(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 December 2007 (21.12.2007)

PCT

(10) International Publication Number
WO 2007/144434 A1

(51) International Patent Classification:
B05C 17/01 (2006.01)

(21) International Application Number:
PCT/EP2007/056039

(22) International Filing Date: 18 June 2007 (18.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

S2006/0459	16 June 2006 (16.06.2006)	IE
S2006/0834	16 November 2006 (16.11.2006)	IE
S2006/0927	18 December 2006 (18.12.2006)	IE

(71) Applicants and
(72) Inventors: **DEVLIN, Seamus** [IE/IE]; Drimreen, Co. Donegal (IE). **DEVLIN, Tracey** [IE/IE]; Drimreen, Co. Donegal (IE).

(74) Agents: **BROPHY, David** et al.; F.R. Kelly & Co., Dublin 4 (IE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

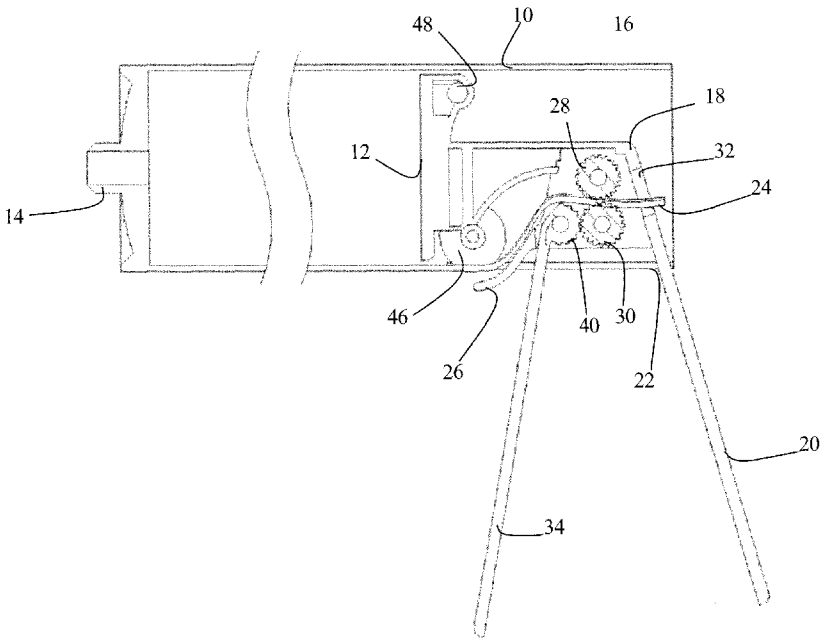
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DISPOSABLE DISPENSING DEVICE



(57) Abstract: A sealant gun or like device comprises a hollow cylindrical barrel (10) containing sealant or other viscous material, a plunger (12) located in the barrel, and a drive mechanism (16) for effecting relative axial movement between the plunger and the barrel to eject the material from a nozzle at the front of the barrel. The drive mechanism includes means (28, 30) for engaging the barrel progressively along its length to draw the barrel rearwardly relative to the drive mechanism and plunger.

WO 2007/144434 A1

Disposable Dispensing Device

Field of the Invention

This invention relates to a device for dispensing a viscous material, such as caulk, sealant or adhesive.

Background to the Invention

Caulk, sealant and adhesives are commonly supplied in cartridge form comprising a hollow cylindrical barrel containing the viscous material and a plunger (piston) located in and movable axially relative to the barrel to eject the material from a nozzle at the front of the barrel. A dispensing gun is used to hold the cartridge containing these materials and the action of the gun is to push the plunger along the barrel towards the nozzle to cause the contents to be dispensed.

Conventional dispensing guns have a frame into which the cartridge barrel is fitted and a long rod extending rearwardly of the frame and having a circular front plate which engages the plunger. In use the rod is driven in an axial direction toward the cartridge nozzle while the cartridge barrel remains fixed in the frame, the circular plate pushing the plunger ahead of it to expel the material from the nozzle. The combined length of the rod and the cartridge, especially when the cartridge is full, means the device is unwieldy and difficulties are encountered when material has to be applied in confined spaces.

Also, as the cartridge is emptied, the weight of the remaining material is concentrated at one end of the cartridge. A weight imbalance is created and can cause fatigue in the user resulting in short duty cycles.

An object of the invention is to produce a dispensing device in which the above disadvantages are avoided or mitigated.

Summary of the Invention

According to the present invention there is provided a device for dispensing a viscous material, comprising a hollow cylindrical barrel for containing the viscous material, a plunger located in the barrel, and a drive mechanism for effecting relative axial movement between the plunger and the barrel to eject the material from a nozzle at the front of the barrel, wherein the drive mechanism includes means for engaging the barrel progressively along its length to draw the barrel rearwardly relative to the drive mechanism and plunger.

The advantage of the invention is that it allows the overall length of the device, especially when the cartridge is full, to be much less than conventional guns. Also, the device is well balanced, thus enabling the user longer duty cycles without undue fatigue.

There is also provided a device for receiving a barrel containing a viscous material and for dispensing the viscous material contained within the barrel, the device comprising a housing to receive a barrel, a plunger located in the housing for acting on a moveable portion of the barrel, and a drive mechanism for effecting relative axial movement between the plunger and the barrel to eject the viscous material from a nozzle of the barrel, wherein the drive mechanism includes means for engaging with the barrel to move the barrel relative to the drive mechanism and plunger.

The device can accordingly be re-used as an attachment for stand-alone tubes of sealant.

Preferably, the device further comprises the barrel containing viscous material.

Preferably, a part of the drive mechanism extends laterally beyond the outside circumference of the barrel, and the drive mechanism includes means for progressively separating at least one longitudinal strip of the barrel to provide a slot through which the said part can project.

Preferably, the drive mechanism includes a cutting means for separating the longitudinal strip.

Preferably, the laterally extending part comprises a handle.

Preferably, the drive mechanism draws the barrel rearwardly by progressive engagement with the longitudinal strip of the barrel.

Preferably, the drive mechanism comprises a toothed wheel which engages the longitudinal strip and an actuator for rotating the toothed wheel in a direction to draw the strip in a rearward direction.

Preferably, the drive mechanism comprises at least one toothed wheel which engages the interior wall of the barrel and an actuator for rotating the at least one toothed wheel in a direction to draw the barrel in a rearward direction.

Preferably, the drive mechanism comprises a plurality of toothed wheels, the toothed wheels engaging the interior wall of the barrel at different circumferential locations.

Preferably, the actuator comprises a rack-and-pinion mechanism having a reciprocating rack coupled to at least one pinion wheel, wherein the at least one pinion wheel is coupled to the at least one toothed wheel by a ratchet mechanism.

Preferably, the at least one pinion wheel and the at least one toothed wheel are parallel and with opposed adjacent faces.

Preferably, the ratchet mechanism comprises co-operating members disposed respectively on the opposed adjacent faces of the at least one pinion wheel and the at least one toothed wheel.

Preferably, the drive mechanism comprises a support, a grip ring loosely surrounding the barrel at the front of the support, means resiliently biasing the grip ring and support

apart in the axial direction of the barrel, and an actuator for repeatedly tilting the grip ring to grip the barrel, moving the grip ring rearwardly against the resilient bias while the barrel is gripped, and releasing the grip ring to allow it to be moved forwardly along the barrel by the resilient bias, thereby to draw the barrel incrementally in a rearward direction.

Preferably, the actuator comprises a manually operated trigger.

Preferably, the plunger is attached to the front of the drive mechanism.

Preferably, the actuator comprises a worm screw coupled with at least one worm wheel.

Preferably, the means for engaging with the barrel comprises an endcap for locating at the front of the barrel, and a cable connecting the endcap to the drive mechanism.

Preferably, the drive mechanism is adapted to progressively engage the cable on actuation of the drive mechanism, drawing the barrel rearwardly relative to the drive mechanism.

Preferably, the handle is pivotably mounted on said housing, the handle operable to pivot from a first folded position wherein the longitudinal axis of the handle is parallel to the longitudinal axis of the barrel when held in the device, to a second open position, wherein the longitudinal axis of the handle is generally orthogonal to the longitudinal axis of the barrel when held in the device.

Preferably, the device comprises a handle locking mechanism operable to releasably secure said handle in said second open position.

Preferably, the handle locking mechanism comprises an interconnect member located on said handle and an interconnect projection located on said support, the interconnect member brought into engagement with the interconnect projection when said handle is

in said second open position, the interconnect member releasably coupling with the interconnect projection.

Preferably, the cutting means includes at least one cutting wheel, the cutting wheel acting on the surface of the barrel to cut the surface of the barrel to be received.

Preferably, the cutting means comprises at least one internal cutting wheel and at least one external cutting wheel, the at least one internal cutting wheel mounted within the housing acting on the internal surface of the barrel, the at least one external cutting wheel mounted within the housing acting on the external surface of the barrel.

Preferably, the cutting means comprises a plurality of cutting wheel pairs, the cutting wheel pairs each comprising one internal cutting wheel and one external cutting wheel, the cutting wheels of each cutting wheel pair located in close proximity to each other, the cutting wheels of each cutting wheel pair having parallel rotational axes.

Preferably, the drive mechanism is releasably coupled to a manually operated trigger having a first end and a second end.

Preferably, the trigger is pivotably mounted on said handle, the trigger operable to pivot from a first at rest position wherein the second end of the trigger is spaced from the handle, to a second depressed position wherein the second end of the trigger abuts the handle.

Preferably, the first end of the trigger is operable to couple with the drive mechanism when the handle is in said second open position, the trigger operable to actuate the drive mechanism as the trigger is pivoted from said first at rest position to said second depressed position.

Preferably, the device further comprises a trigger lock mechanism operable to releasably secure said trigger in said second depressed position.

Preferably, the trigger lock mechanism comprises an interconnect member located on said trigger and an interconnect projection located on said handle, the interconnect member brought into engagement with the interconnect projection when said trigger is in said second depressed position, the interconnect member releasably coupling with the interconnect projection.

Preferably, the trigger lock mechanism further comprises a projecting arm, the projecting arm moveably mounted within said handle, the projecting arm moveable from a first locked position to a second unlocked position, the projecting arm operable to act on the trigger interconnect member when in the first locked position to retain the trigger interconnect member in coupling engagement with the handle interconnect projection, the projecting arm removed from acting on the trigger interconnect arm when in the second unlocked position releasing the trigger interconnect member from coupling engagement with the handle interconnect projection.

In the embodiments described below the drive mechanism is manually operated by a trigger. However, embodiments are possible in which the drive mechanism can be attached to an electric motor so that the device does not rely on manual operation. This would be advantageous in situations where a large amount of caulk, sealant, adhesive or similar viscous material is to be applied by the same person over a prolonged period of time, to avoid both short-term debilitation and longer-term injury such as RSI (Repetitive Strain Injury).

In the prior art, guns used for dispensing caulking, sealant, adhesive or other similar viscous material are regarded as, and designed to be, reusable units separate from the cartridge containing the material to be dispensed. In the embodiments of the invention to be described the drive mechanism is attached to the rear of the plunger to form a single unit, and would be disposed of together with the empty cartridge when the contents of the cartridge are consumed.

Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a sectional side view of a first embodiment of the invention;

Figure 2 is a perspective view of the trigger mechanism of the first embodiment;

Figure 3 is a rear perspective view of the first embodiment with portions cut away;

Figure 4 is a sectional side view of a second embodiment of the invention;

Figure 4(A) is an alternate view of the device of Figure 4;

Figure 5 is a rear perspective view of the second embodiment;

Figure 6 is a rear perspective view of the second embodiment with portions cut away;

Figure 6(A) is an alternate view of the device of Figure 6;

Figure 7(a) is a front view of a third embodiment of the invention, and Figure 7(b) is a sectional side view of the third embodiment along the line A-A shown in Figure 7(a);

Figure 8 is a front perspective view of the third embodiment;

Figure 9 is a rear perspective view of the third embodiment when the cartridge barrel is full and prior to operation of the drive mechanism;

Figure 10 is a rear perspective view of the third embodiment when the cartridge barrel is partially empty and after to operation of the drive mechanism;

Figure 11 is a sectional side view of a fourth embodiment of the invention;

Figure 12 is a rear perspective view of the fourth embodiment;

Figure 13 is a rear perspective view of the fourth embodiment with portions cut away;

Figures 14 and 15 are front perspective and side views of a fifth embodiment of the invention;

Figures 16 to 18 are a sequence of cross-sectional side-views of the fifth embodiment illustrating the operation of the device as the trigger is squeezed;

Figure 19 is a perspective view similar to Figure 14 but omitting the outer collar;

Figure 20 is a perspective view of the trigger-operated drive mechanism of the fifth embodiment;

Figure 21 is an enlarged view of the drive mechanism at the top end of Figure 20;

Figure 22 is the same as Figure 21 but omitting two of the gearwheels to reveal details otherwise obscured;

Figure 23 is the same as Figure 22 but further omitting the two pinion wheels to reveal further details otherwise obscured;

Figure 24 is a rear perspective view of the fifth embodiment of the invention;

Figure 25 is a front perspective view of a sixth embodiment of the invention showing the device and;

Figure 26 is a front perspective view of the sixth embodiment, when the device is attached to a tube of sealant;

Figure 27 is a sectional view of the drive mechanism of Figure 26;

Figure 28 is an enlarged rear perspective view of the device shown in Figure 25 when the barrel protrudes through the rear of the device;

Figure 29 is an exploded view of the drive mechanism of Figure 26;

Figure 30 is a cross-sectional view of the device of Figure 26, prior to operation of the drive mechanism;

Figure 31 is a cross-sectional view of the device of Figure 26, as the tube of sealant is being driven through the device;

Figure 32 is a front perspective view of the seventh embodiment of the device, when the device is attached to a tube of sealant;

Figure 33 is a side plan view of the device of Figure 32;

Figure 34 is a cross-sectional view of the device of Figure 32;

Figure 35 is a rear perspective view of the device of Figure 32;

Figure 36 is a front perspective view of an eight embodiment of the device;

Figure 37 is a cross-sectional view of the device of Figure 36, when the device is attached to a tube of sealant;

Figure 38 is a front perspective cut-away view of the device of Figure 36, showing the drive mechanism;

Figure 39 is an enlarged view of the drive mechanism of Figure 38;

Figure 40 is an enlarged view of the drive mechanism of Figure 38, showing the pinion drive wheel in detail;

Figure 41 is an enlarged view of the drive mechanism of Figure 38, showing the grip wheel in detail;

Figure 42 is an enlarged view of the drive mechanism of Figure 38, showing the cutting wheel and the axel in detail;

Figure 43 is an enlarged perspective view of the drive mechanism of Figure 38;

Figure 44 is an enlarged frontal view of the drive mechanism of Figure 38;

Figure 45 is a rear perspective view of the device of Figure 36, when the device is attached to a tube of sealant;

Figure 46 is a side plan view of a ninth embodiment of the device, when the handle of the device is in the closed (or folded) position, when the device is attached to a tube of sealant;

Figure 47 is a cross-sectional view of the device of Figure 46;

Figure 48 is a cross-sectional view of the device of Figure 46, as handle of the device is being moved from the closed position to the open position;

Figure 49 is a cross-sectional view of the device of Figure 46, when the handle of the device is in the open position; and

Figure 50 is a cross-sectional view of the device of Figure 46, when the handle of the device is in the open position, when the device is attached to a tube of sealant, when the trigger of the device is deployed and the device is ready for use.

