidental activation, associated to the electric circuit 6 and destined to activate the second micro-motor 1 such that the rod 2 rotates to the left, in a way which will be described herein below.

[0015] The first transmission organs 11 are constituted, for example, by a plurality of gears also functioning as speed reducer; preferably these organs 11 cause the second micro-motor 1 and the rod 2 to rotate in a same direction (figures 2 and 3).

[0016] The second transmission organs 52 are constituted, for example, by an epicyclical gear reducer.

[0017] There follows a description of the operation of the pistol 100 for application of a rivet 3 to a wall P, starting from the inoperative position of figure 4, in which:

the first micro-motor 5 and the second micro-motor 1 are stationary;

the pressure in the hydraulic system 4 is at the minimum, with the piston 50 in the lowered position of the cylinder 51 and the cursor 40 advanced in the chamber 41, towards the front head 101 a of the body 101, due to the action of a relative contrast spring 42;

the switch associated to the batteries 7 is in the ON position.

[0018] The rivet 3 is arranged in the hole in the wall P therefor, with the relative collar 3B striking against the wall; or, alternatively, the rivet 3 is manually positioned before the rod 2 of the pistol 100 (see figure 4).

[0019] Similarly to the known riveter pistol, mentioned in the preamble hereto, the rod 2 is inserted into the axial hole 3A of the rivet 3 up to the start of the threading thereof, thus determining an axial thrust on the threaded rod 2, towards the body 101 of the pistol 100, which causes activation of the first micro-switch 61; the closing of the contact therein provides the signal to the control unit 60 to activate the second micro-motor 1 in a suitable direction, rotating the rod 2 in right-wise rotation in order to screw up the rivet 3.

[0020] When the collar 3B of the rivet 3 strikes against the front head 101A of the body 100, the rod 2 is recalled in an externalwise direction, releasing the first micro-switch 61 and thus causing the second micro-motor 1 to stop (figure 5).

[0021] By pressing the trigger 63, the second micro-switch 62 is activated and the control unit 60 starts up the automatic operating cycle of the pistol 100 (figure 6).

[0022] The first micro-motor 5 is then activated in the suitable direction, in order to determine the outward run of the piston 50 in the cylinder 51, with a consequent increase in the pressure of the hydraulic fluid F into the chamber 41 of the cursor 40 (figure 7).

[0023] By keeping the trigger pressed 63, the piston 50 continues to rise, while the pressurised fluid F overcomes the resistance of the contrast spring 42 and pushes the cursor 40 to retreat, together with the associated threaded rod 2.

[0024] The translation continues, causing a progressive compression of the rivet 3 which deforms towards the outside, in the weakened portion, to define an annular edge 3C adhering to the surface of the wall P opposite the surface on which the collar 3B is resting, thus determining a blocking of the rivet 3 (figure 8).

[0025] The increase in the pressure in the hydraulic system 4 increases the resistance to rising of the piston 50, which leads to a proportional increase in the absorption of power on the part of the first micro-motor 5.

[0026] The value of this absorption is constantly monitored by the control unit 60, since the force exerted on the rod 2 to deform the rivet 3 is calculated in relation thereto, by means of suitable parameters.

[0027] On the basis of the maximum force the pistol is to be calibrated for, the maximum peak of absorption the first micro-motor 5 has to reach is calculated and the relative datum is stored in the control unit 60.

[0028] When the instantaneous absorption detected equals the maximum value foreseen, and with this the predetermined deformation thrust having been reached, the control unit 60 inverts the rotation of the first micro-motor 5, with consequent inversion of the movement of the piston 50 (figure 9).

[0029] The above leads to a sharp drop in hydraulic fluid pressure F, with a consequent interruption of the retraction of the cursor-rod group and thus of the stressed on the rivet 3.

[0030] While the piston 50 proceeds in its descent, due to the action of the first micro-motor 5, the contrast spring 42 newly prevails on the force determined by the fluid pressure F and advances the cursor 40 and the rod 2.

[0031] The control unit 60, in a suitable phase relation with the descent of the piston 50, starts up the second micro-motor 1 too, setting the threaded rod 2 in leftwise rotation so that it unscrews from the rivet 3 which by now is blocked to the wall P (figure 10).

[0032] The first micro-motor 5 is maintained in motion until the piston 50 reaches the lowered start position, after which it is automatically deactivated by the control unit 60 (see figure 10 once more); the signal which attests to the reaching of the position can be given by an end-run sensor (not illustrated), or by the increase of absorption of the first micro-motor 5 consequent upon the intercepting of a mechanical end-run stop 53 which is integral with the piston 50.

[0033] The rotation of the second micro-motor 1, on the other hand, continues as long as the trigger 63 is kept

depressed, such that the rotation of the rod 2, for unscrewing the just-applied rivet 3, proceeds for the time decided by the operator.

[0034] On release of the trigger 63, with a consequent stop of the second micro-motor 1, the foreseen functioning program is completed (figure 11).

[0035] At this point the pistol 100 is newly in the condition described with reference to figure 4, with the control unit 60 predisposed for a new cycle.

[0036] A particularly able operator, therefore, can optimally synchronise the disengagement of the rod 2 with the halting of the second micro-motor 1, such as to render the pistol 100 immediately ready for another rivet 3, previously positioned on the wall P.

[0037] If the trigger 63, due to error or another reason, is released before the disengagement of the rod 2, the unscrewing can be completed by pressing the emergency command, in order to reactivate the second micro-motor 1 with a further left-wise rotation of the rod 2.

[0038] Worthy of note is the fact that the pistol 100, as described, does not minimally suffer from any manoeuvring error which might be committed if, following an early release of the trigger 63, pressure is newly placed thereon.

[0039] The control logic of the control unit 60 can be programmed to continue the interrupted cycle if, for example, release occurs during the stage of deformation of the rivet 3.

[0040] In a case where the manoeuvring error is in the final stage of unscrewing, with a subsequent pressure on the trigger 63, instead of the activating of the emergency control, the pistol repeats the automatic traction cycle on the rod 2 without causing undesired stress on the rivet 3 applied, as on reaching the preceding maximum fluid pressure F, the control unit 60 interrupts the action and starts unscrewing, so that the only drawback that obtains is a slight waste of time.

[0041] Other embodiments of the electro-hydraulic pistol device are envisaged, apart from the one illustrated and described herein above.

[0042] In a second embodiment, not illustrated, the batteries 7 and possibly also the control unit 60 can be housed in a module which is external of the body of the pistol; this is to contain the weight and size of the pistol, making it easier to use.

[0043] In a third embodiment, also not illustrated, the batteries are eliminated and electrical energy is sourced from a network, with the interposing of a suitable transformer/rectifier, with the aim of obtaining unlimited working autonomy, together (in this case too) with a considerable reduction in weight.

[0044] Certainly, with reference to the last solution, total device independence of external energy sources is lost, but it is extremely evident that having a current tap available is much more likely than having a handy source of compressed air.

[0045] In a further embodiment, not illustrated, the constructional characteristics of the two above-mentioned

embodiments are combined, thus providing a module which is external of the body of the pistol which contains, apart from the batteries and the control unit, the transformer/rectifier for network-sourced power and possibly a device for recharging the batteries.

[0046] From the above it can be understood how the electro-hydraulic pistol device fully reaches the set aims, in particular for obtaining a functioning logic which is entirely similar to that of the known-type pistol cited in the preamble hereto, without there being any need for supply of compressed air.

