(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 480 347 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **91117037.1**

(51) Int. Cl.5: **B25B 21/00**, B25F 5/00

(22) Date of filing: **07.10.91**

(30) Priority: **09.10.90 IT 2167690**

(43) Date of publication of application:
15.04.92 Bulletin 92/16

(84) Designated Contracting States:
DE FR GB IT

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(54) Self-advancing automatic apparatus for the application of inserts with in-view positioning.

(57) The present invention relates to a self-advancing automatic apparatus for the application of inserts with in-view positioning, which has the peculiarity of comprising an insert-holder head (1) which is associable with an outer skirt (3) which defines a chamber (4) in which a positioning piston (5) is sealingly movable; the positioning piston (5) supports a freely rotating tool (10) and interacts with an advancement piston (20). There are also telescopic means (26,27) for the connection of the tool (10) to an actuation unit (25) for the rotation of the tool (10).

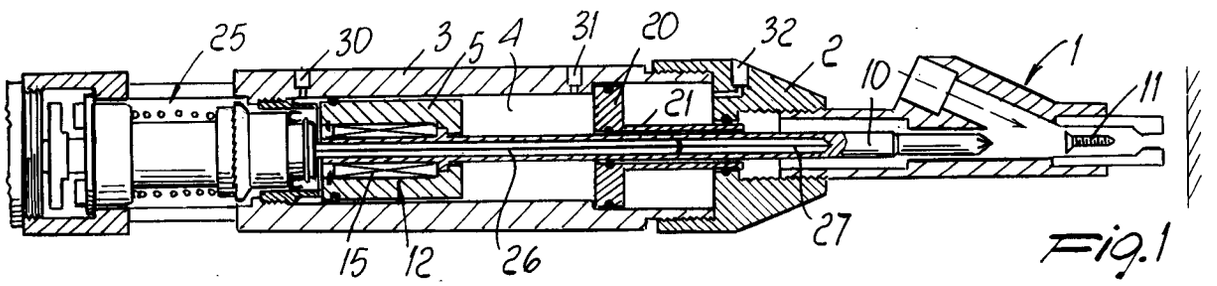

Fig.1

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The present invention relates to a self-advancing automatic apparatus for the application of inserts with in-view positioning.

As is known, in the execution of self-advancing automatic apparatuses, such as for example screw drivers with in-view positioning of the insert, considerable constructive problems are currently encountered which mainly arise from the fact that the actuation unit, constituted by the motor and the clutch, must move during the self-advancement step, so as to in practice keep the position of the screwing device stable during the screwing of the insert; the actuation unit undergoes a similar movement during the in-view positioning of the insert.

This fact is the source of considerable constructive problems, and the movement of the masses inside the screw driver can create discomfort for the user.

The aim of the invention is indeed to solve the above described problem by providing a self-advancing automatic apparatus for the application of inserts with in-view positioning, wherein the actuation unit substantially maintains its position, consequently simplifying all the constructive characteristics of the screw driver.

Within the scope of the above described aim, a particular object of the invention is to provide an automatic apparatus which is particularly handy and practical in use.

Another object of the present invention is to provide an automatic apparatus which can be easily manufactured in various versions starting from the same inventive concept, i.e. which can be executed with lever actuation, with automatic actuation, and with screwing torque control.

Not least object of the present invention is to provide an automatic apparatus which, by virtue of its peculiar constructive characteristics, is capable of giving the greatest assurances of reliability and safety in use.

Not least object of the present invention is to provide a self-advancing automatic apparatus for the application of inserts with in-view positioning, characterized in that it comprises an insert-holder head which is associable with an outer skirt which defines a chamber in which a positioning piston is sealingly movable, said piston supporting a freely rotatable tool and interacting with an advancement piston, telescopic means being furthermore provided for the connection of said tool to an actuation unit for the rotation of said tool.