In the drawings the same reference numerals have been used for the same or equivalent components in the various embodiments.

In this specification the front of the barrel is the end having the nozzle, and terms such as forwardly, rearwardly, etc., are to be interpreted accordingly.

Detailed Description of the Embodiments

Referring first to Figures 1 to 3, a first embodiment of the invention comprises a hollow cylindrical plastics barrel 10 for containing a viscous material (not shown), and a

plunger 12 located in and movable axially relative to the barrel to eject the viscous material from a nozzle 14 at the front of the barrel. The plunger 12 is attached to the front of a drive mechanism 16.

The drive mechanism 16 comprises a support 18 whose front end forms the plunger 12 and whose rear end forms a handle 20 which projects laterally beyond the outside circumference of the barrel 10 through a longitudinal slot 22 in the wall of the barrel. The slot 22 is formed by separating a longitudinal strip 24 from the barrel behind the plunger 12. The longitudinal strip 24 is fed up an inclined guide ramp 26 to pass between two toothed wheels 28 and 30, which are rotatably mounted between two opposite side plates 36, 38 (Figure 2) of the support 18, and finally emerges from an exit 32 at the rear of the support 18.

A hand-operated trigger 34 is mounted for rotation between the side plates 36, 38 and projects through the slot 22 in front of the handle 20. The upper end of the trigger has teeth 40 which engage the teeth of the wheel 30. The opposite ends of the shaft of the wheel 30 are located in slots 44 in the plates 36, 38 so that the wheel 30 can move bodily towards and away from the wheel 28. A spring 42 (not shown in Figure 1 or Figure 3) couples the trigger 34 and wheel 30 such that when the trigger 34 is depressed (i.e. rotated anticlockwise, as seen in Figure 1, towards the handle 20), the wheel 30 is initially lifted towards the wheel 28 by movement of its shaft in the slots 44 so that the longitudinal strip 24 of the barrel becomes gripped between the wheels 28, 30. Then, further depression of the trigger 34 resiliently deforms the spring 42 and, through engagement of the teeth 40 with the wheel 30, causes the wheel 30 to rotate clockwise. This draws the strip 24, and hence the entire barrel 10, rearwardly relative to the plunger 14 and drive mechanism 16.

When the trigger 34 is released the spring 42 returns the trigger to the initial forward (un-depressed) position, the wheel 30 disengaging the strip 24. Thus, successive depressions on the trigger 34 will draw the barrel 10 progressively and incrementally rearwardly relative to the plunger and drive mechanism as the wheels 28, 30 engage the

strip 24 progressively along its length. Thus the viscous material will be ejected from the nozzle 14.

Since the handle 20 and trigger 34 extend laterally beyond the circumference of the barrel 10, and because the drive mechanism 16 operates by drawing on the strip 24, it is necessary to progressively separate a greater length of the strip 24 from the barrel walls as the drive mechanism 16 progresses towards the front of the barrel 10. This is effected by a pair of rotary cutting blades 46 mounted on the support 18 just behind the plunger 12. These blades preferably move along pre-formed lines of weakening on the inside of the barrel, to ensure a clean cut. However, such weakening of the inside of the barrel may not be necessary as we have shown that sharp blades can slice readily through barrel material up to 2mm thick. The drive mechanism 16 is stabilised by guide wheels 48 on the support 18 which engage the inside surface of the barrel opposite the cutting blades 46. The circular cutting blades could, alternatively, be replaced with two fixed flat blades.

Referring to Figures 4 to 6(A), in a second embodiment of the invention the support 18 includes a collar 18A closely surrounding the exterior surface of the barrel 10. Again the plunger 12 is mounted on the front of the support 18 which also retains two sharp-toothed wheels 50 and 52 whose teeth engage the interior wall of the barrel 10 at diametrically opposite locations at the top and bottom of the barrel. The wheels 50, 52 can only turn in one direction, the wheel 50 clockwise (as seen in Figure 4) and the wheel 52 anticlockwise. Two spring-loaded arms 54, 56 are mounted in a housing 58 which is slidably mounted on the support 18 for movement back and forth along a slot 64. The housing 58 is biased rearwardly by two tension springs 60, 62 and the arms 54, 56 are biased, by their spring-loading, mutually outwardly into engagement with the teeth of the wheels 50, 52 respectively.

When the trigger 34 is depressed, it rotates about its pivot axis 66 and its upper end 68 bears against and pushes the housing 58 forward relative to the support 18. As a result the arms 54, 56 are levered forward and these rotate the wheels 50, 52. In turn, the wheels 50 and 52, by biting into the interior wall of the barrel 10, draw the barrel

rearwardly relative to the plunger 12 and support 18. When the trigger 34 is released the springs 60, 62 draw the housing 58 and arms 54 and 56 back, and rotate the trigger 34 forwards to its initial position, ready for the next depression of the trigger.

Thus, successive depressions on the trigger 34 will draw the barrel 10 progressively and incrementally rearwardly relative to the plunger and drive mechanism as the wheels 50, 52 engage the interior of the barrel 10 progressively along its length. Thus sealant or other viscous material will be ejected from the nozzle 14.

As for the first embodiment, in order to make clearance for the movement of the barrel 10 relative to the handle 20 and trigger 34, a longitudinal strip 24 of the barrel is progressively cut from the barrel to leave a longitudinal slot 22 along which the handle and trigger pass. The strip 24 is progressively cut, as the barrel is drawn back past the plunger 12, by a pair of fixed blades 70, the strip 24 being fed through escape slots 74, 76 in the trigger and handle. At the same time a second longitudinal strip 24A is cut from the barrel 10 by a second pair of fixed blades 72, the strip 24A being fed through an escape slot 78 in the support 18. The corresponding longitudinal slot 22A provides clearance for the tongue of material attaching the top of the collar 18A to the main body of the support 18 within the barrel 10. It will be appreciate that Figures 4 and 6 show the drive mechanism at the extreme rear end of the barrel, before the strips 24, 24A have been cut.

Figures 7 to 10 show a third embodiment of the invention. The device comprises a plunger 12 formed as the front part of a support 18, the latter also retaining upper and lower pairs of cutting blades 70, 72 respectively. The support 18 is coupled to an O-shaped grip ring 84 which loosely surrounds the barrel 10. A pair of guide rails 85 are provided on the grip ring 84. The guide rails 85 project in a parallel direction from the surface of the grip ring 84, towards the support 18. The guide rails 85 are received within corresponding guide channels (not shown) in the support 18. A pair of compression springs 87,88 extend between the grip ring 84 and the support 18, the springs 87,88 biasing the grip ring 84 forwardly relative to the support 18. The device has a hand-operated trigger 34 attached to a U-shaped bracket 90 that is, in turn, pivoted

to the support 18 by studs 92. The trigger 34 bears against the lower end 86 of the grip ring 84. The guide rails 85 are provided on that side of the grip ring 84 opposite to the trigger 34.

Depressing the trigger 34 causes the bracket 90 to rotate and, as this bears against the lower end 86 of the grip ring 84, it causes the grip ring 84 to tilt relative to the axis of the barrel 10 against the bias of the spring 88. This tilt causes the grip ring 84 to grip the outside of the barrel. Further depression of the trigger 34 moves the entire grip ring 84 rearwardly against the bias of the springs 87,88, while gripping the barrel 10, so that the barrel is drawn rearwardly relative to the plunger 12 and support 18. If the trigger is now released the spring 88 untilts the grip ring 84 so that it no longer grips the barrel, and the springs 87,88 move the grip ring 84 forwardly along the barrel. Thus, by repeatedly depressing and releasing the trigger 34 the barrel 10 is drawn progressively and incrementally in a rearward direction relative to the plunger 12 and support 18 so that the contents of the barrel are dispensed through the nozzle 14.

As the barrel is drawn backwards, it is cut by the two pairs of cutting blades 70, 72 and the cut strips 24, 24A are directed through escape slots 94, 96 respectively. It will be appreciate that Figures 7 and 9 show the drive mechanism at the extreme rear end of the barrel, before the strips 24, 24A have been cut.

Figures 11 to 13 show a fourth embodiment of the invention and comprises a plunger 12 which is part of a support 18 which also retains a pair of cutting blades 72. Two diametrically opposite, sharp-toothed gearwheels 100 and 102 are mounted on the support 18, whose teeth engage and bite into the top and bottom of the interior wall of the barrel 10. The gearwheels 100, 102 can only rotate in one direction, the wheel 100 clockwise (as seen in Figure 11) and the wheel 102 anticlockwise. The gearwheels are meshed together such that when the gearwheel 100 rotates clockwise the gearwheel 102 rotates anticlockwise.

The device has a handle 20 integral with the support 18 and a hand-operated trigger 34 that has a toothed gear 104 at its upper end. The upper end of the trigger 34 has a slot

106 at its upper end and a transverse rod 108, fixed to the support 18, extends through the slot 106. This allows the upper end of the trigger to move towards and away from the gearwheel 100. The upper end of the trigger 34 is normally maintained out of engagement with the gearwheel 100 by a tension spring 110 which biases the trigger 34 against a fixed stop 112.

When the trigger 34 is depressed, the toothed gear 104 is initially moved, against the bias of the spring 110, into meshing engagement with the gearwheel 100, i.e. into the position shown in Figure 11. Further depression of the trigger then rotates the gearwheel 100 clockwise, which in turn rotates the gearwheel 102 anticlockwise. The rotating gearwheels 100, 102 bite into the interior wall of the barrel 10 and draw it rearwardly relative to the piston 12 and support 18. Upon release of the trigger 34 the gear 104 disengages the gearwheel 100 and the trigger returns to its initial position ready for a further stroke.

Repeated depressions of the trigger 34 will therefore draw the barrel 10 progressively and incrementally in a rearward direction relative to the plunger 12 and support 18 so that the contents of the barrel are dispensed through the nozzle 14. As the barrel 10 is drawn backwards, a longitudinal strip 24 thereof it is cut by the pair of cutting blades 72 and the cut strip 24 is directed into escape slots 114 and 116.

Figures 14 to 23 show a fifth embodiment of the invention and comprises a plunger 12 which is part of a support 18 which also retains a pair of cutting blades 72. Two diametrically opposite pairs of sharp-toothed coaxial gearwheels 100 and 102 are mounted on the support 18, the teeth of the gearwheel pairs 100, 102 engaging and biting into the top and bottom of the interior wall of the barrel 10. The gearwheel pairs 100, 102 can only rotate in one direction, the gearwheels 100 clockwise (as seen in Figure 17) and the gearwheels 102 anticlockwise. The gearwheel pairs are driven by a rack and pinion mechanism comprising a toothed rack 150 and upper and lower pinion wheels 151 and 152 respectively that are meshed with the rack 150. The pinion wheel 151 is mounted coaxially between the gearwheels 100 and the pinion wheel 152 is mounted coaxially between the gearwheels 102.

The pinion wheels 151 and 152 have multiple flexible engagement leaves 153 that cooperate with ribs 154 formed on the gear wheels 100 and 102. When the toothed rack 150 moves forwardly, under action of a trigger 34 as will be described, the pinion wheels 151 and 152 are rotated respectively in clockwise and anticlockwise directions. During such rotation the engagement leaves 153 of the two pinion wheels 151 and 152 press against the gearwheel ribs 154 with the result that the gearwheel 100 rotates clockwise and the gearwheel 102 rotates anticlockwise. When the trigger 34 is released the toothed rack 150 moves backwardly and rotates the two pinion wheels 151 and 152 respectively in anticlockwise and clockwise directions. However, in this instance the engagement leaves 153 deflect and move over the gearwheel notches 154 and hence gearwheels 100 and 102 move only in the forward direction axially along the barrel 10. In effect, the engagement leaves 153 and ribs 154 form a ratchet mechanism between the pinion wheels 151, 152 and the gearwheels 100, 102 with the engagement leaves 153 forming the pawls.