[0047] The constructional possibilities given by the choice of electrical workings means that it is easy to set up numerous constructional variations, without there being any negative effect on the functioning of the device, which variations can respond to needs that otherwise would be destined to remain unaddressed.

[0048] Thanks to the external locating of the components such as the batteries, it is possible to attain considerable benefits in terms of compactness and lightness of the device, with obvious advantages in the use thereof.

Claims

1. An electro-hydraulic pistol device for deformation of fastening elements, of a type comprising:

- a trigger (63), an electric circuit (6) and electrical energy supply means (7);
- a threaded rod (2) which engages with a threaded axial hole (3A) of a rivet (3);
- a hydraulic system (4) comprising means (40), associated to the threaded rod (2), which impresses an axial translation on the threaded rod (2), by action of the hydraulic fluid (F) of the system (4), for determining a plastic deformation of a predetermined portion of the rivet (3) such as to block the rivet (3) to a corresponding wall (P);
- a piston (50) located internally of a cylinder (50);
- a first electric micro-motor (5), for controlling compression and discharge runs of said piston (50) located internally of said cylinder (51), so as to determine, respectively, a raising of the pressure of the fluid (F) of the hydraulic system (4), up to a maximum predetermined value, and a reduction of the pressure;

the device being characterized in that

- a second electric micro-motor (1) is provided for setting the threaded rod (2) in right-wise respectively left-wise rotation, for engaging respectively disengaging the threaded rod (2) from the threaded axial hole (3A) of the rivet;
- said electrical circuit (6) is managed by an electronic control unit (60) and comprises a first mi-

cro-switch (61) which is activable via the rod (2) for activation of the second micro-motor (1), such that the rod (2) rotates in a rightwise direction, and a second micro-switch (62), activable by the trigger (63) after deactivation of the first micro-switch (61), for activating the first micro-motor (5) first in a direction causing the compression run of the piston (50) and then in another direction causing the discharge run of the piston (50) as well as for activating the second micro-motor (1) in phase relation with activation of said discharge run of the piston (50), such that the rod (2) rotates left-wise; and
- said electrical energy supply means (7) are adapted to supply electrical energy to the electric circuit (6) and, through the circuit (6), to the first micro-motor (5) and the second micro-motor (1).

2. The device of claim 1, **characterised in that** the means (40) associated to the rod (2) are constituted by a cursor which is slidably inserted in a chamber (41) and subjected at a side thereof to action of a contrast spring (42) and at another side thereof to action of the hydraulic fluid (F) of the system (4).
3. The device of claim 1, **characterised in that** the control unit (60) is provided with means for instantaneously detecting absorption of power of the first micro-motor (5), and calculating means for relating a value of the absorption with the pressure of the hydraulic fluid (F).
4. The device of claim 1, **characterised in that** first transmission organs (11) are interposed between the second micro-motor (1) and the threaded rod (2).
5. The device of claim 4, **characterised in that** the first transmission organs (11) are constituted by a plurality of gears which reduce a number of rotations from an input to an output of the motion.
6. The device of claim 1, **characterised in that** second transmission organs (52) are interposed between the first micro-motor (5) and the piston (50).
7. The device of claim 6, **characterised in that** the second transmission organs (52) are constituted by an epicyclic reducer.
8. The device of claim 1, **characterised in that** a button-operated emergency command is included, associated to the electric circuit (6) and activating the second micro-motor (1) such that the rod (2) rotates left-wise.
9. The device of claim 1, **characterised in that** a two-way switch is associated to the electric energy supply

means (7), positions of the two-way switch being respectively for connecting and disconnecting the electric energy supply means (7) to and from the electrical circuit (6).

10. The device of claim 1 or 9, **characterised in that** the electric energy supply means (7) are housed in the body (101) and the grip (102) of the device (100). 5
11. The device of claim 1 or 9, **characterised in that** the electric energy supply means (7) are housed in a module which is external of the device (100). 10
12. The device of claim 1 or 9 or 10 or 11, **characterised in that** the electric energy supply means (7) are constituted by batteries. 15
13. The device of claim 1 or 9 or 10 or 11, **characterised in that** the electric energy supply means (7) are constituted by a transformer/rectifier which can be connected to an external electricity source line. 20
14. The device of claim 1, **characterised in that** the control unit (60) is housed in the body (101) and the grip (102) of the device (100). 25
15. The device of claim 1, **characterised in that** the control unit (60) is housed in a module which is external of the device (100). 30

Patentansprüche

1. Elektrohydraulische Schussvorrichtung zur Verformung von Nietmuttern, der Art umfassend: 35
 - einen Trigger (63), eine elektrische Schaltung (6) und Mittel zur elektrischen Energiezufuhr (7),
 - einen Gewindestab (2), welcher mit einem axialen Gewindeloch (3A) einer Niete (3) in Eingriff steht; 40
 - ein hydraulisches System (4), das Mittel umfasst, die zu dem Gewindestab (2) zugeordnet sind, welcher eine axiale Übersetzung auf den Gewindestab (2) durch Einwirkung des hydraulischen Fluids (F) des Systems (4) ausübt, um eine plastische Verformung eines vorgegebenen Abschnitts der Niete (3) zu bestimmen, wie etwa um die Niete (3) zu einer entsprechenden Wand (P) zu verschließen; 45
 - ein Schussgerät (50), das innerhalb eines Zylinders (50) angeordnet ist;
 - einen ersten Elektro-Mikromotor (5), um die Kompression und den Austausch, der das Schussgerät (50) betreibt, das innerhalb des Zylinders (51) angeordnet ist, zu steuern, um so jeweils einen Druckanstieg des Fluids (F) des hydraulischen Systems (4) bis zu einem maxi- 55

malen, vorgegebenen Wert und einen Druckabfall zu bestimmen;

wobei die Vorrichtung **dadurch gekennzeichnet ist, dass**

- ein zweiter Elektro-Mikromotor (1) vorgesehen ist, um den Gewindestab (2) in rechtsseitige bzw. linksseitige Drehung einzustellen, um den Gewindestab (2) von dem axialen Gewindeloch (3A) der Niete zu erfassen bzw. freizugeben;
- die elektrische Schaltung (6) durch eine elektronische Steuereinheit (60) gesteuert wird und einen ersten Mikroschalter (61), welcher über den Stab (2) ebenso zur Aktivierung des zweiten Mikromotors (1), sodass sich der Stab (2) in einer rechtsseitigen Richtung dreht, und einen zweiten Mikroschalter (62) umfasst, der durch den Trigger (63) nach der Deaktivierung des ersten Mikroschalters (61) aktivierbar ist, um den ersten Mikromotor (5) zuerst in einer Richtung, die den Kompressionslauf des Schussgerätes (50) verursacht, und dann in eine andere Richtung zu aktivieren, die den Freigabelauf des Schussgerätes (50) verursacht, als auch zur Aktivierung des zweiten Mikromotors (1) in Phasenrelation zu der Aktivierung des Freigabelaufs des Schussgerätes aktivierbar ist, so dass sich der Stab (2) linksseitig dreht; und
- Mittel zur elektrischen Energiezufuhr (7) geeignet sind, um elektrische Energie zu der elektrischen Schaltung (6) und durch die Schaltung (6) zu dem ersten Mikromotor (5) und dem zweiten Mikromotor (1) zuzuführen.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel (40), die zu dem Stab (2) zugeordnet sind, durch einen Positionsanzeiger, welcher verschiebbar in einer Kammer (41) eingesetzt ist, ausgebildet und an einer Seite davon einer Wirkung einer Kontrastfeder (42), und an einer anderen Seite davon einer Winklung des hydraulischen Fluids (F) des Systems (4) ausgesetzt sind.
3. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuereinheit (60) mit Mittel, um die Leistungsaufnahme des ersten Mikromotors (5) sofort zu erkennen, und mit Berechnungsmittel vorgesehen ist, um einen Wert der Absorption mit dem Druck des hydraulischen Fluids (F) ins Verhältnis zu setzen.
4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die ersten Übersetzungsorgane (11) zwischen dem zweiten Mikromotor (1) und dem Gewindestab (2) eingefügt sind.
5. Vorrichtung nach Anspruch 4, **dadurch gekenn-**