Further characteristics and advantages will become apparent from the description of some preferred but not exclusive embodiments of a self-advancing automatic apparatus for the application of inserts with in-view positioning, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a view of an automatic apparatus with lever actuation during the initial step of insertion of the insert;

figure 2 is a view of the apparatus during the step of the in-view positioning of the insert;

figure 3 is a view of the apparatus during the screwing step;

figure 4 is a schematic view of an apparatus with automatic startup during the step of the in-view positioning of the tool;

figure 5 is a view of the apparatus of figure 4 during the screwing step;

figure 6 is a schematic view of the bearing interposed between the positioning piston and the tool;

figures 7, 8 and 9 are views of a different embodiment of the automatic apparatus, respectively during the steps of insert positioning, in-view insert positioning, and screwing;

figure 10 is a view of a different embodiment of the apparatus, wherein the in-view positioning of the insert is obtained by means of a pneumatic head;

figure 11 is a sectional view of the pneumatic head with the jaws in the position for locking the insert in the visible position;

figure 12 is a sectional view of the pneumatic head with the jaws in open position for the screwing step.

With reference to the above figures, and in particular to figures 1 to 3, the self-advancing automatic apparatus for the application of inserts with in-view positioning, according to the invention, comprises an insert-holder head 1, of a per se known type, which is axially screwed to a cap 2 which is associated with an outer skirt 3 which internally defines a cylindrical chamber 4 in which a positioning piston 5 is sealingly movable; said piston supports, so that it can freely rotate, a tool 10 the shape of which corresponds to the insert 11 on which it acts. As more clearly shown in figure 6, the tool 10 is connected to the piston 5 by interposing a rolling assembly 12, which in practice has a combined roller and thrust bearing, indicated by 15, which is associated with a tang 16 with which the tool 10 can be associated by screwing. There is also a rotation sealing gasket, indicated by 17, which is defined on a ring 18 which is retained in position by a stop ring 19.

There is furthermore an advancement piston 20, which is also sealingly movable in the chamber 4 and which is provided with a sleeve 21 which sealingly engages the tool 10.

The tool 10 is connected, by virtue of telescopic means, to an actuation unit, generally indicated by 25 and constituted by a motor and a clutch; said actuation unit 25 is provided with a polygonal pivot 26 which telescopically inserts itself

in a corresponding polygonal cavity 27 defined by the tool, so as to allow the translatory motion of the tool without requiring the translatory motion of the actuation unit.

On the chamber 4 there are a first opening 30, arranged at the rear end of the piston 5, the end opposite to the advancement piston being considered as rear end, a second opening 31, which is interposed between the positioning piston and the advancement piston, and a third opening 32, which acts in the portion of the chamber 4 which is delimited by the positioning piston 20.

As illustrated in figure 1, the insert constituted by the screw 11 is inserted, in the initial step, into the head 1 and subsequently, as illustrated in figure 2, compressed air is introduced into the chamber 4 by means of the first opening, causing the translatory motion of the positioning piston 5, which moves the tool 10 to engage the insert and move it into view.

The translatory motion of the piston 5 continues until it stops against the piston 20, which cannot move, since pressure is maintained in the related portion of the chamber 4.

In this step there is a partial backoff of the actuation unit 25, which is prepared for screwing.

The subsequent screwing step entails the translatory motion of the advancement piston 20, which is obtained by means of the venting of the air through the third opening 32.

In all the piston movement steps, the actuation unit undergoes no translatory motion, since it is coupled by virtue of the telescoping means, which allow the translatory motion of the tool without affecting the actuation unit in this sense.

With reference to figures 4 and 5, a conceptually similar solution is shown; the difference is that the startup of the apparatus, instead of being lever-operated, is of the automatic type and is obtained by means of an actuation cap, indicated by 40, which can slide in contrast with elastic means constituted by a spring 41 which cause, once the screw has been moved into view, the actuation of the actuation unit by means of a pressure exerted on the apparatus; the pressure causes the translatory motion of the actuation cap, with the consequent startup of the motor, which causes rotation.

Figures 7 to 9 illustrate an apparatus which is conceptually similar to the ones described above, with the structural advantage that it does not require rotating gaskets between the tool 10 and the advancement piston 20.

For this purpose, the piston 20 has an outer jacket 50 which extends axially on the same side as the actuation piston 5, is sealingly movable in the chamber 4 and defines a sealed movement chamber for the piston 5. For this purpose, the jacket 50 has a connecting hole 51 arranged proximate to the coupling region of the advancement piston 20.