The device has a handle 20 integral with the support 18 and a hand-operated trigger 34 that has the toothed rack mechanism 150 fixed at its upper end. The upper end of the trigger 34 has a slot 106 at its upper end and a transverse rod 108, fixed to the support 18, extends through the slot 106. This allows the upper end of the trigger to move towards and away from the gearwheels 100 and 102 and drive the rack mechanism 150 backwards and forwards.

A spring, not shown, lies between the trigger 34 and the handle 20 such that when the trigger 34 is depressed (i.e. rotated anticlockwise towards the handle 20, as seen in the sequence of Figures 16 to 18), the toothed rack 150 is moved forwardly to rotate the gearwheels 100 and 102 in the manner described above until the trigger 34 touches the handle 20. During such rotation of the trigger the spring is resiliently deformed so that when the trigger 34 is released the spring returns the trigger to the initial forward (un-depressed) position, Figure 16, the toothed rack 150 being drawn backwards.

Thus, successive depressions on the trigger 34 cause the rotating gearwheels 100, 102 to bite into the interior wall of the barrel 10. This action will draw the barrel 10 progressively and incrementally rearwardly relative to the plunger 12 and support 18 as the gearwheels 100 and 102 engage the barrel 10 progressively along its length. Thus the viscous material will be ejected from the nozzle of the tube.

As for the previous embodiment, in order to make clearance for the movement of the barrel 10 relative to the handle 20 and trigger 34, a longitudinal strip 24 of the barrel (Fig. 24) is progressively cut from the barrel to leave a longitudinal slot 22along which the handle and trigger pass. The strip 24 is progressively cut, as the barrel is drawn back past the plunger 12, by the pair of fixed blades 72, the strip 24 being fed through escape slots 74, 76 in the trigger and handle. At the same time a second longitudinal strip 24a, is cut from the barrel 10 by the blades 72, the strip 24A being fed through an escape slot 78 above the handle 20.

Further embodiments are illustrated that demonstrate that the invention may comprise a dispensing drive device that is adaptable to accept stand-alone cartridges in the form of a barrel containing viscous material. Use of these embodiments allows for one device to be re-used in the dispensing of a number of cartridges of viscous material.

Figures 25 to 31 show a sixth embodiment of the invention wherein the device is driven by an electric motor similar to that used in an electric drill. A plunger 12 which is part of a support 18 which also retains a plurality of cutting blades (shown as 72 in Figure 29).

Two pairs of diametrically opposite, sharp-toothed gearwheels 200 and 202 are mounted on the support 18, whose teeth engage and bite into the top and bottom of the interior wall of the barrel 10. The gearwheels 200, 202 can rotate in both directions, clockwise and anti-clockwise. The gearwheels are driven by an electric motor 205 that turns a worm screw 206 and this turns two worm wheels 207 and 208 that are meshed with the worm screw 206. These worm wheels 207 and 208 are linked directly by common axles to the sharp-toothed gearwheels 200 and 202 such that when the worm

screw 206 turns, the worm wheels 207 and 208 and the sharp-toothed gearwheels 200 and 202 turn.

This mechanism has been designed such that, when depressing the trigger 34 and activating the electric motor 205, the worm screw 206 turns. In forward motion, gearwheel 200 rotates clockwise and the gearwheel 202 rotates anti-clockwise drawing the barrel 10 axially backwards. When the trigger 34 is released the current is cut off from the electric motor 205 and motion stops.

As in the previous embodiments, the rearward motion of the barrel 10 causes the cutting blades 72 to progressively cut the barrel 10. In this embodiment, as can be seen in Figure 30, the barrel 10 is cut into four segments 19 by the action of the cutting blades 72. The segments 19 are fed through a corresponding number of apertures 209 in the rear face of the housing 18.

When the electric motor 205 is put in reverse mode the worm screw 207 rotates in the reverse direction, gearwheel 200 rotates anti-clockwise and the gearwheel 202 rotates clockwise pushing the barrel 10 axially forwards and thereby allowing the barrel 10 to be discharged and removed from the device.

Thus, depression on the trigger 34 causes the rotating gearwheels 200, 202 to bite into the interior wall of the barrel 10. This action will draw the barrel 10 progressively and incrementally rearwards relative to the plunger 12 and support 18 as the gearwheels 200 and 202 engage the barrel 10 progressively along its length. Thus the viscous material will be ejected from the nozzle 220 of the tube.

The device has a handle 20 integral with the support 18 and a finger-operated trigger 34 that closes a circuit and allows electric current to flow to the electric motor 205.

The device in this embodiment is also provided with a rechargeable battery pack 210 contained in the base of the handle 20, the rechargeable battery electrically connected to the electric motor 205, allowing the device to be operated without use of mains current.

Similarly the device in a similar embodiment may be connected directly to mains electricity to power the electric motor 205.

A further mechanism (not shown in these drawings) serves to control the rate of rotation of the electric motor 205 and thereby control the rate of rotation of the worm screw 206. This allows the user to control the rate of discharge of the viscous fluid from the nozzle 220 that is connected to the end of the barrel 10.

Another mechanism (not shown in these drawings) allows the motion of the worm screw 206 to be reversed. This may be achieved by either reversing the direction of the current through the electric motor 205 or by placing intermediate gearwheels between the electric motor 205 and the worm screw 206. With one gearwheel engaged the worm screw 206 rotates in a clockwise direction and with the second gearwheel engaged the worm screw 206 rotates in an anti-clockwise direction.

Figures 32 to 35 show a seventh embodiment of the invention and comprises a plunger 12 which is part of a support 18 which also retains a pair of cutting blades 72.

Figures 32,33 and 35 show the cartridge or barrel 10 being held within the support 18 by means of cables 300 and an end cap 301 that entraps the cartridge. It may be seen in this embodiment that the barrel of the cartridge 10 has been partially cut by the cutting blades 72.

Figure 34 shows a cross-sectional view of the device wherein it comprises a rear handle 302, a trigger 303, a gearwheel 304 at the top of the trigger and a further gearwheel 305 around which the cables 300 are coiled. Not shown in this embodiment is a V shaped spring that is fitted between the rear handle 302 and the trigger 303 and serves to return the trigger to its start position after it is compressed and released. The gearwheel 304 can only rotate in an anti-clockwise direction and via a ratchet mechanism is disengaged from the trigger 303 whilst that trigger 303 is returning to its start position under the force of the V shaped spring.

As the trigger 303 is pulled towards the rear handle 302 the ratchet mechanism turns the gearwheel 304 in an anti-clockwise direction. This action causes the gearwheel 305 to rotate in a clockwise direction and wind the cables 300 onto the axle of this gear 305. The cables 300 are fed through the slots 306 cut in the barrel of the cartridge 10 by the cutting blades 72.

Further depression of the trigger 34 resiliently deforms the spring 42 causing rotation of the gearwheels 304 and 304 and the cables 300 are wound onto the axle of gearwheel 305. This action will draw the barrel 10 progressively and incrementally axially rearwards relative to the plunger 12 and support 18 as the cables are wound onto the axle of gearwheel 305. Thus the viscous material will be ejected from the nozzle of the tube.

This embodiment may be further provided with a mechanism to unwind the cables 300 from the axle of the gear 305, allowing for the device to be re-used on other cartridges.

Figures 36 to 45 show an eighth embodiment of the invention. As in previous embodiments, the device comprises a plunger 12 and a support 18 to receive a tube of sealant in the form of barrel 10. Two sets of diametrically opposite, sharp-toothed, internal cutting wheel pairs 400 and 402 are mounted on the support 18 such that they lie within the interior wall of the barrel 10 when the barrel 10 is attached to the device. These internal cutting wheels 400 and 402 comprise a plurality of sharpened teeth about their rim, which simultaneously engage and cut into the respective top and bottom surfaces of the interior wall of the barrel 10.

As these internal gripping and cutting wheels 400 and 402 act to engage and cut into the interior wall of the barrel 10, opposing diametrically opposite, sharp-toothed, pairs of cutting wheels 500 and 502 are mounted on the support 18 such that they lie exterior to the walls of the barrel 10. These sharp-toothed pairs of exterior cutting wheels 500 and 502 act against the internal 400 and 402 cutting wheel pairs to create a scissor action and so cut through the walls of the barrel 10.

The cutting wheels 400, 402, 500, 502 are configured to rotate in one direction, the cutting wheels 400 and 502 clockwise and the cutting wheels 402 and 500 anticlockwise, with respect to the orientation shown in the accompanying figures. The internal cutting wheels 400 and 402 are mounted on axle 700, while the external cutting wheels 500 and 502 are mounted on axles 800 and 802.

The internal cutting wheels 400 and 402 are driven by a rack and pinion mechanism comprising a toothed rack 450 and two pinion drive wheels 451 and 452 that are meshed with the rack mechanism. As shown in Figure 40 these pinion drive wheels 451 and 452 are designed to have multiple flexible engagement leaves 453 that engage with notches 454 formed in the grip gears 600 and 602. The pinion drive wheels 451 and 452 are mounted on a circularly shaped portion of the axle 700. The grip gears 600 and 602 are mounted on the same axle 700, on a hexagonally shaped portion of the axle, corresponding to the central apertures formed in the grip gears 600 and 602. Similarly the internal cutting wheels 400 and 402 are mounted on the outer hexagonal portions of axle 700.

Alternatively, the gripping gears 600 and 602 could be formed as an integral part of the cutting wheels 400 and 402 rather than as separate components as shown in this embodiment and the associated figures. These components have been shown as separate items for the sake of clarity.

The rack and pinion mechanism 450 has been designed such that when the toothed rack moves forward under action of the trigger 34, the engagement leaves 453 of the two pinion drive wheels 451 and 452 press against the gearwheel notches 454 with the result that grip wheel 600 rotates clockwise whilst grip wheel 602 rotates anticlockwise. When the trigger is released the toothed rack 450 moves backwards and turns the two pinion drive wheels 451 and 452. As described with reference to previous embodiments, the engagement leaves 453 deflect and move over the gearwheel notches 453. As a result grip wheels 600 and 602 move only in one direction axially along the barrel 10.

As the grip wheels 600 and 602 share a common hexagonal portion of the axle 700 with the internal cutting wheels 400 and 402 respectively the internal cutting wheels 400 and 402 similarly move only in one direction axially along the barrel 10.

As described in previous embodiments, the device further comprises a handle 20 integral with the support 18 and a hand-operated trigger 34. The trigger 34 is pivotably mounted to the handle 20 at pivot 908, the trigger 34 operable to pivot from an initial forward (un-depressed) position (as seen in Figure 50) to a rearward (depressed) position when the trigger 34 abuts the handle 20 (as seen in Figure 49). The trigger 34 is coupled with the toothed rack mechanism 450 fixed at the upper end of the trigger 34. The upper end of the trigger 34 has a slot 106 at its upper end. A transverse rod 108, fixed to the rack mechanism 450, extends through the slot 106. This allows the upper end of the trigger 34 to move towards and away from the gearwheels 451 and 452 and drive the rack mechanism 450 backwards and forwards.

A spring 42 (shown in Figures 36 and 37) lies between the trigger 34 and handle 20 such that when the trigger 34 is depressed (i.e. rotated anticlockwise, as shown with respect to a previous embodiment seen in Figures 17 and 18) towards the handle 20, the toothed rack 450 is moved forward towards the gearwheels 451 and 452. Further depression of the trigger 34 resiliently deforms the spring 42 until the position shown in figure 18 is reached wherein the trigger 34 abuts the handle 20.

When the trigger 34 is released the spring 42 returns the trigger 34 to the initial forward (un-depressed) position, and the toothed rack mechanism 450 is drawn backwards.

Successive depressions on the trigger 34 cause the grip wheels 600 and 602 to rotate, which in turn cause the internal cutting wheel pairs 400 and 402 to bite into the interior wall of the barrel 10. This action draws the barrel 10 progressively and incrementally rearwards relative to the plunger 12 and support 18, as the internal cutting wheel pairs 400 and 402 engage the barrel 10 progressively along its length. As the barrel 10 is drawn backwards the external cutting wheel pairs 500 and 502 rotate and the combined scissor action between the 400/500 cutting wheels and the 402/502 cutting wheels

serves to cut through the wall of the barrel 10. The action of drawing the barrel 10 backwards, and progressively cutting the wall of this barrel 10, forces the contained viscous material to be ejected from the nozzle of the tube 10 through the action of the plunger 12.

Figures 46 to 50 show a ninth embodiment of the invention, which is common to all previous embodiments of this device. As shown in this embodiment, the trigger 34 and handle 20 are designed to be folded up to aid shipping and storage of the device and for display of the invention in, for example, retail premises. Similarly it can be folded up by the user when not in use.

In this embodiment, the handle 20 is pivotably mounted to the support 18 via pivot 907 (as shown in Figures 47-50).

This embodiment also allows the device to be attached to the tube 10 containing the viscous material such that the invention and the tube 10 can be provided to a customer as a single unit.

As can be seen from Figure 46, the handle 20 and trigger 34 are designed to be folded in such a way that they lie parallel and alongside the barrel 10 of the cartridge containing the viscous material.

Figure 46 shows a view of the ninth embodiment of the device, where the trigger 34 and the handle 20 are folded into a closed position such that the trigger 34 and the handle 20 are arranged parallel to and adjacent the barrel 10. In addition, the longitudinal axis of the trigger 34 and the handle 20 is perpendicular to the support 18. A trigger lock and release button 900 is also illustrated shown in Figure 46.

Figure 47 shows a cross-sectional view of the device with trigger 34 and handle 20 fully folded as shown and discussed in Figure 46 above. An L-shaped engagement arm 903 extends from that surface of trigger 34 facing handle 20. When in the closed position,

the arm 903 projects into a chamber formed in the handle 20 having an engagement shoulder 902.