zeichnet, dass die ersten Übersetzungsorgane (11) durch eine Vielzahl von Getrieben gebildet sind, die eine Anzahl von Drehungen von einem Eingang zu einem Ausgang der Bewegung vermindern.

6. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** zweite Übersetzungsorgane (52) zwischen dem ersten Mikromotor (5) und dem Schussgerät (50) eingefügt sind.
7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** die zweiten Übersetzungsorgane (52) durch einen Umlaufminderer gebildet sind.
8. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Knopf betriebener Notbefehl beinhaltet ist, der zu der elektrischen Schaltung (6) zugeordnet ist, und um den zweiten Mikromotor (1) zu aktivieren, sodass sich der Stab (2) linksseitig dreht.
9. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Zwei-Wege-Schalter zu den Mitteln zur elektrischen Energiezufuhr (7) geordnet ist, wobei die Positionen des Zwei-Wege-Schalters entsprechend sind, um die Mittel zur elektrischen Energiezufuhr (7) mit der elektrischen Schaltung (6) zu verbinden und von dieser zu lösen.
10. Vorrichtung nach Anspruch 1 oder 9, **dadurch gekennzeichnet, dass** die Mittel zur elektrischen Energiezufuhr (7) in dem Körper (101) und dem Griff (102) der Vorrichtung (100) aufgenommen sind.
11. Vorrichtung nach Anspruch 1 oder 9, **dadurch gekennzeichnet, dass** die Mittel zur elektrischen Energiezufuhr (7) in einem Modul aufgenommen sind, welches außerhalb der Vorrichtung (100) ist.
12. Vorrichtung nach Anspruch 1 oder 9 oder 10 oder 11, **dadurch gekennzeichnet, dass** die Mittel zur elektrischen Energiezufuhr (7) durch Batterien gebildet sind.
13. Vorrichtung nach Anspruch 1 oder 9 oder 10 oder 11, **dadurch gekennzeichnet, dass** die Mittel zur elektrischen Energiezufuhr (7) durch einen Transformator/Gleichrichter gebildet sind, welcher mit einer externen elektrischen Linienquelle verbunden werden kann.
14. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuereinheit (60) in dem Körper (101) und dem Griff (102) der Vorrichtung (100) aufgenommen ist.
15. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuereinheit (60) in einem Modul aufgenommen ist, welches außerhalb der Vor-

richtung (100) ist.

Revendications

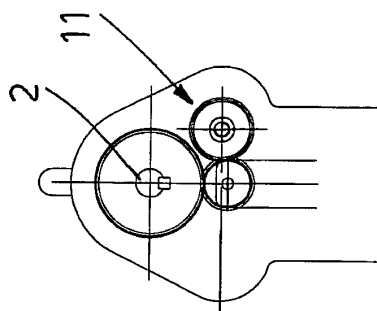
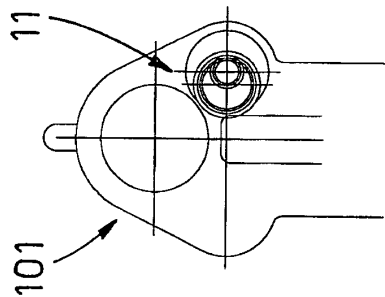
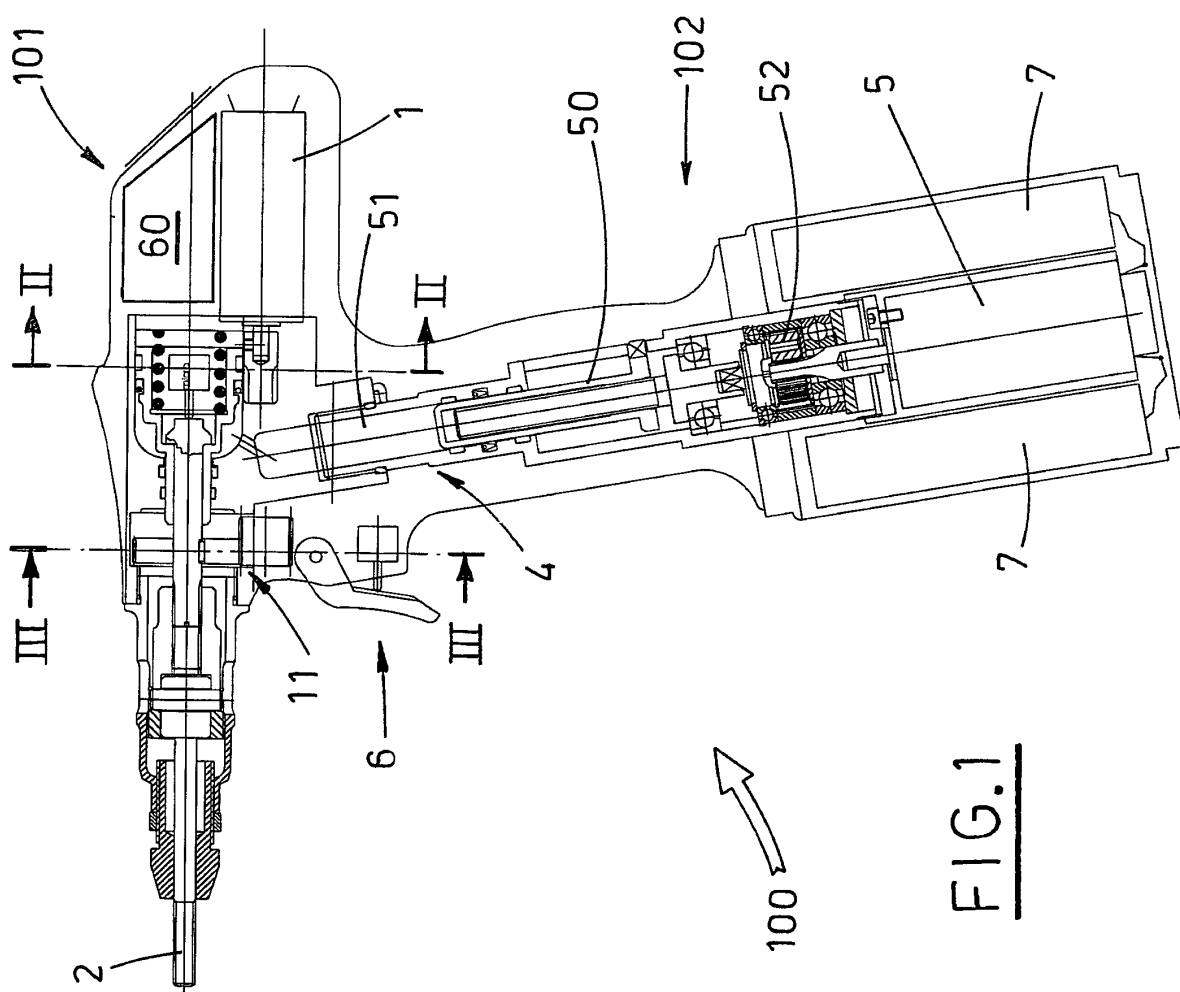
1. Dispositif de pistolet électro-hydraulique pour la déformation des éléments de fixation, d'un type comprenant:

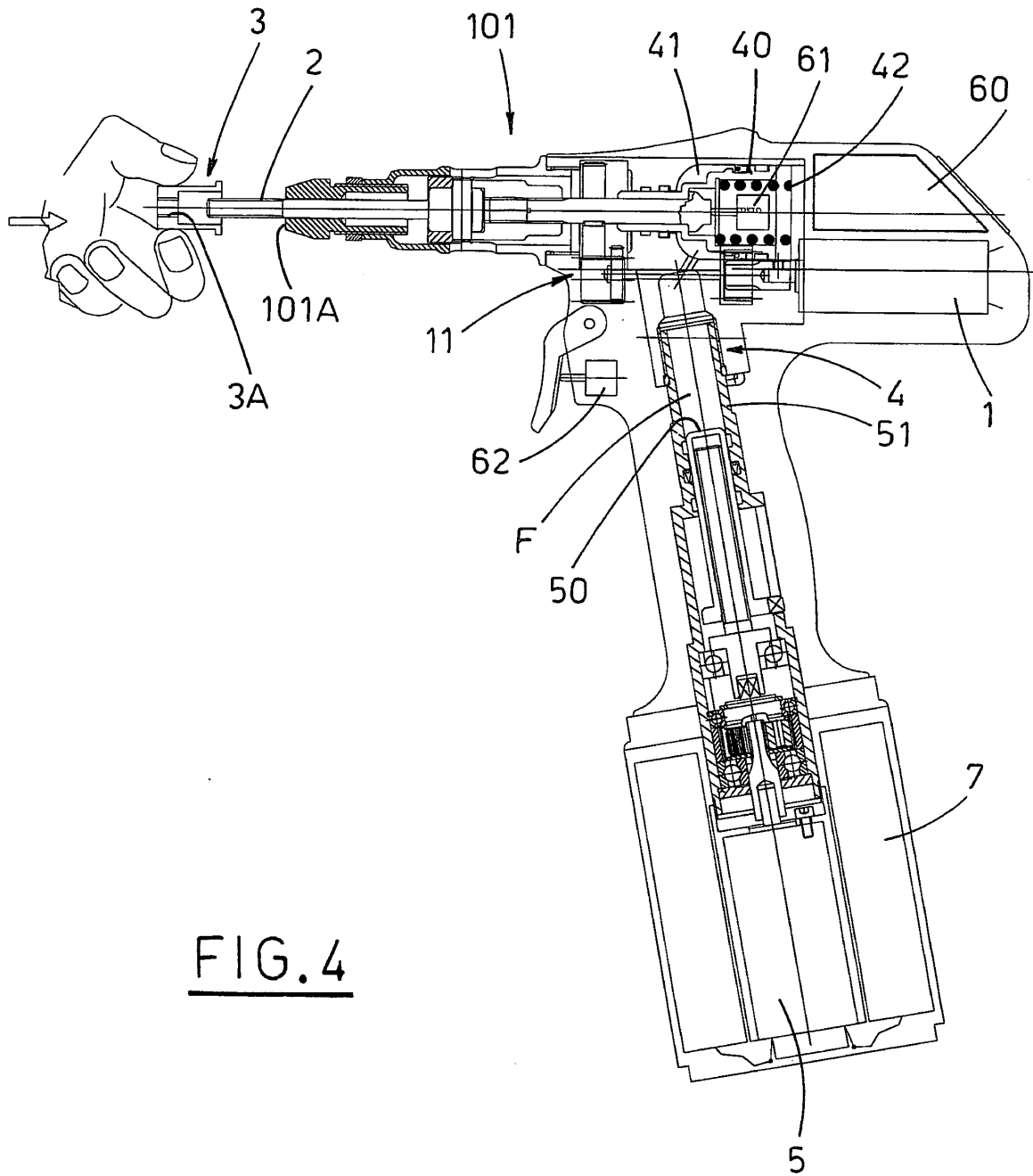
une gâchette (63), un circuit électrique (6) et des moyens d'alimentation d'énergie électrique (7), une tige filetée (2) qui met en prise un trou axial fileté (3A) d'un rivet (3) ;
un système hydraulique (4) comprenant des moyens (40), associés à la tige filetée (2), qui imprime une translation axiale sur la tige filetée (2), par l'action du fluide hydraulique (F) du système (4), pour déterminer une déformation plastique d'une partie prédéterminée du rivet (3) afin de bloquer le rivet (3) sur une paroi (P) correspondante ;
un piston (50) positionné à l'intérieur d'un cylindre (50) ;
un premier micromoteur électrique (5) pour commander les courses de compression et de décharge dudit piston (50) positionné à l'intérieur dudit cylindre (51), afin de déterminer, respectivement, une augmentation de la pression du fluide (F) du système hydraulique (4), jusqu'à une valeur maximale prédéterminée et une réduction de la pression ;