Similarly, the positioning piston 5 has an internal jacket 53 which can move sealingly with respect to an intermediate jacket 55 which extends axially from the piston 20 and is sealingly movable with respect to the cap 3.

Proximate to the ends of the outer jacket there is a stop abutment 60 which prevents the accidental extraction of the piston 5 with respect to the outer jacket 50.

In practical operation, compressed air is initially introduced by means of the first opening and causes the translatory motion of the piston 5 inside the jacket until it abuts against the piston 20, moving the insert into view.

Then the compressed air starts to escape from the opening 32, with the consequent advancement of the tool and the screwing of said insert.

Once the screwing step has ended, compressed air is introduced through the second opening, thus obtaining in succession the backoff of the positioning piston and the backoff of the advancement piston to return to the initial conditions.

This solution eliminates the rotating seals between the tool and the piston, thus ensuring better operating conditions, since wear and the constructive difficulties typical of rotating gaskets are prevented.

According to what is illustrated in figures 10 to 12, an automatic apparatus is shown which allows to obtain self-advancement and in-view positioning with different means; in particular, the positioning piston 20 is replaced with a pneumatically actuated head which is capable of locking the insert in a visible position.

More in detail, the pneumatic head, generally indicated by the reference numeral 100, which is sealingly associated with the end of the outer skirt 3, has an actuation piston, indicated by 101, which acts in an actuation chamber 102 which is provided with an access port 103 for the introduction of compressed air.

The chamber 102 is separated from the chamber 4 by means of a partition 105 through which the tool, again indicated by 10, passes with a fluid-tight seal.

An actuation tang 110 extends axially from the actuation piston 101 and interacts with the jaws of the head, which are generally indicated by 120.

The jaws 120 are pivoted, in a median portion, indicated by 121, to the body of the head, and have an external grip end 122, which interacts with the tool 10 and with the insert, as will become apparent hereinafter, and an actuation arm, indicated by 124, which ends with cam-shaped protrusions 125 which enter the body of the head

through slots, indicated by 126, so as to interact with the actuation tang 110.

More in detail, as more clearly schematically illustrated in figure 11, when the actuation piston 101 is in the advanced position, i.e. pressurized fluid is fed into the chamber 102, the end of said tang interacts with the cam-shaped protrusions 125, preventing the rotation of the arms 124 and consequently preventing the opening of the jaws, so that, as illustrated in figures 10 and 11, the advancement piston 5 moves the insert 11 so as to position it in view, but it cannot continue its stroke since the jaws remained clamped and in closed position.

In order to be able to perform the subsequent step of advancement with protrusion of the insert, pressure in the chamber 102 is removed, so that the thrust exerted by the tool 10 on the insert allows to obtain the free divarication of the jaws, since the actuation piston returns to its initial position, as illustrated in figure 12, and consequently the clamps can freely divaricate.

The fact should furthermore be stressed that with this arrangement there is no wear of the jaws, which are normally elastically pushed against the tool, since said jaws are not contrasted by elastic pusher means but arrange themselves in locking position by virtue of a pneumatic action, and in release position they freely divaricate, without constituting a hindrance to the advancement of the tool.

In practice, with this solution a pneumatic head is therefore obtained which allows to obtain in-view positioning in an extremely simple manner and is advantageously applicable to an apparatus with self-advancing tool, thus combining the two effects.

From what has been described above, it can thus be seen that the invention achieves the intended aim and objects; in particular, the fact is stressed that a self-advancing automatic apparatus is provided wherein the actuation unit is not subjected to translatory motion during the work steps, with consequent considerable practical and constructive advantages.

The invention thus conceived is susceptible to 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 compatible with the specific use, as well as the contingent shapes and 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. Self-advancing automatic apparatus for the application of inserts with in-view positioning, characterized in that it comprises an insert-holder head (1) which is associable with an outer skirt (3) which defines a chamber (4) in which a positioning piston (5) is sealingly movable, said piston (5) supporting a freely rotatable tool (10) and interacting with an advancement piston (20), telescopic means (26,27) being furthermore provided for the connection of said tool (10) to an actuation unit (25) for the rotation of said tool (10).