An extension arm 904 is provided within the handle 20. The extension arm is coupled to the trigger lock and release button 900, and projects through the handle 20 to a point adjacent the engagement shoulder 902. The trigger lock and release button 900, and consequently the extension arm 904, are slidably moveable between a first locked position (shown in Figures 47-49), wherein the button 900 and the arm 904 are located towards the free end of the handle 20, and a second unlocked position (shown in Figure 50), wherein the button 900 and the arm 904 are displaced away from the free end of the handle 20.

When the trigger 34 abuts the handle 20, and the trigger button 900 and the extension arm 904 are in the first locked position, the extension arm 904 contacts the surface of the L-shaped engagement arm 903, and acts to deflect the engagement arm 903 in the direction towards the distal end of the trigger 34. Consequently, the engagement arm 903 couples with the engagement shoulder 902, retaining the engagement arm 903 within the chamber.

Once the trigger button 900 and the extension arm 904 are pivoted about pivot 907 and moved to the second unlocked position, the extension arm 904 is brought out of contact with the engagement arm 903, and consequently the engagement arm 903 is no longer deflected. The engagement arm 903 is released from coupling with the engagement shoulder 902, and as a result the trigger 34 is released from coupling with the handle 20.

As can be seen in Figure 50, the trigger 34 may be biased away from the handle 20 through use of a suitable torsion spring 42. The torsion spring 42 acts to force the trigger 34 towards the at rest position shown in Figure 50, when the device is unlocked by moving the trigger button 900 to the second unlocked position.

Forming part of the handle 20, Figures 47 to 50 inclusive also show a generally flexible interconnect arm 905. Interconnect arm 905 is located at that end of the handle 20

adjacent the support 18, and arm 905 projects substantially orthogonally from the longitudinal axis of the handle 20. A corresponding interconnect projection 906 is provided on the interior surface of the upper portion of the support 18.

As the handle 20 is pivoted about pivot 907 and moved from the closed (or folded) position (as seen in Figures 46 and 47) to the open position (as seen in Figure 49), the interconnect arm 905 of the handle 20 is brought into engagement with the interconnect projection 906 of the support 18. The arm 905 and the projection 906 provide a secure interconnection between the handle 20 and the support 18, locking the device in the operational position, as seen in Figures 49 and 50. The interconnection is designed to resist the forces generated when a user operates the device to cut the walls of a barrel 10, move the barrel 10 axially rearwards towards the handle 20 and expel the viscous material from the nozzle, ensuring that the handle 20 is maintained in the open position.

As described in previous embodiments, the trigger 34 has a slot 106 provided at the end of the trigger adjacent the support 18. A transverse rod 108 is provided on the rack mechanism 450. As the handle 20 and the trigger 34 are brought into the open position, the slot 106 receives the transverse rod 108, coupling the rack mechanism 450 to the trigger 34, as can be seen in Figures 49 and 50.

It will be understood that the handle 20 can be easily removed from engagement with the interconnect projection 906 of the support 18 by applying downward pressure to the interconnect arm 905. This removes the arm 905 from its position of being coupled to the projection 906, allowing for the handle 20 to be pivoted about pivot 907 to the closed (or folded) position shown in Figures 46 and 47.

Figure 50 shows the device in a position wherein the handle 20 is fully unlocked as the trigger lock and release button 900 has been moved into the unlocked position, and the generally flexible interconnect arm 905 of the handle 18 is shown fully engaged with the interconnect projection 906 on the support 18. The device may now be used to eject the viscous material from the tube 10 in the manner described with reference to earlier embodiments.

The provision of the folding handle 20 and the lockable trigger 34 allows for the device to be easily packaged and transported, and also allows the device to be easily stored when not in use.

The invention is not limited to the embodiments described herein which may be modified or varied without departing from the scope of the invention.

Claims

1. A device for receiving a barrel containing a viscous material and for dispensing the viscous material contained within the barrel, the device comprising a housing to receive a barrel, a plunger located in the housing for acting on a moveable portion of the barrel, and a drive mechanism for effecting relative axial movement between the plunger and the barrel to eject the viscous material from a nozzle of the barrel, wherein the drive mechanism includes means for engaging with the barrel to move the barrel relative to the drive mechanism and plunger.

2. A device as claimed in claim 1, wherein the device further comprises the barrel containing viscous material.

3. A device for dispensing a viscous material, comprising a hollow cylindrical barrel for containing the viscous material, a plunger located in the barrel, and a drive mechanism for effecting relative axial movement between the plunger and the barrel to eject the material from a nozzle of the barrel, wherein the drive mechanism includes means for engaging the barrel progressively along its length to draw the barrel rearwardly relative to the drive mechanism and plunger.

4. A device as claimed in any one of claims 1-3, wherein a part of the drive mechanism extends laterally beyond the outside circumference of the barrel, and wherein the drive mechanism includes means for progressively separating at least one longitudinal strip of the barrel to provide a slot through which the said part can project.

5. A device as claimed in claim 4, wherein the drive mechanism includes a cutting means for separating the longitudinal strip.

6. A device as claimed in claim 4 or 5, wherein the laterally extending part comprises a handle.

7. A device as claimed in claim 4, 5 or 6, wherein the drive mechanism draws the barrel rearwardly by progressive engagement with the longitudinal strip of the barrel.

8. A device as claimed in claim 7, wherein the drive mechanism comprises a toothed wheel which engages the longitudinal strip and an actuator for rotating the toothed wheel in a direction to draw the strip in a rearward direction.

9. A device as claimed in any one of the preceding claims, wherein the drive mechanism comprises at least one toothed wheel which engages the interior wall of the barrel and an actuator for rotating the at least one toothed wheel in a direction to draw the barrel in a rearward direction.

10. A device as claimed in claim 9, wherein the drive mechanism comprises a plurality of toothed wheels, the toothed wheels engaging the interior wall of the barrel at different circumferential locations.

11. A device as claimed in claim 8 or 9, wherein the actuator comprises a rack-and-pinion mechanism having a reciprocating rack coupled to at least one pinion wheel, wherein the at least one pinion wheel is coupled to the at least one toothed wheel by a ratchet mechanism.

12. A device as claimed in claim 11, wherein the at least one pinion wheel and the at least one toothed wheel are parallel and with opposed adjacent faces.

13. A device as claimed in claim 12, wherein the ratchet mechanism comprises co-operating members disposed respectively on the opposed adjacent faces of the at least one pinion wheel and the at least one toothed wheel.

14. A device as claimed in any one of claims 4, 5 or 6, wherein the drive mechanism comprises a support, a grip ring loosely surrounding the barrel at the front of the support, means resiliently biasing the grip ring and support apart in the axial direction of the barrel, and an actuator for repeatedly tilting the grip ring to grip the barrel, moving

the grip ring rearwardly against the resilient bias while the barrel is gripped, and releasing the grip ring to allow it to be moved forwardly along the barrel by the resilient bias, thereby to draw the barrel incrementally in a rearward direction.

15. A device as claimed in any one of claims 8-14, wherein the actuator comprises a manually operated trigger.

16. A device as claimed in any preceding claim, wherein the plunger is attached to the front of the drive mechanism.

17. A device as claimed in any preceding claim , wherein the drive mechanism comprises an electric motor.

18. A device as claimed in claim 17, wherein the device further comprises a power source, the power source powering the electric motor.

19. A device as claimed in claim 18, wherein the power source comprises a battery.

20. A device as claimed in claim 19, wherein the power source comprises a connection to mains power.

A device

21. A device as claimed in claim 9, wherein the actuator comprises a worm screw coupled with at least one worm wheel.

22. A device as claimed in any one of claims 1-2, wherein the means for engaging with the barrel comprises an endcap for locating at the front of the barrel, and a cable connecting the endcap to the drive mechanism.

23. A device as claimed in claim 22, wherein the drive mechanism is adapted to progressively engage the cable on actuation of the drive mechanism, drawing the barrel rearwardly relative to the drive mechanism.

24. A device as claimed in claim 6, wherein the handle is pivotably mounted on said housing, the handle operable to pivot from a first folded position wherein the longitudinal axis of the handle is parallel to the longitudinal axis of the barrel, to a second open position, wherein the longitudinal axis of the handle is generally orthogonal to the longitudinal axis of the barrel.

25. A device as claimed in claim 24, wherein the device comprises a handle locking mechanism operable to releasably secure said handle in said second open position.

26. A device as claimed in claim 25, wherein the handle locking mechanism comprises an interconnect member located on said handle and an interconnect projection located on said support, the interconnect member brought into engagement with the interconnect projection when said handle is in said second open position, the interconnect member releasably coupling with the interconnect projection.

27. A device as claimed in claim 5, wherein the cutting means includes at least one cutting wheel, the cutting wheel acting on the surface of the barrel to cut the surface of the barrel to be received.

28. A device as claimed in claim 27, wherein the cutting means comprises at least one internal cutting wheel and at least one external cutting wheel, the at least one internal cutting wheel mounted within the housing acting on the internal surface of the barrel, the at least one external cutting wheel mounted within the housing acting on the external surface of the barrel.

29. A device as claimed in claim 28, wherein the cutting means comprises a plurality of cutting wheel pairs, the cutting wheel pairs each comprising one internal cutting wheel and one external cutting wheel, the cutting wheels of each cutting wheel pair located in

close proximity to each other, the cutting wheels of each cutting wheel pair having parallel rotational axes.

30. A device as claimed in claim 24, wherein the drive mechanism is releasably coupled to a manually operated trigger having a first end and a second end.

31. A device as claimed in claim 30, wherein the trigger is pivotably mounted on said handle, the trigger operable to pivot from a first at rest position wherein the second end of the trigger is spaced from the handle, to a second depressed position wherein the second end of the trigger abuts the handle.

32. A device as claimed in claim 31, wherein the first end of the trigger is operable to couple with the drive mechanism when the handle is in said second open position, the trigger operable to actuate the drive mechanism as the trigger is pivoted from said first at rest position to said second depressed position.

33. A device as claimed in claim 32, wherein the device further comprises a trigger lock mechanism operable to releasably secure said trigger in said second depressed position.

34. A device as claimed in claim 33, wherein the trigger lock mechanism comprises an interconnect member located on said trigger and an interconnect projection located on said handle, the interconnect member brought into engagement with the interconnect projection when said trigger is in said second depressed position, the interconnect member releasably coupling with the interconnect projection.

35. A device as claimed in claim 34, wherein the trigger lock mechanism further comprises a projecting arm, the projecting arm moveably mounted within said handle, the projecting arm moveable from a first locked position to a second unlocked position, the projecting arm operable to act on the trigger interconnect member when in the first locked position to retain the trigger interconnect member in coupling engagement with the handle interconnect projection, the projecting arm removed from acting on the trigger interconnect arm when in the second unlocked position releasing the trigger

interconnect member from coupling engagement with the handle interconnect projection.