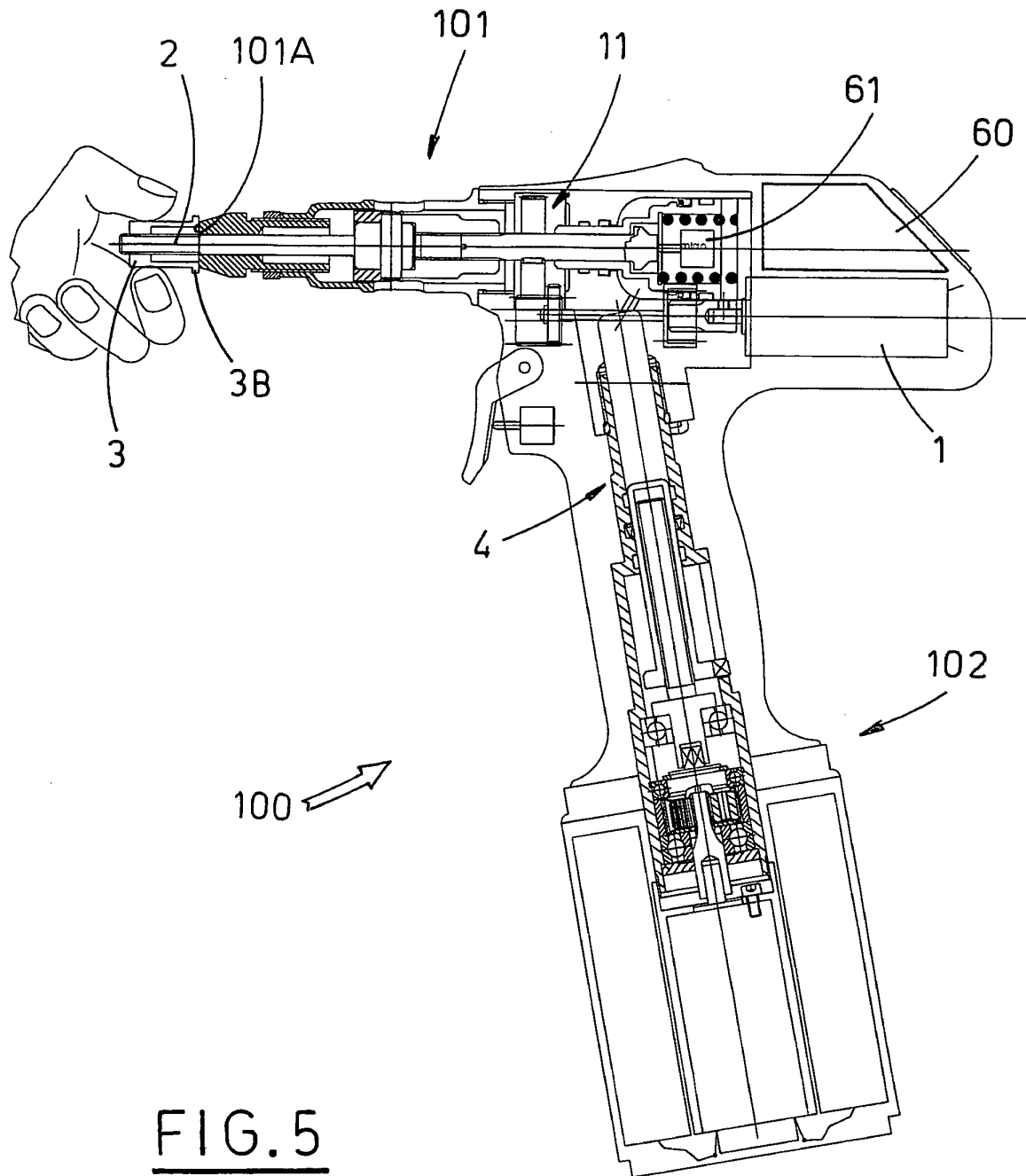
le dispositif étant **caractérisé en ce que** :

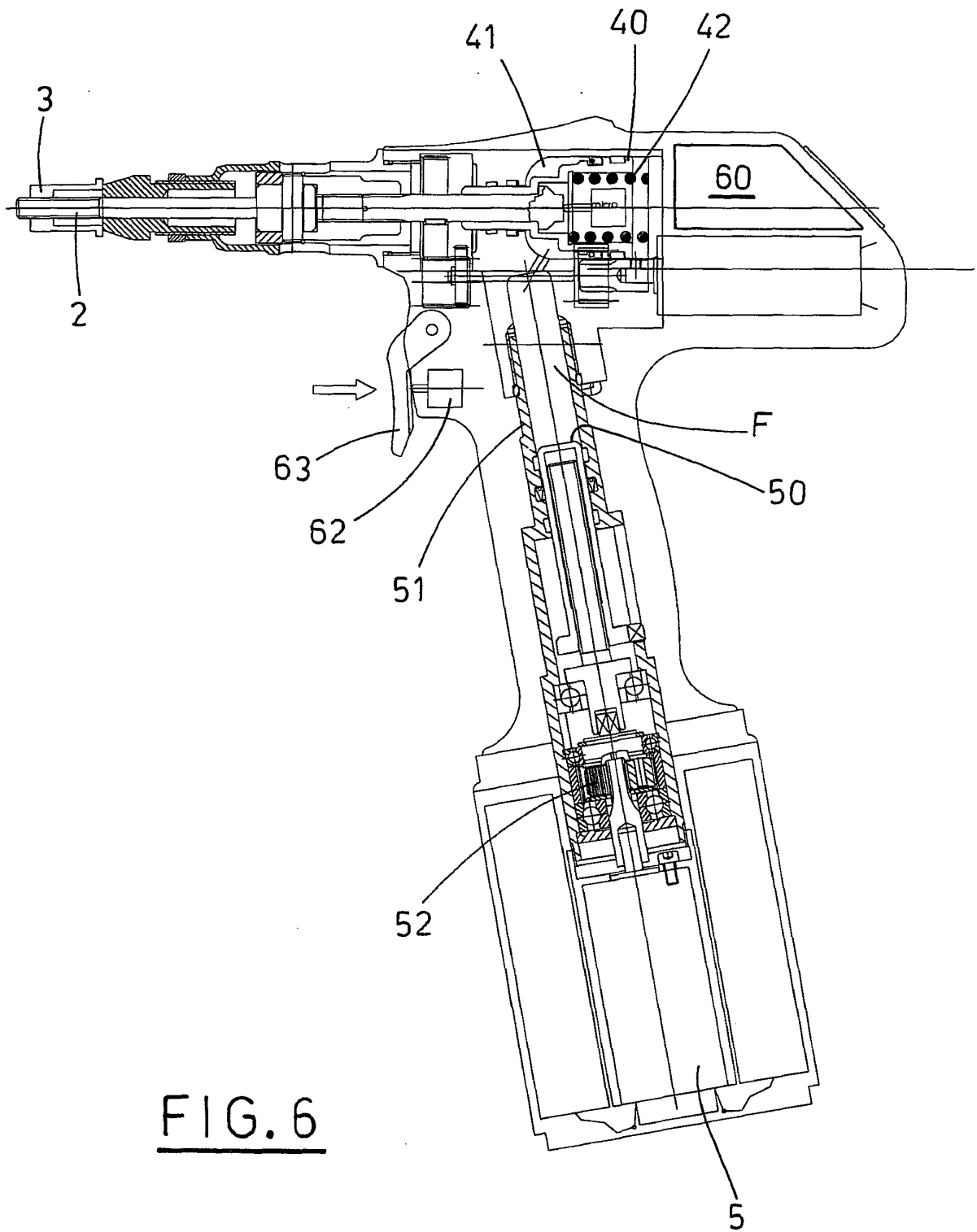
un deuxième micromoteur électrique (1) est prévu pour placer la tige filetée (2) en rotation respectivement vers la droite et vers la gauche, respectivement pour mettre en prise et dégager la tige filetée (2) du trou axial fileté (3A) du rivet ; ledit circuit électrique (6) est géré par une unité de commande électronique (60) et comprend un premier micro-interrupteur (61) qui peut être activé via la tige (2) pour l'activation du deuxième micromoteur (1), de sorte que la tige (2) tourne vers la droite, et un deuxième micro-interrupteur (62), pouvant être activé par la gâchette (63) après la désactivation du premier micro-interrupteur (61), pour activer le premier micromoteur (5) tout d'abord dans une direction provoquant la course de compression du piston (50) et ensuite dans une autre direction provoquant la course de décharge du piston (50) ainsi que pour activer le deuxième micromoteur (1) en relation de phase avec l'activation de ladite course de décharge du piston (50) de sorte que la tige (2) tourne vers la gauche ; et lesdits moyens d'alimentation d'énergie électrique (7) sont adaptés pour alimenter l'énergie