2. Automatic apparatus according to claim 1, characterized in that said telescopic means are constituted by a polygonal pin (26) which is associated with said actuation unit (25) and which slidingly engages a polygonal cavity (27) which is shaped complementarily and is defined by said tool (10).

3. Automatic apparatus according to the preceding claims, characterized in that said tool (10) engages said positioning piston (5) with free rotation means, said free rotation means being constituted by a combined roller and thrust bearing (15) which is interposed between the positioning piston (5) and a coupling tang (16) for said tool (10), a supporting ring (18) of a rotating gasket (17) engaging said combined bearing (15), said ring (18) being kept in position by a stop ring (19) defined on said positioning piston (5).

4. Automatic apparatus according to one or more of the preceding claims, characterized in that said advancement piston (20) has an axial tang (21) which sealingly engages said tool.

5. Automatic apparatus, according to one or more of the preceding claims, characterized in that said chamber (4) has a first opening (30) which is arranged toward the rear end of said positioning piston (5), a second opening (31) interposed between said positioning piston (5) and said advancement piston (20), and a third opening (32) which is provided at the chamber portion delimited by said advancement piston (20).

6. Automatic apparatus, according to one or more of the preceding claims, characterized in that

for automatic startup there is an actuation cap (40) which slidingly engages said skirt (3) in contrast with elastic means constituted by a spring (41), the translatory motion of said actuation cap (40) by compression being suitable for activating said actuation unit (25).

7. Automatic apparatus according to one or more of the preceding claims, characterized in that said advancement piston (20) has an outer skirt (50) which extends in an axial direction and is sealingly movable in said chamber (4), said outer skirt (50) defining a sealing sliding chamber for said positioning piston (5), there being also an internal skirt (53) which extends axially from said positioning piston and is sealingly slidingly movable with respect to an intermediate skirt (55) which extends axially from said advancement piston (20), on the side opposite to said outer skirt (50), said outer skirt (50) defining, at the region of coupling to said advancement piston (20), a connecting hole (51) for connecting the sliding chamber of said positioning piston (5) to said second opening (31).

8. Self-advancing automatic apparatus for the application of inserts with in-view positioning, characterized in that it comprises an insert-holder head (100) with pneumatic actuation, which can be associated with an outer skirt (3) which defines a chamber (4) inside which a positioning piston (5) is sealingly movable, said piston (5) being connected to a tool (10) which is associated with telescopic means for its connection to an actuation unit for the rotation of the tool (10), means being furthermore provided for the removable locking of the jaws (120) which are suitable for achieving the in-view positioning of the insert (11).

9. Apparatus according to the preceding claim, characterized in that it comprises, in said pneumatic insert-holder head (100), an actuation piston (101) which is sealingly movable in an actuation chamber (102) which is sealingly separated from said chamber (4), said actuation piston (101) being provided with an actuation tang (110) which is suitable for interacting with the actuation arms (124) of a pair of jaws (120) which are pivoted to said head (100), cam-shaped protrusions (125) being provided at the end of the actuation arms (124) and being suitable for interacting with said actuation tang (110) in order to retain the jaws (120) in closed position with the insert (11) in view.

10. Apparatus according to the preceding claims, characterized in that it comprises opposite openings (126) on the body of said pneumatic insert-holder head (100) for the removable insertion of said actuation cams (125) in the region of action of said actuation tang (110).