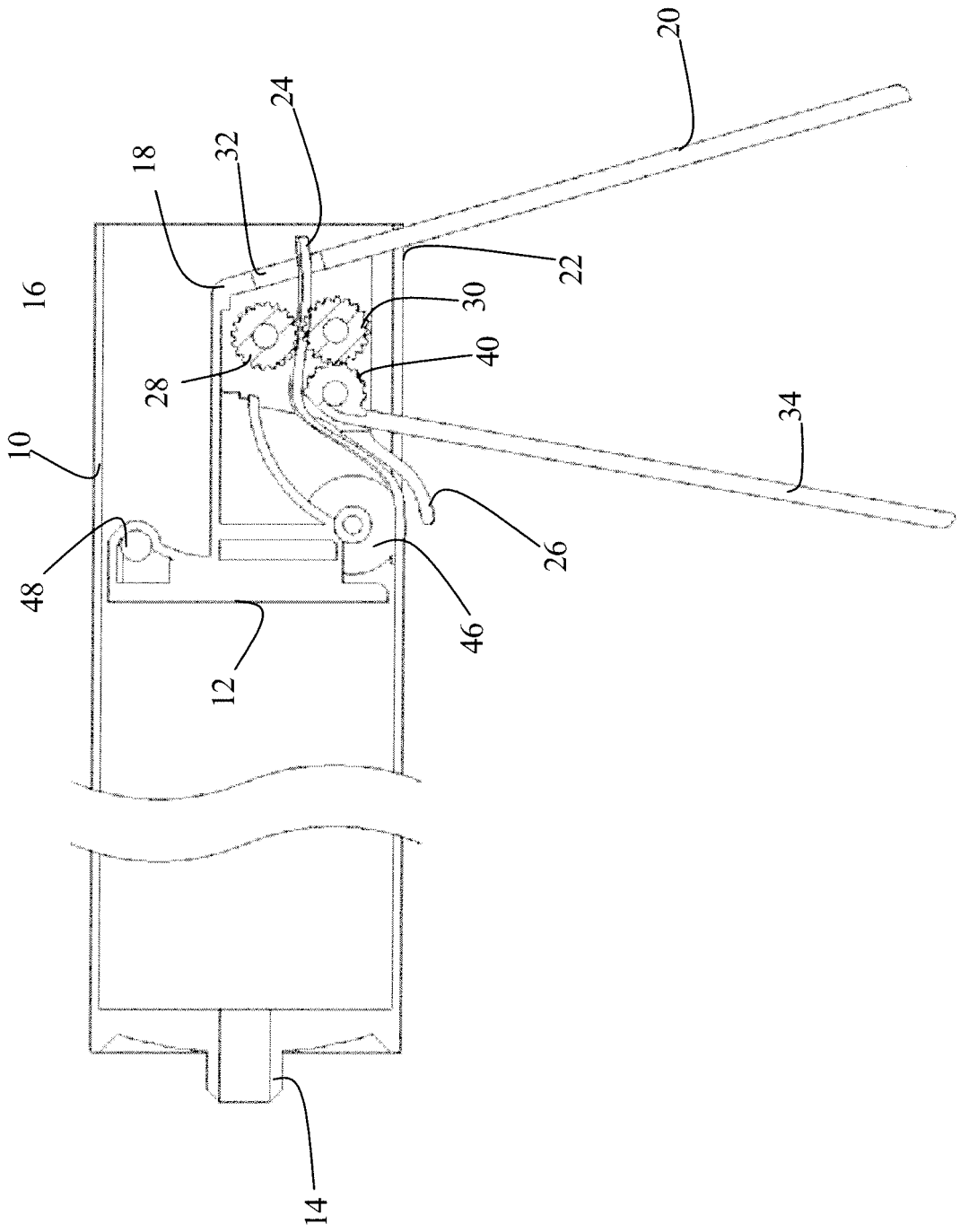


Fig 1

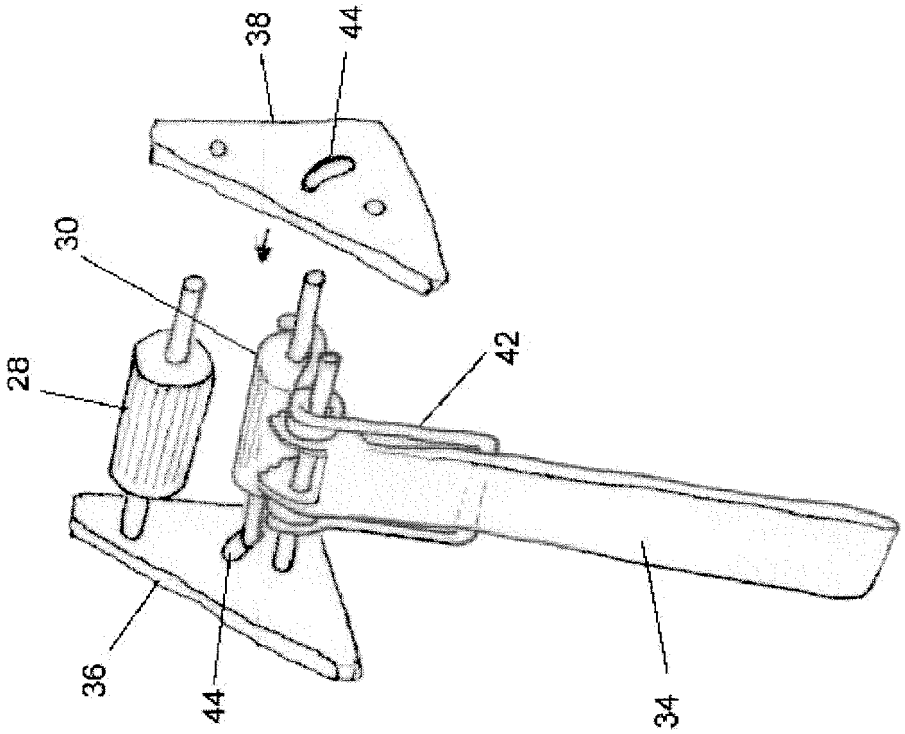


Fig. 2

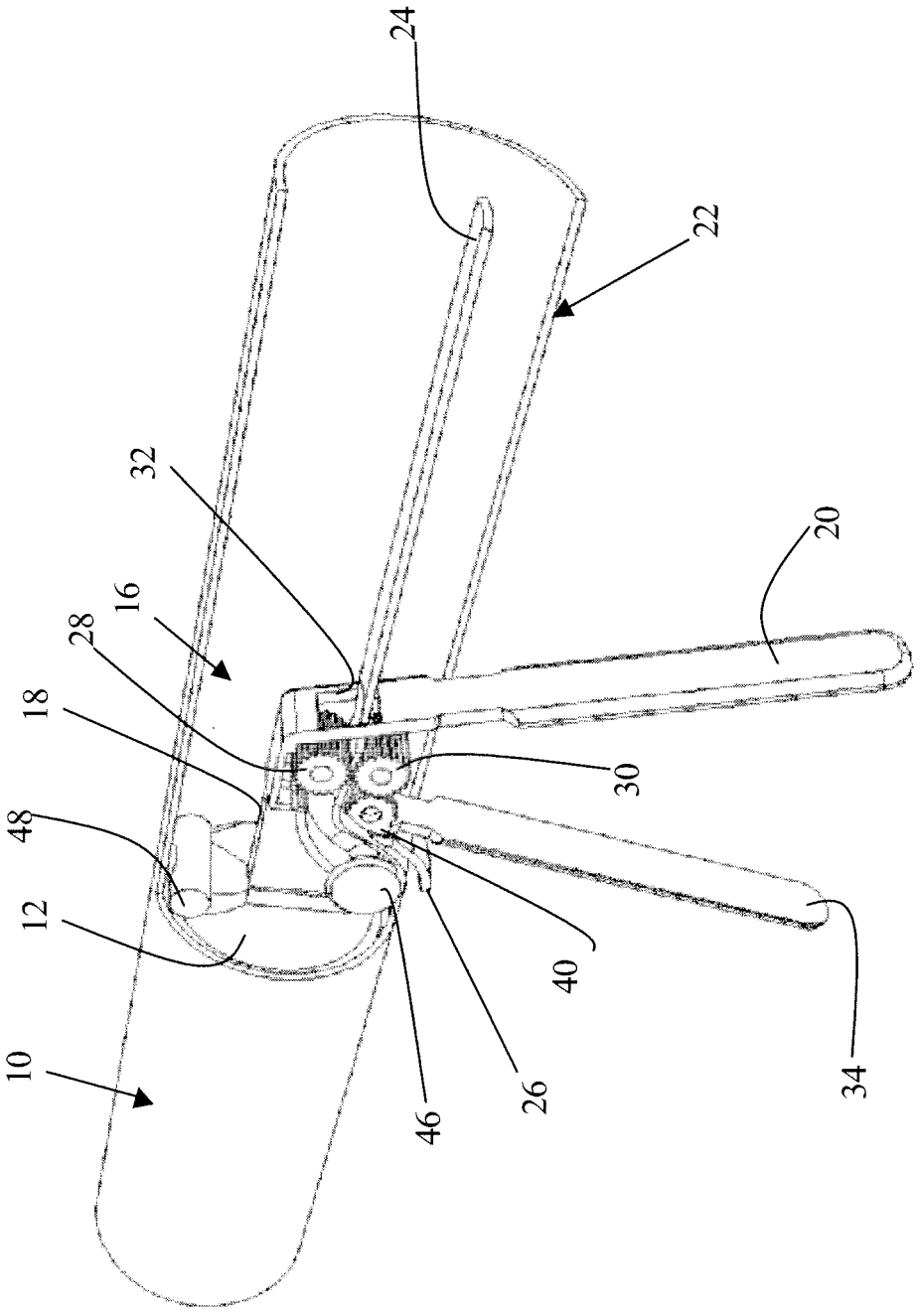


Fig 3

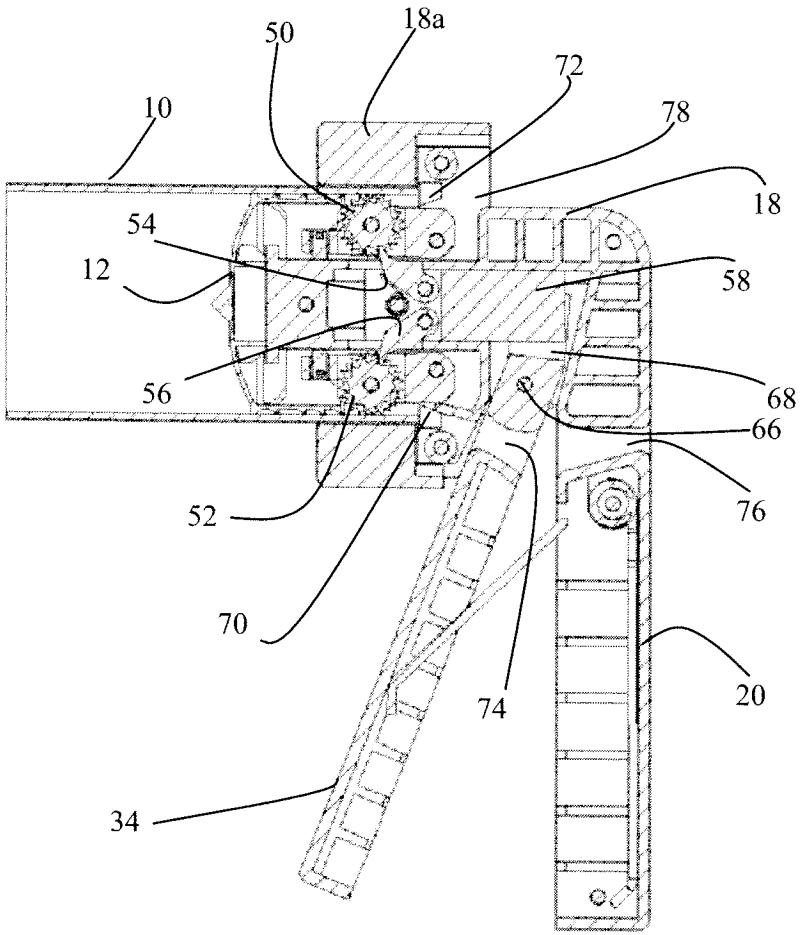

50
18a
72
10
78
18
54
12
58
56
68
66
52
76
70
74
20
34

Fig 4

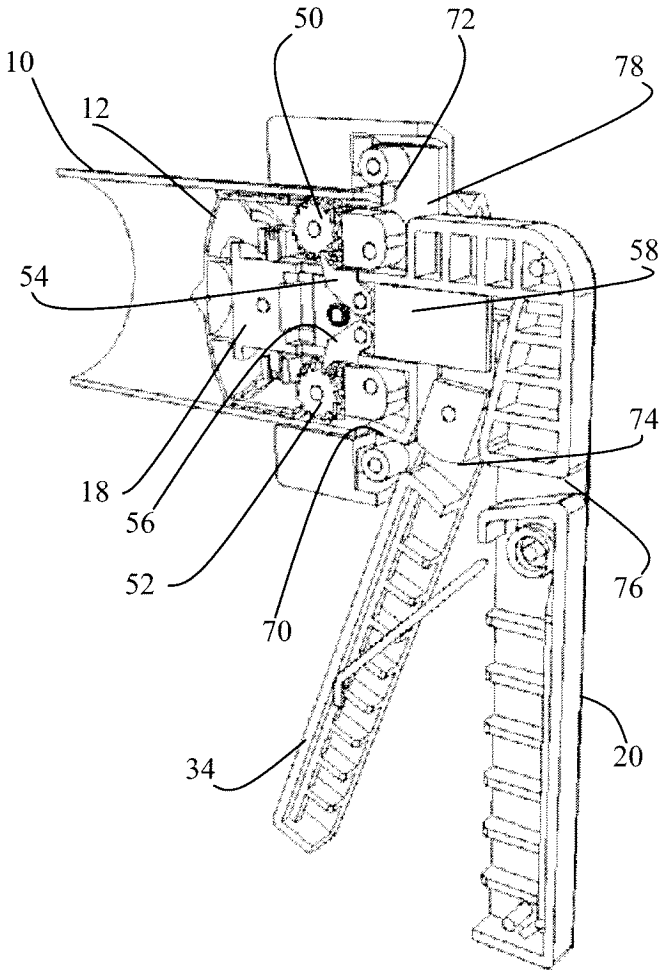

50
72
10
78
12
58
54
74
18
56
52
76
70
20
34

Fig 6