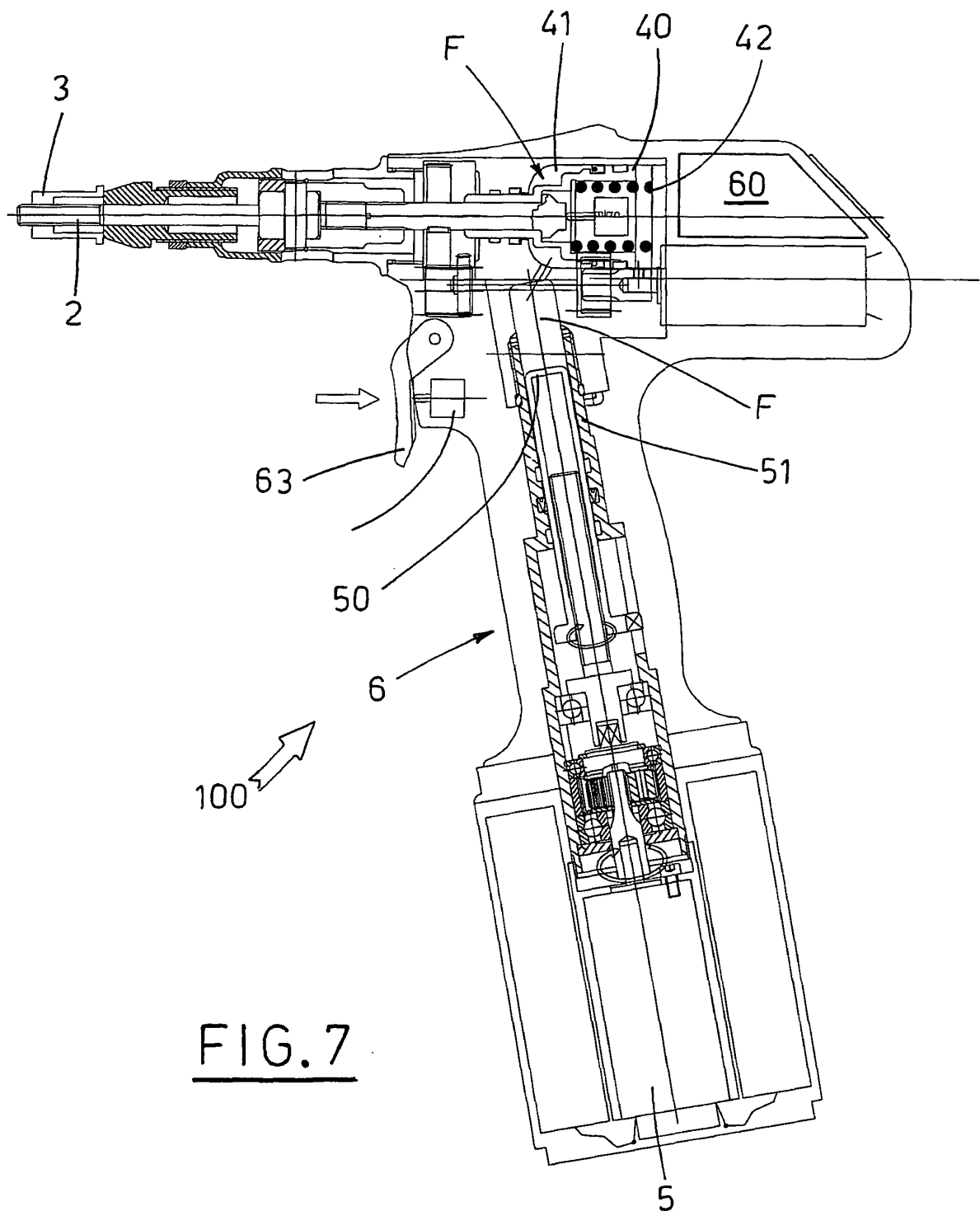
- électrique au circuit électrique (6) et en passant par le circuit (6), au premier micromoteur (5) et au deuxième micromoteur (1).
2. Dispositif selon la revendication 1, **caractérisé en ce que** les moyens (40) associés à la tige (2), sont constitués par un curseur qui est inséré de manière coulissante dans une chambre (41) et soumis sur un côté à l'action d'un ressort de contraste (42) et sur un autre côté, à l'action du fluide hydraulique (F) du système (4). 5
 3. Dispositif selon la revendication 1, **caractérisé en ce que** l'unité de commande (60) est équipée de moyens pour la détection instantanée de l'absorption de la puissance du premier micromoteur (5) et des moyens de calcul pour rapporter une valeur de l'absorption à la pression du fluide hydraulique (F). 10
 4. Dispositif selon la revendication 1, **caractérisé en ce que** des premiers organes de transmission (11) sont intercalés entre le deuxième micromoteur (1) et la tige filetée (2). 15
 5. Dispositif selon la revendication 4, **caractérisé en ce que** les premiers organes de transmission (11) sont constitués par une pluralité d'engrenages qui réduisent un nombre de rotations d'une entrée à une sortie du mouvement. 20
 6. Dispositif selon la revendication 1, **caractérisé en ce que** les deuxièmes organes de transmission (52) sont intercalés entre le premier micromoteur (5) et le piston (50). 25
 7. Dispositif selon la revendication 6, **caractérisé en ce que** les deuxièmes organes de transmission (52) sont constitués par un réducteur épicyclique. 30
 8. Dispositif selon la revendication 1, **caractérisé en ce que** l'on inclut une commande d'urgence actionnée par bouton, associée au circuit électrique (6) et activant le deuxième micromoteur (1) de sorte que la tige (2) tourne vers la gauche. 35
 9. Dispositif selon la revendication 1, **caractérisé en ce qu'un** interrupteur à deux voies est associé aux moyens d'alimentation d'énergie électrique (7), les positions de l'interrupteur à deux voies étant respectivement prévues pour raccorder et déconnecter les moyens d'alimentation d'énergie électrique (7) à et du circuit électrique (6). 40
 10. Dispositif selon la revendication 1 ou 9, **caractérisé en ce que** les moyens d'alimentation d'énergie électrique (7) sont logés dans le corps (101) et la poignée (102) du dispositif (100). 45
 11. Dispositif selon la revendication 1 ou 9, **caractérisé en ce que** les moyens d'alimentation d'énergie électrique (7) sont logés dans un module qui est externe par rapport au dispositif (100). 50
 12. Dispositif selon la revendication 1 ou 9 ou 10 ou 11, **caractérisé en ce que** les moyens d'alimentation d'énergie électrique (7) sont constitués par des batteries. 55
 13. Dispositif selon la revendication 1 ou 9 ou 10 ou 11, **caractérisé en ce que** les moyens d'alimentation d'énergie électrique (7) sont constitués par un transformateur / rectificateur qui peut être raccordé à une conduite de source d'électricité externe.
 14. Dispositif selon la revendication 1, **caractérisé en ce que** l'unité de commande (60) est logée dans le corps (101) et la poignée (102) du dispositif (100).
 15. Dispositif selon la revendication 1, **caractérisé en ce que** l'unité de commande (60) est logée dans un module qui est externe par rapport au dispositif (100).