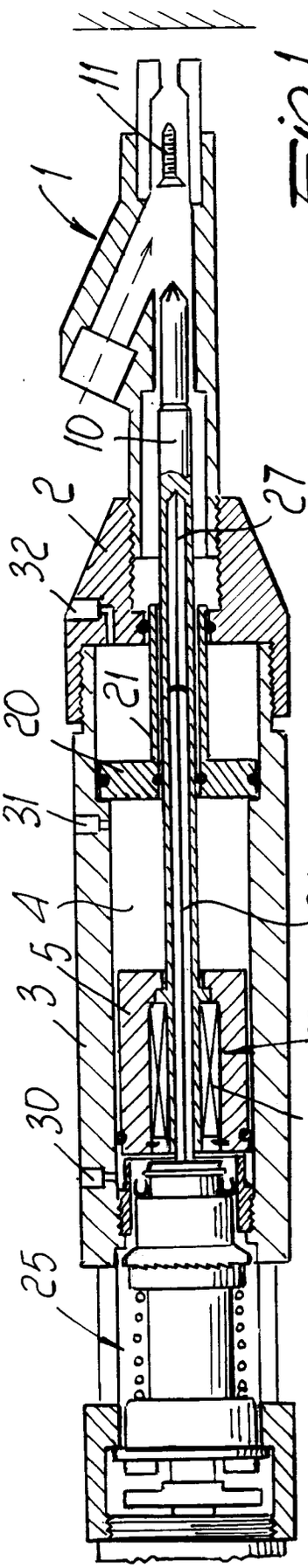

Fig.1

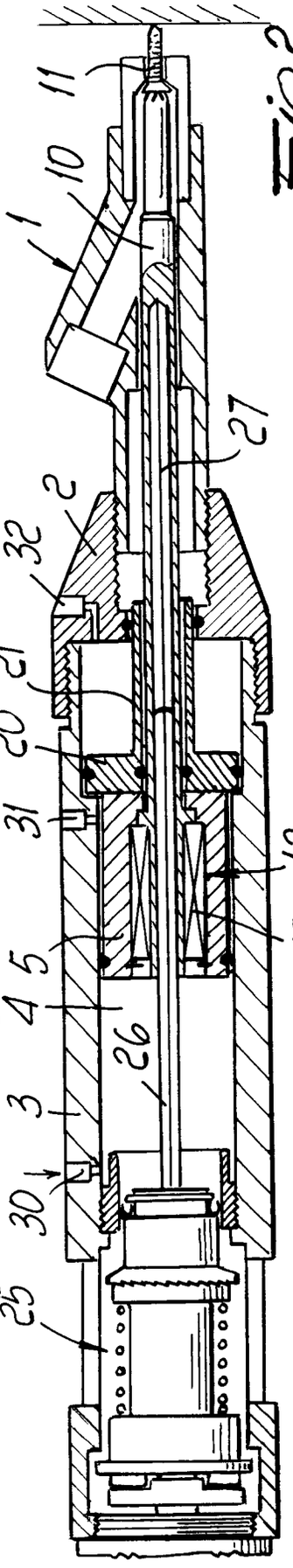

Fig.2