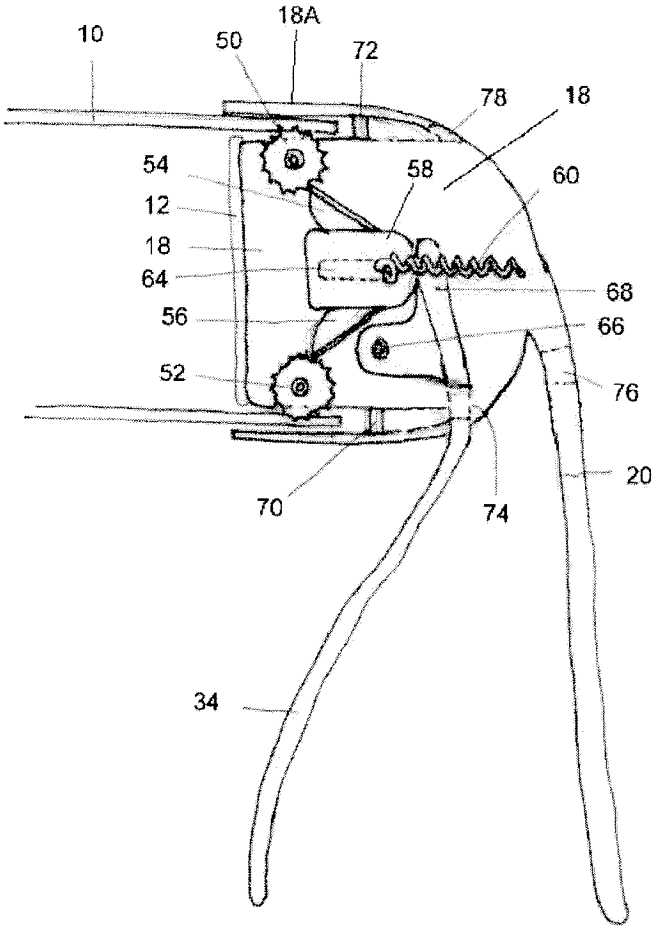

10
50
18A
72
78
18
54
58
60
12
18
64
68
56
66
52
76
20
70
74
34

Fig. 4A

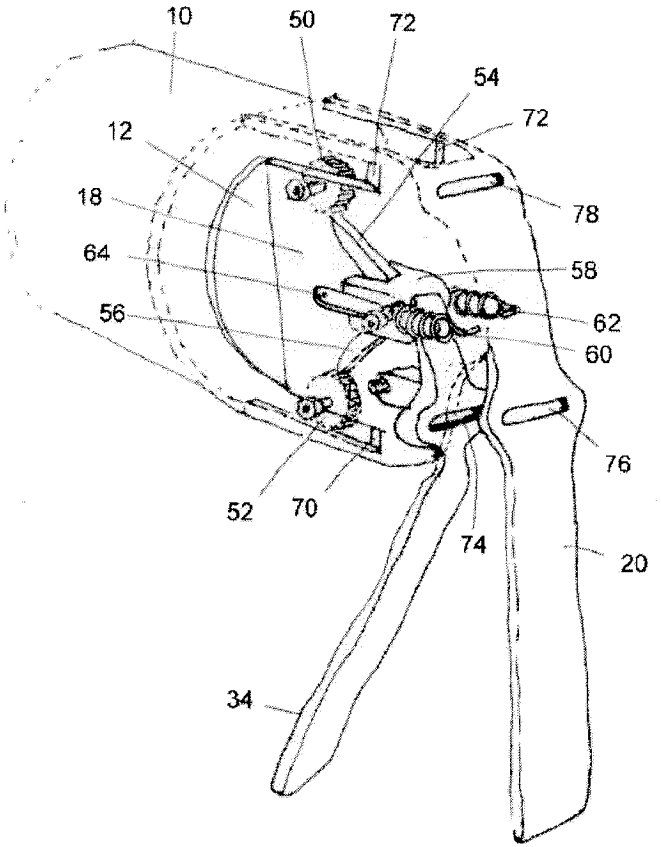

10
50
72
54
72
12
78
18
64
58
56
62
60
76
52
70
74
20
34

Fig. 6A

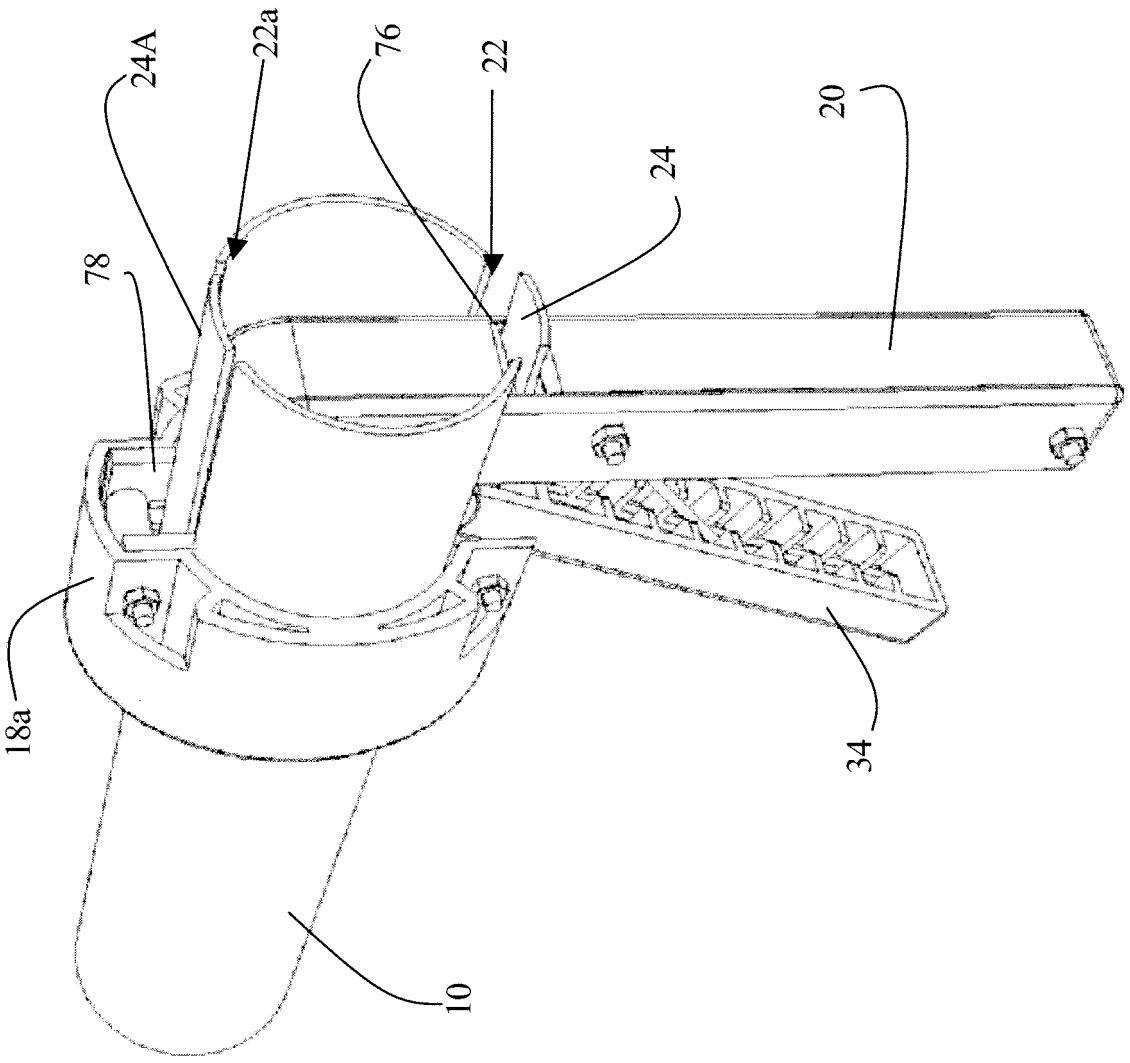


Fig 5

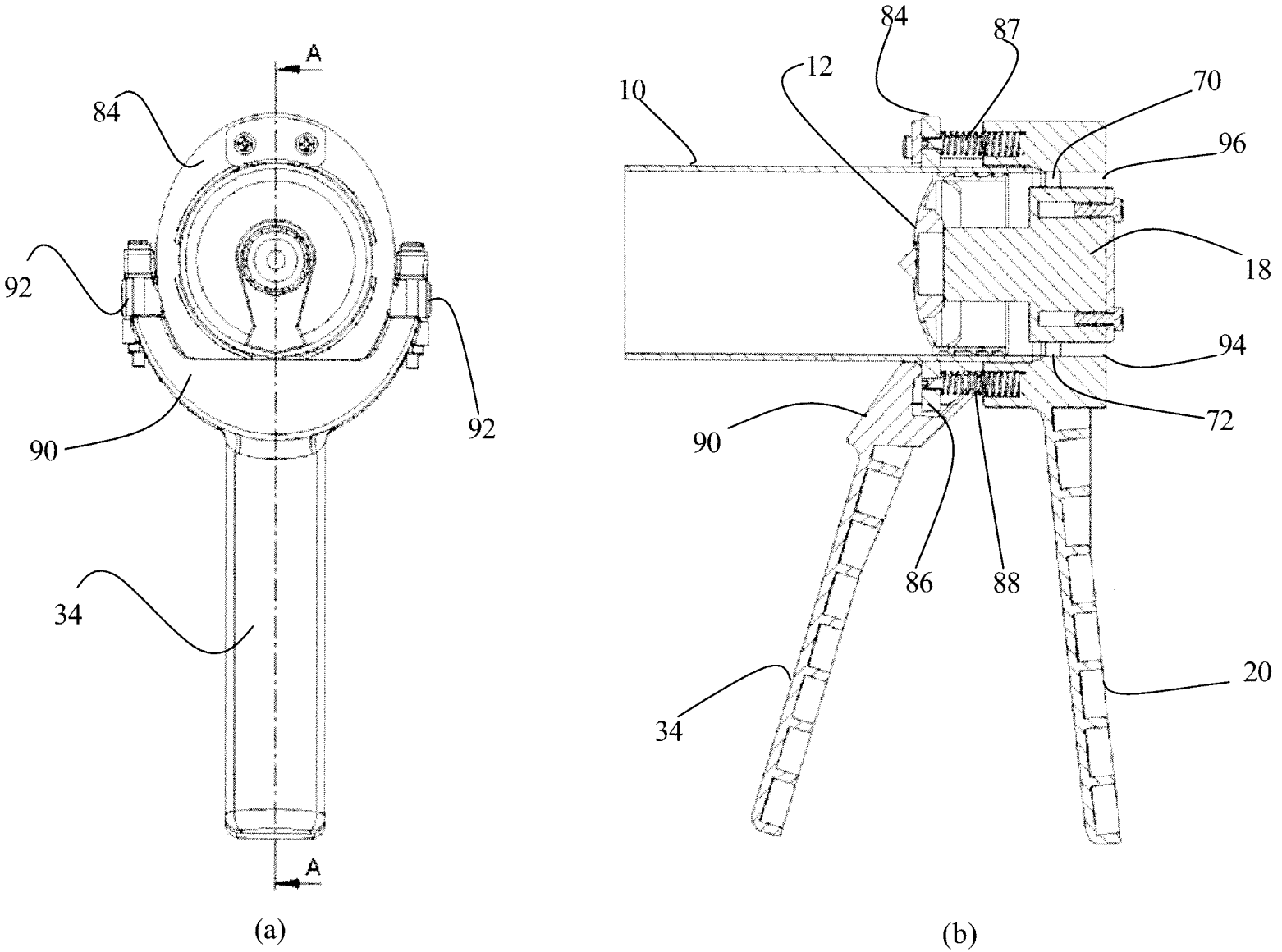


Fig. 7

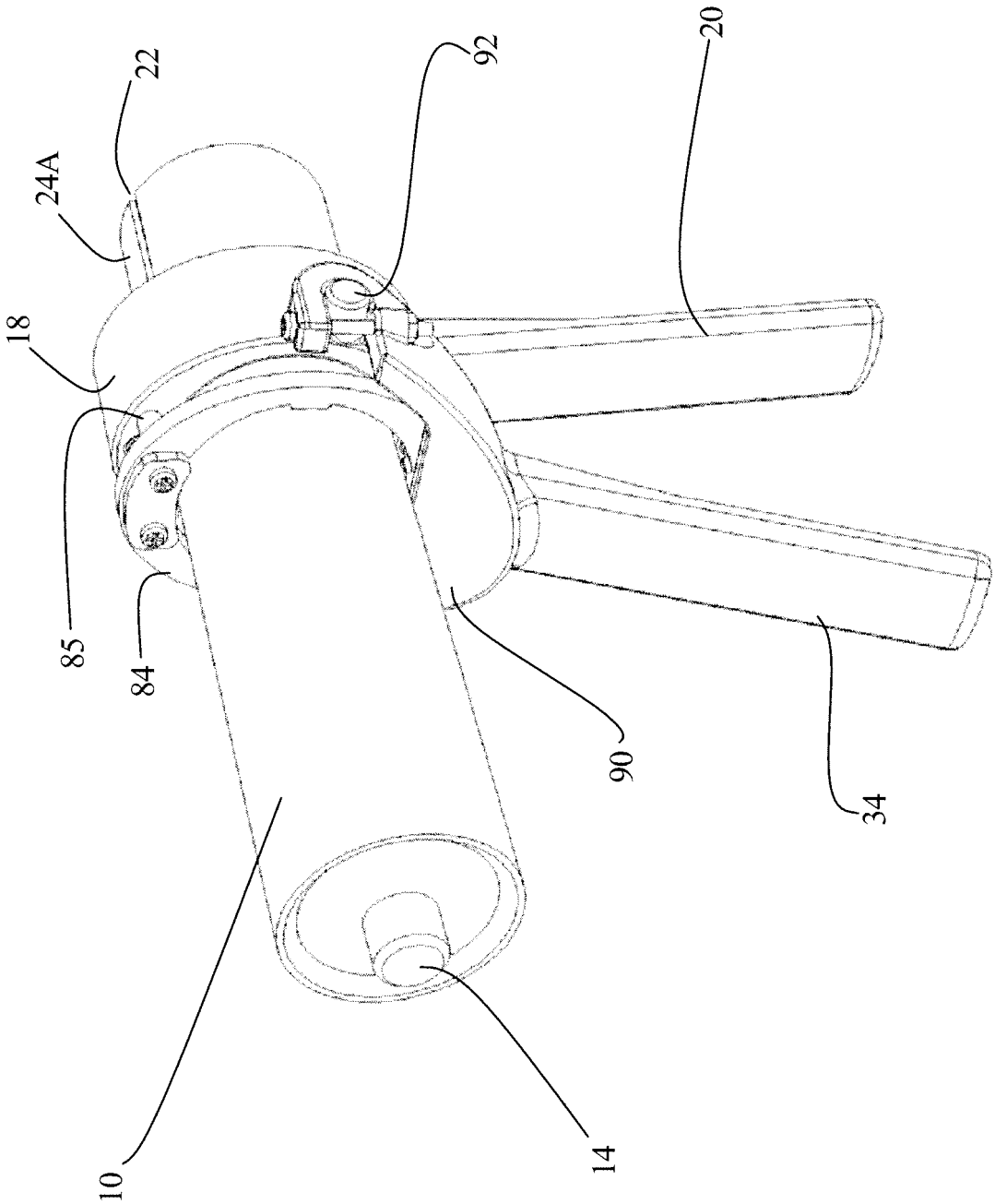