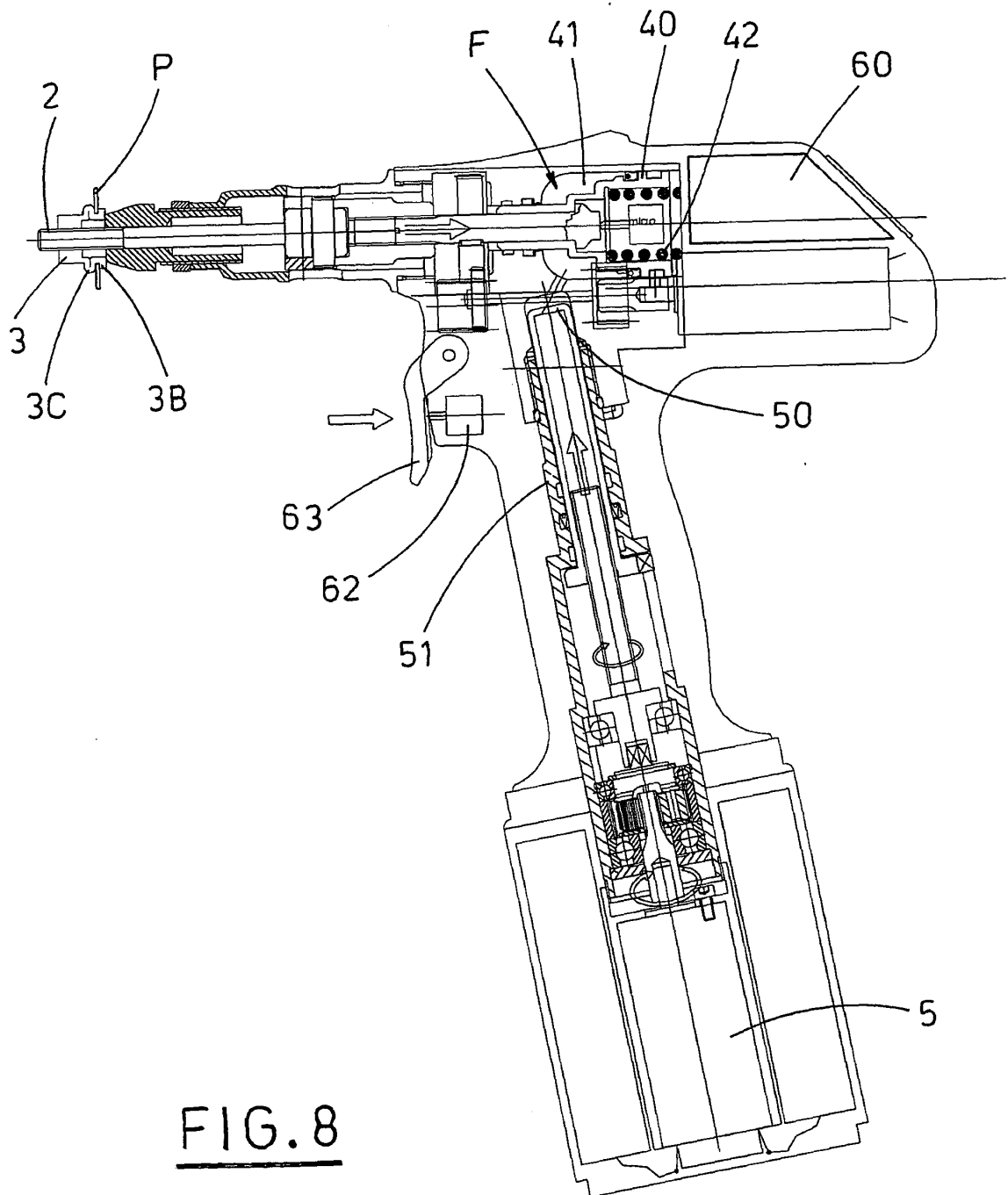












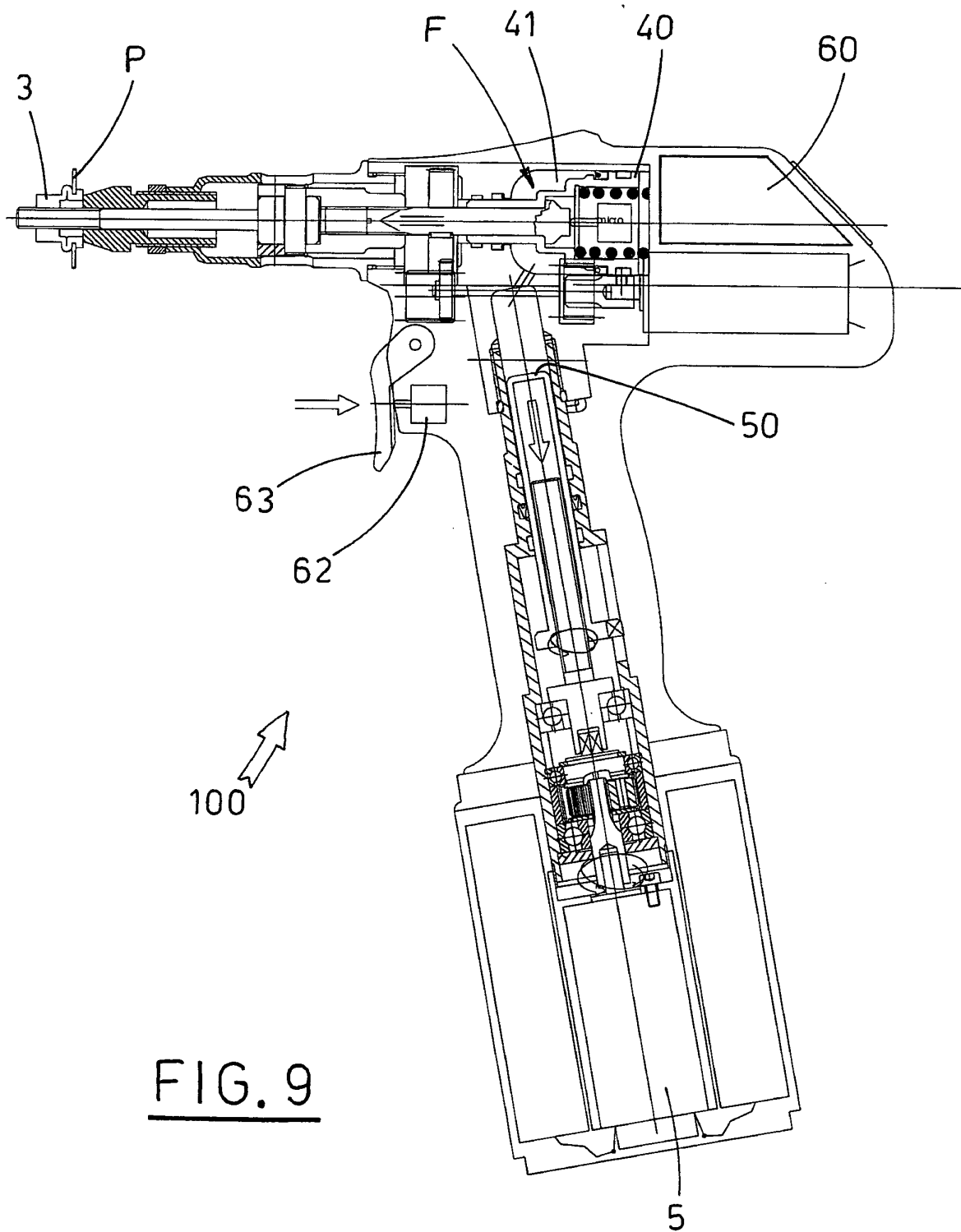
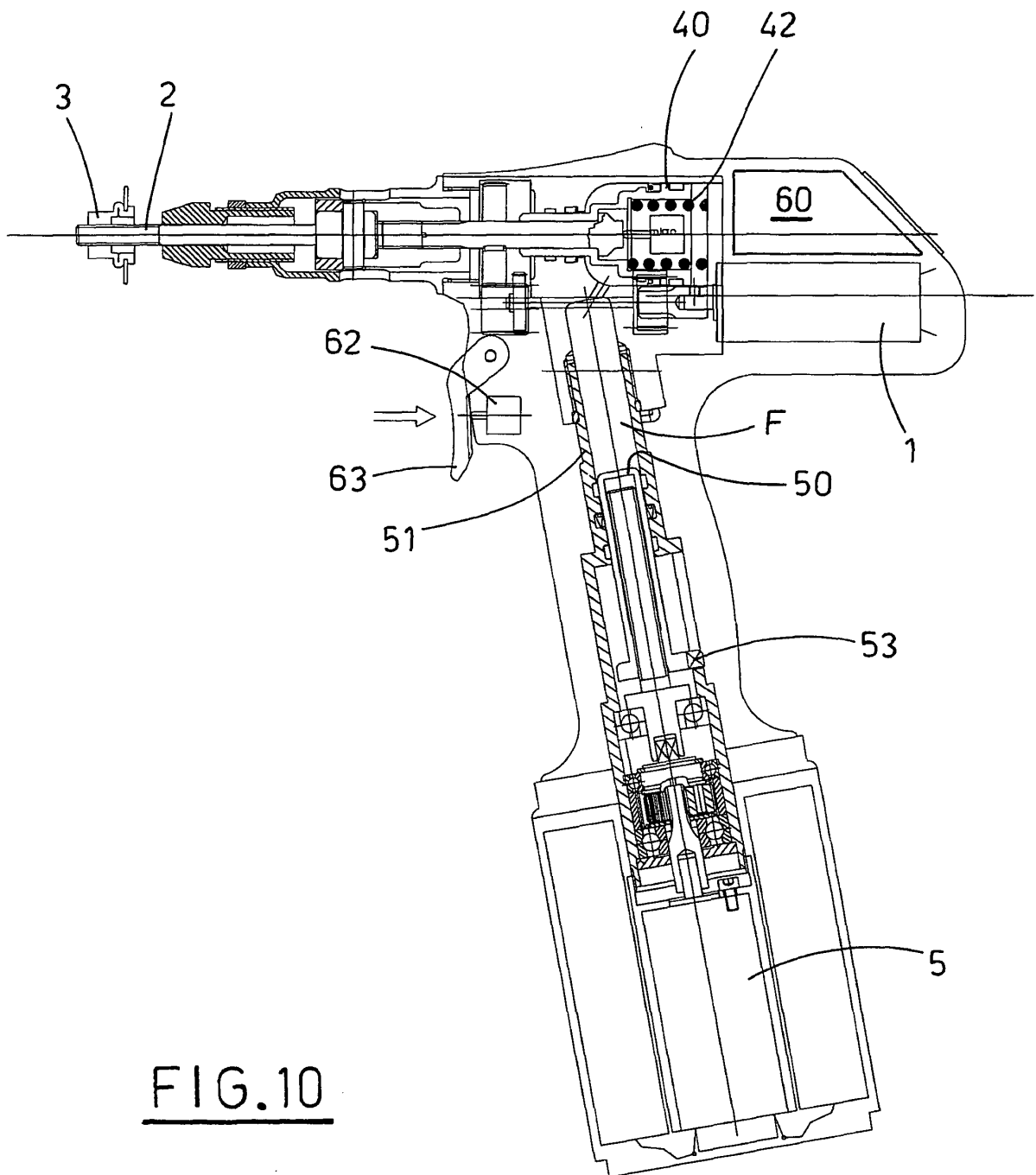