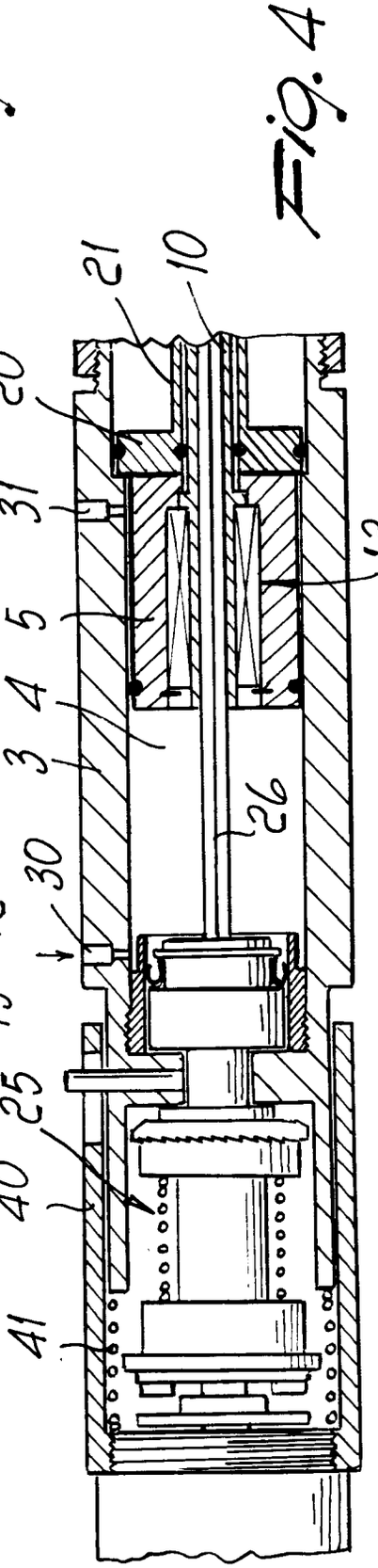

Fig.4

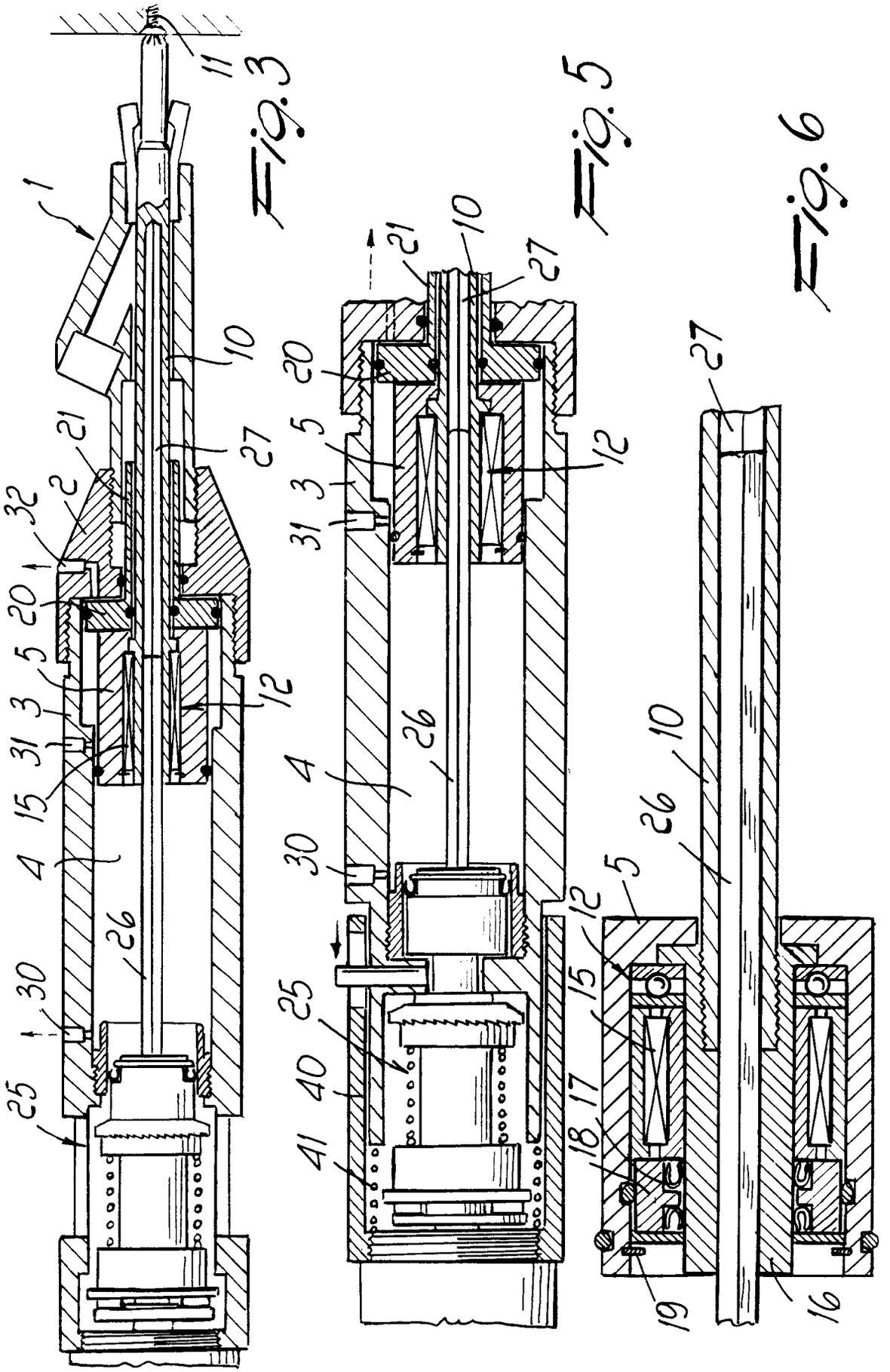

Fig. 3

Fig. 5

Fig. 6