Fig. 8

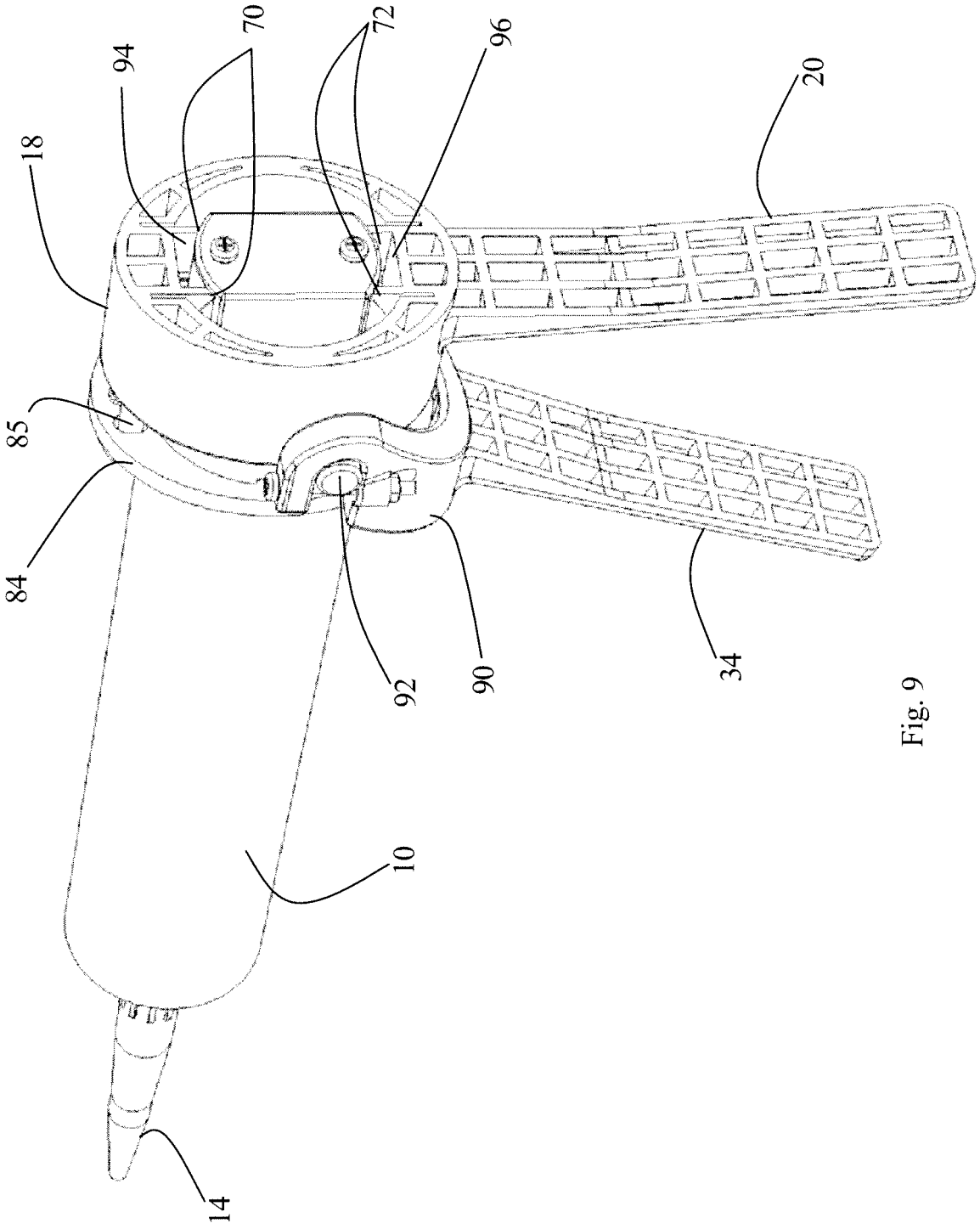


Fig. 9

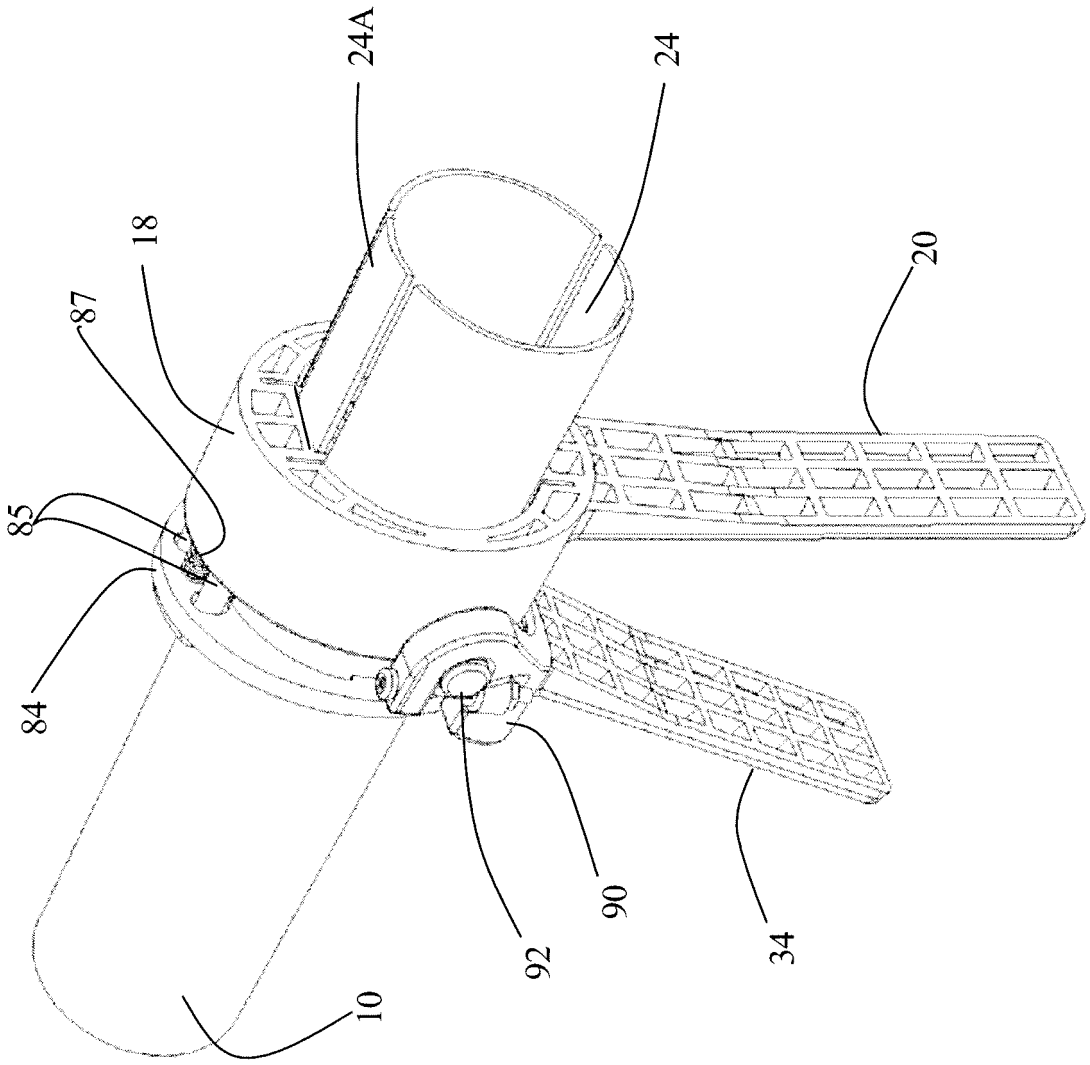


Fig. 10

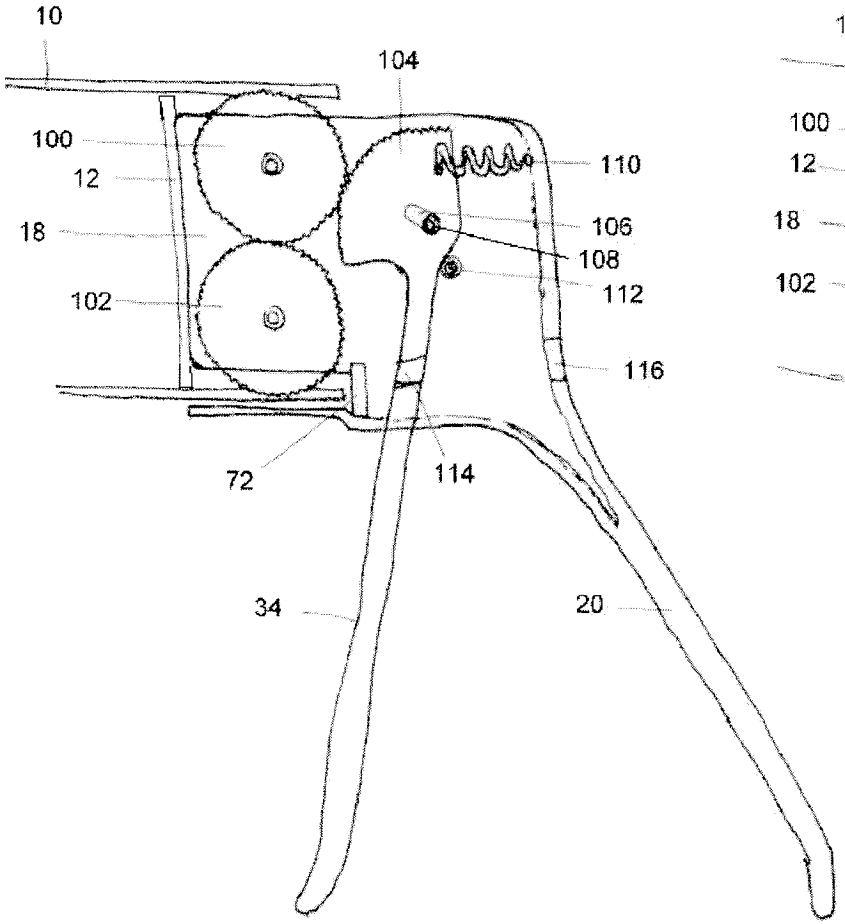

10
104
100
12
18
102
110
106
108
112
116
72
114
34
20

Fig. 11

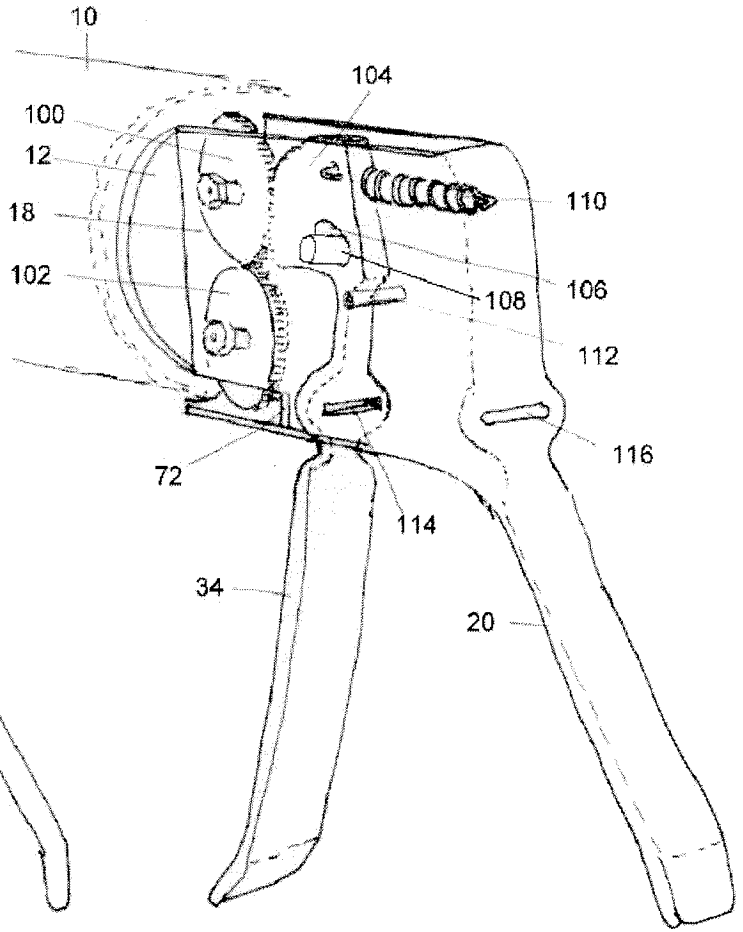

10
104
100
12
18
102
110
106
108
112
116
72
114
34
20

Fig. 13

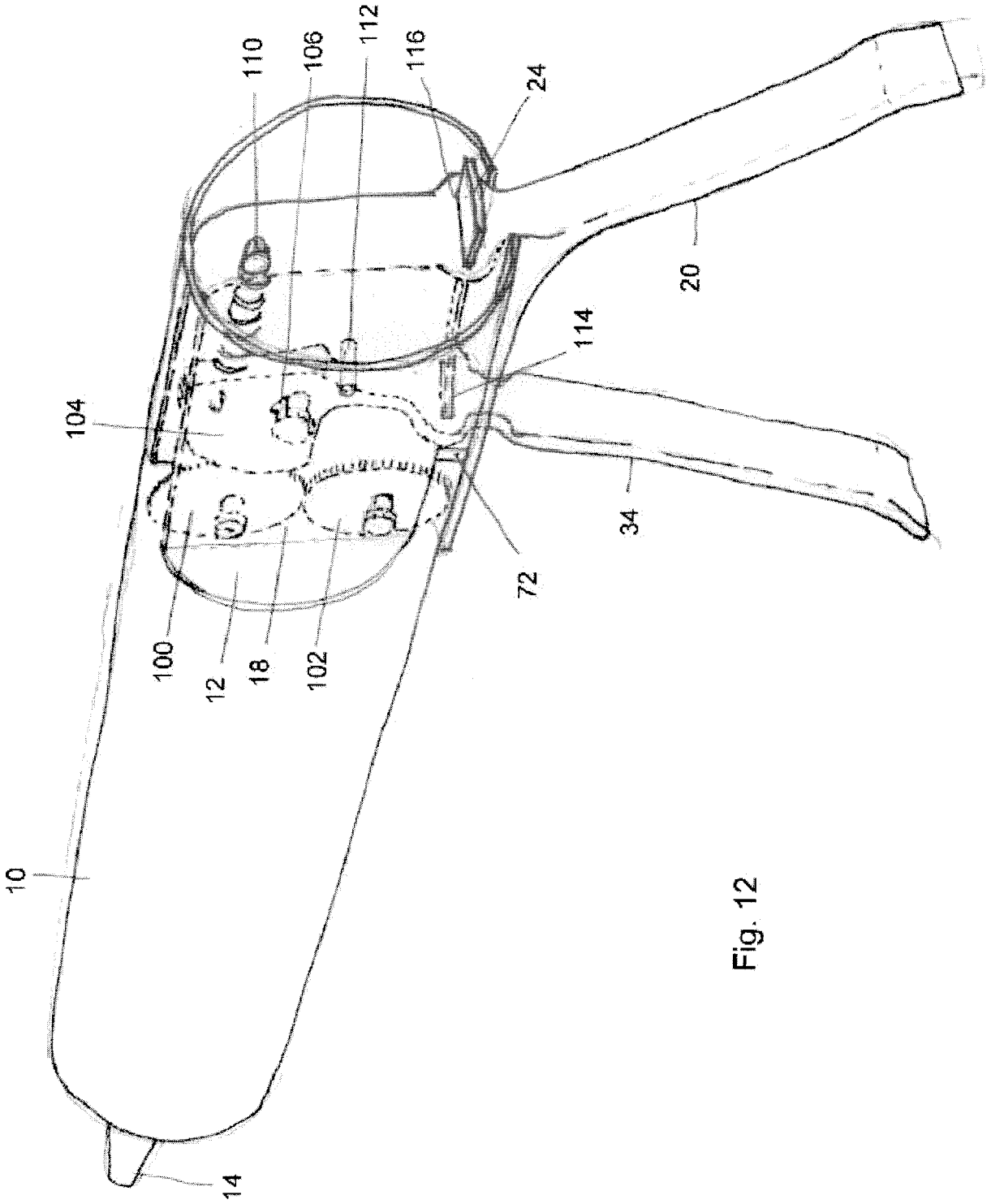