FIG. 9



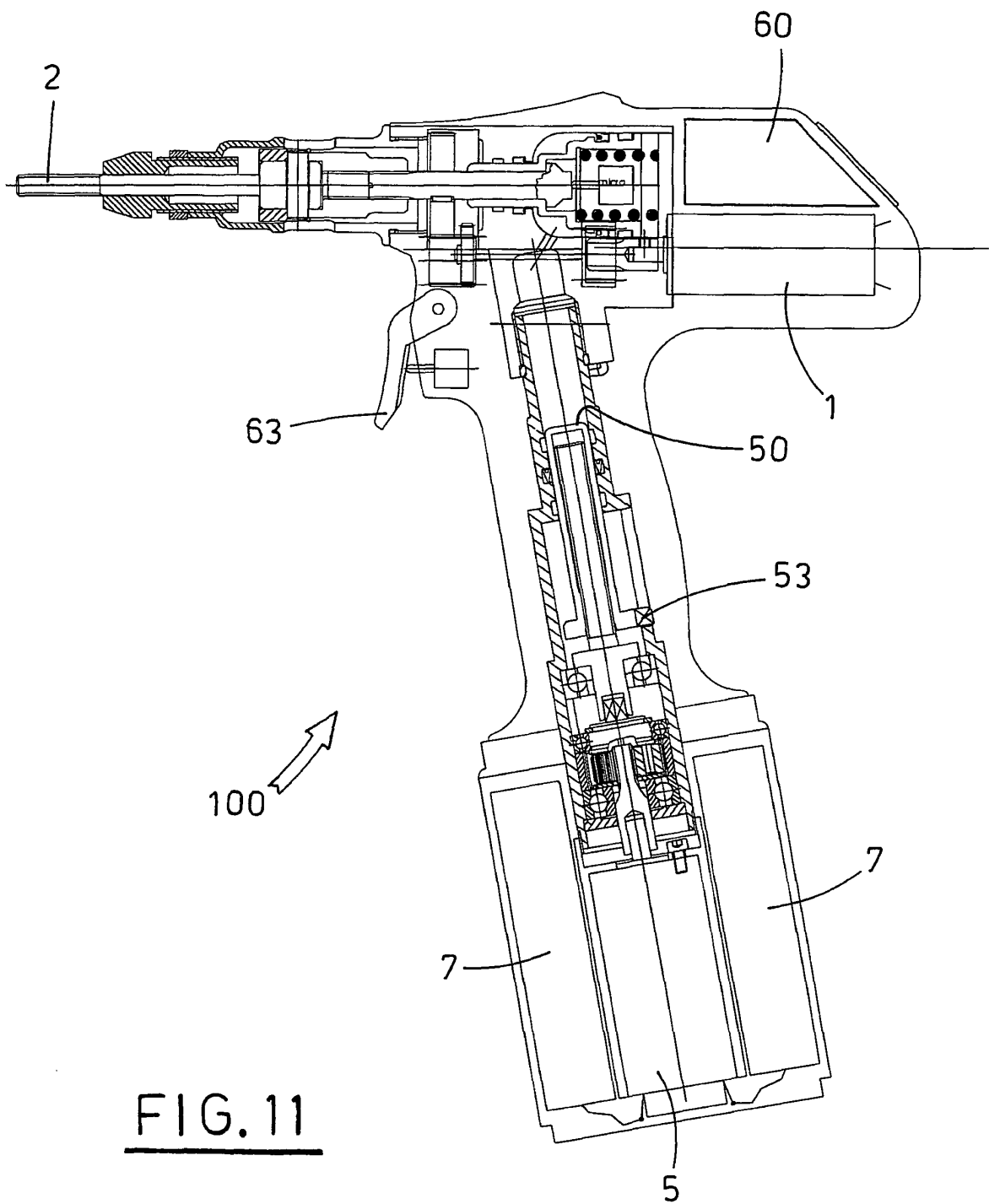


FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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