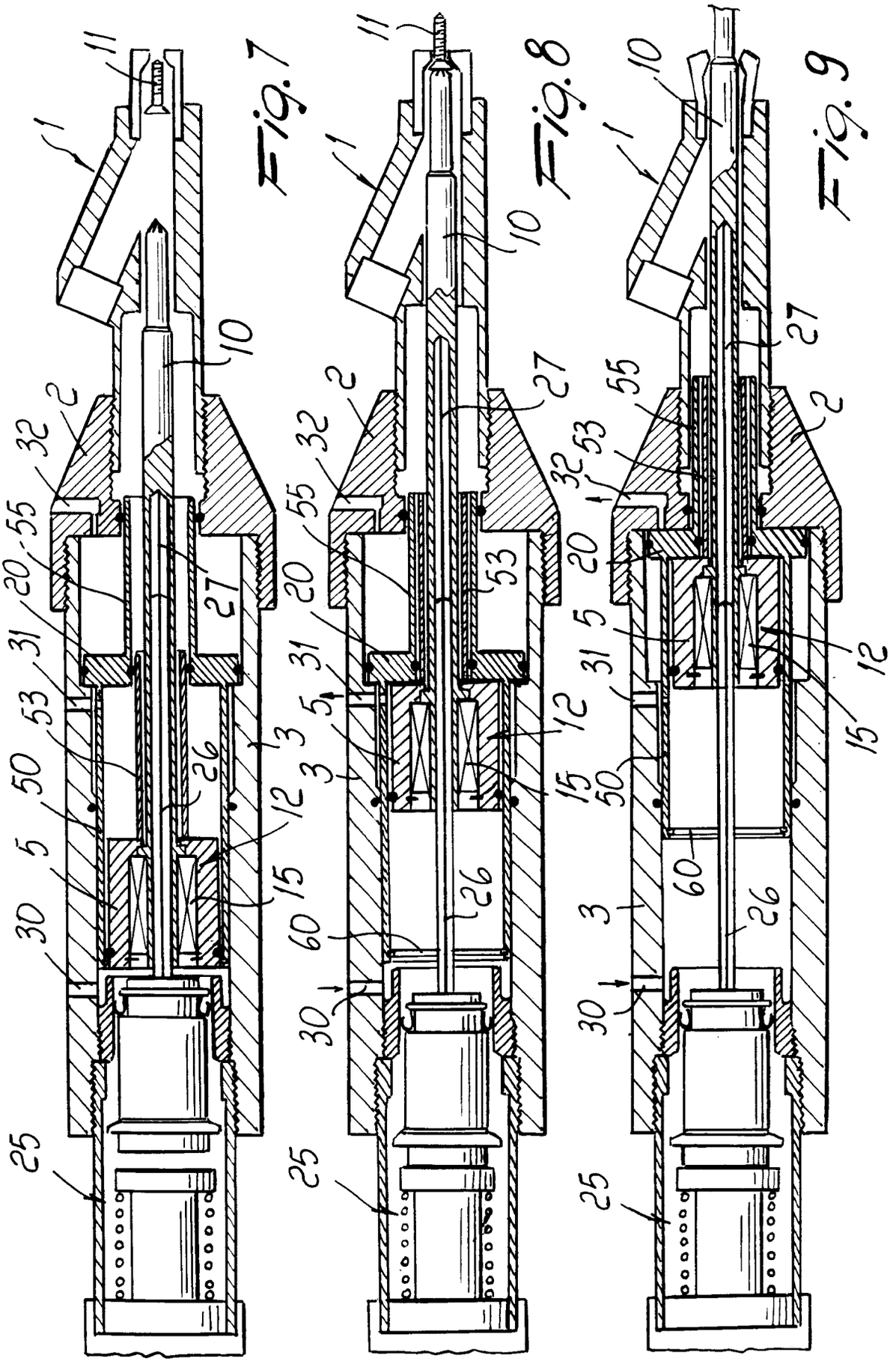
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Fig. 7
Fig. 8
Fig. 9

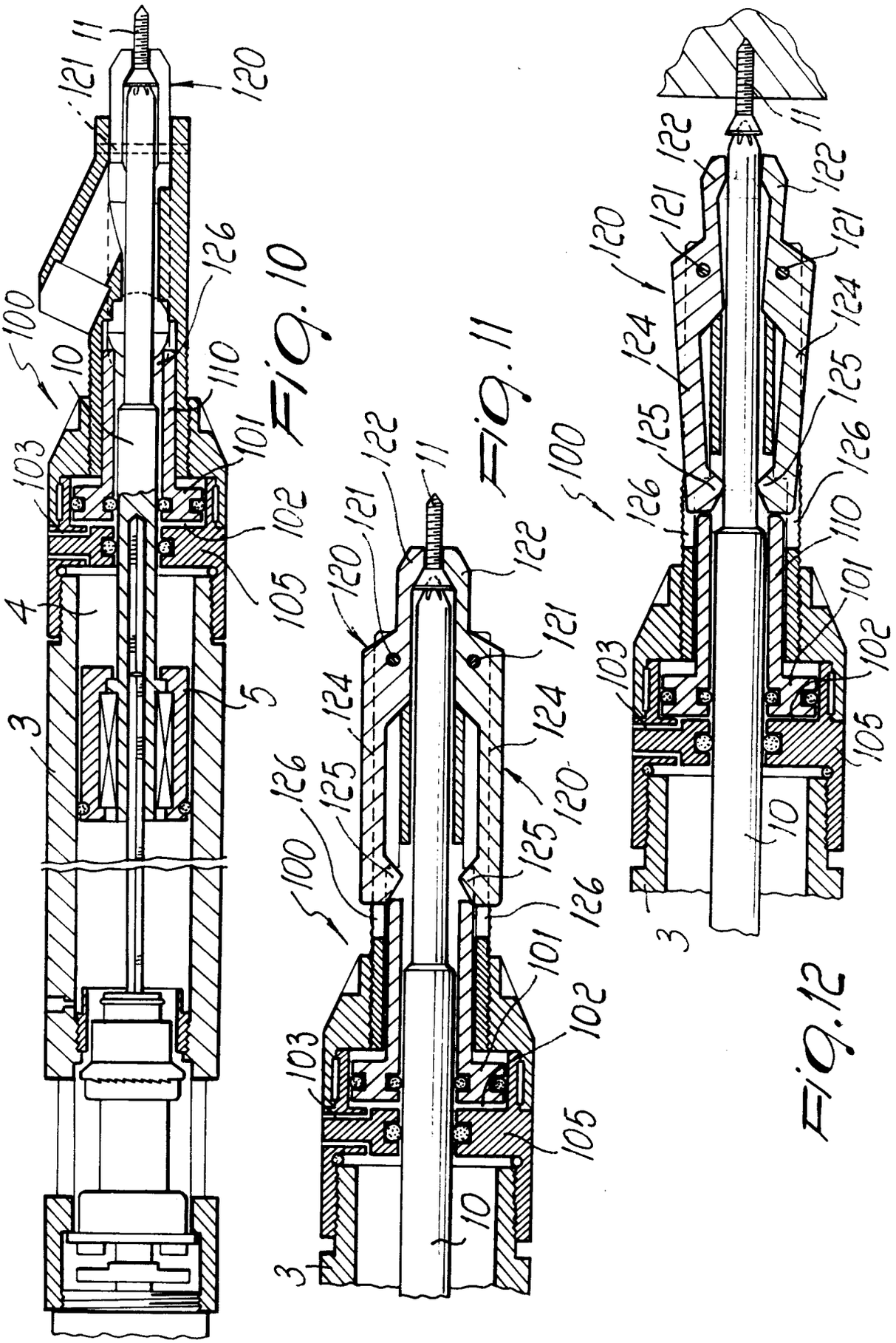

Fig. 10

Fig. 11

Fig. 12