Fig. 12

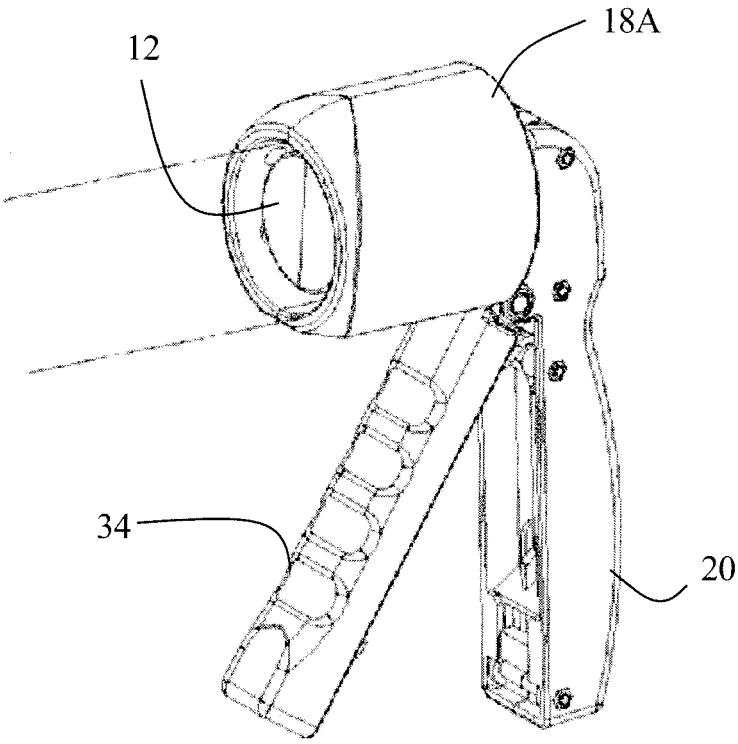


Fig 14

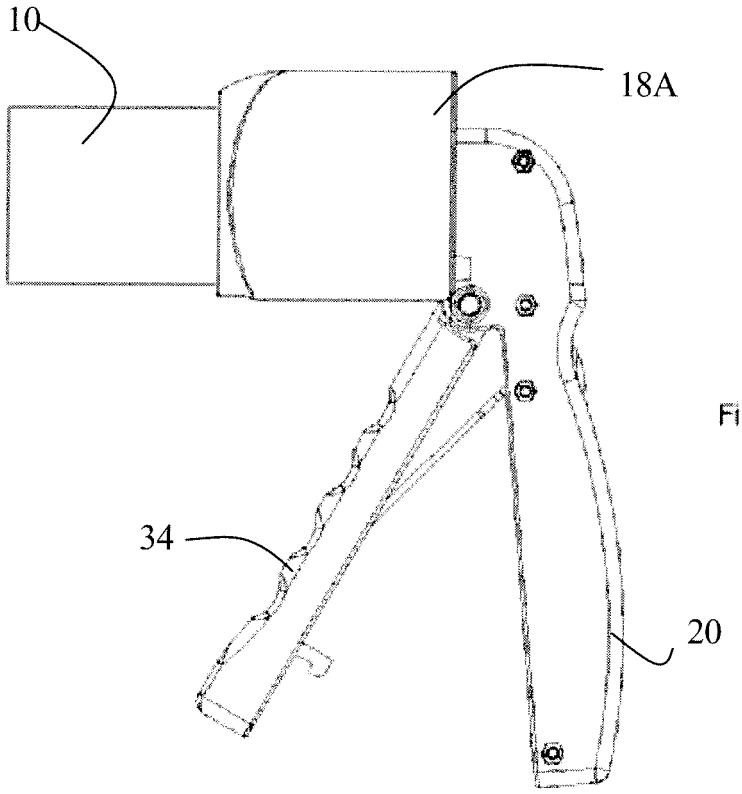


Fig 15

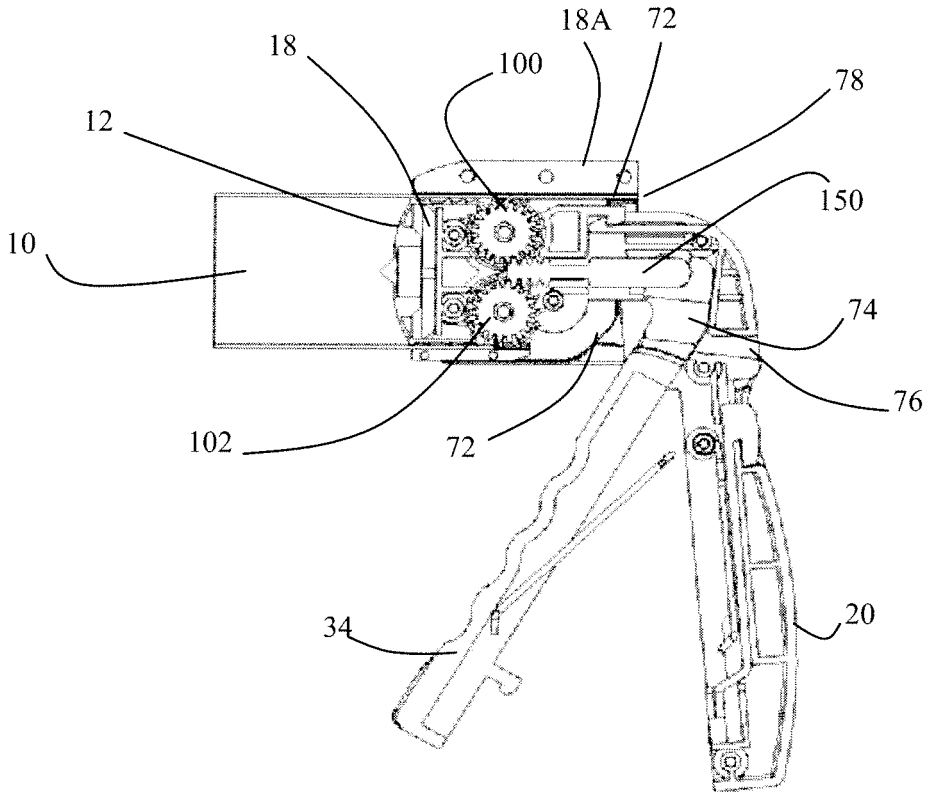

18
18A
72
100
78
12
150
10
74
76
102
72
34
20

Fig 16

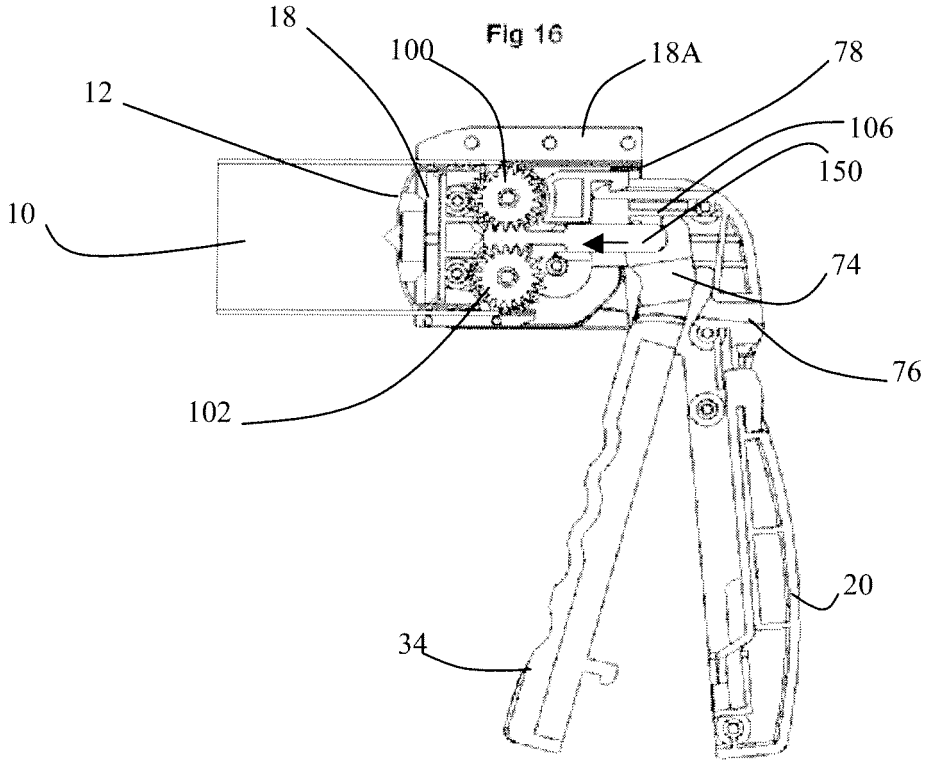

18
100
18A
78
12
106
150
10
74
76
102
20
34

Fig 17

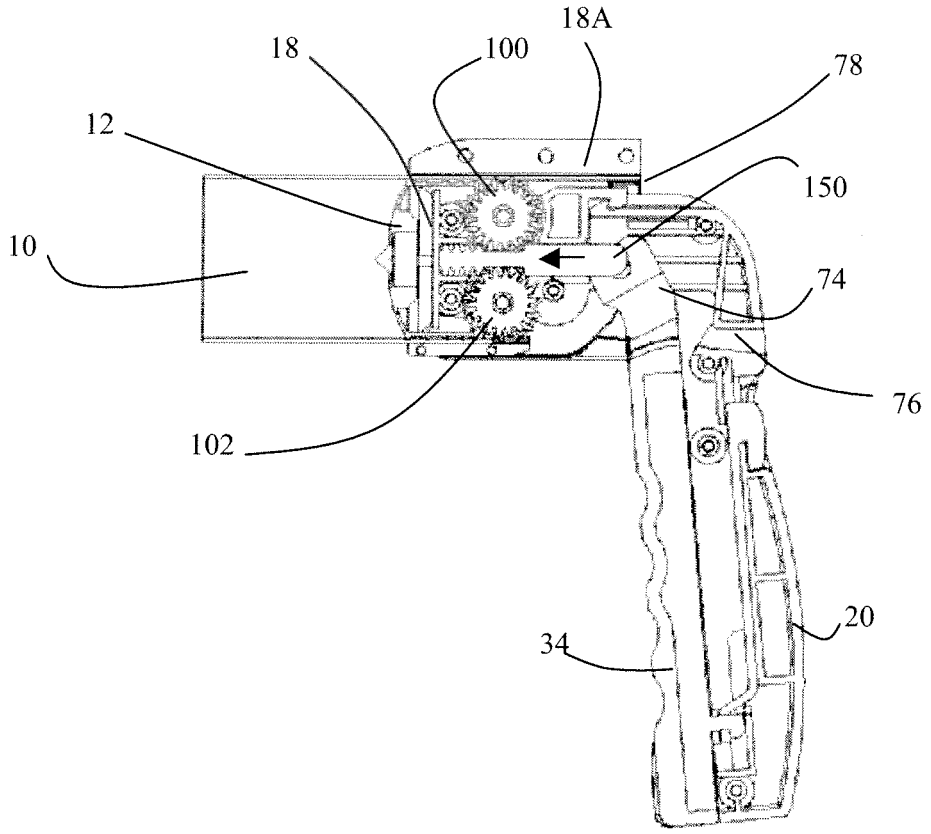


Fig 18

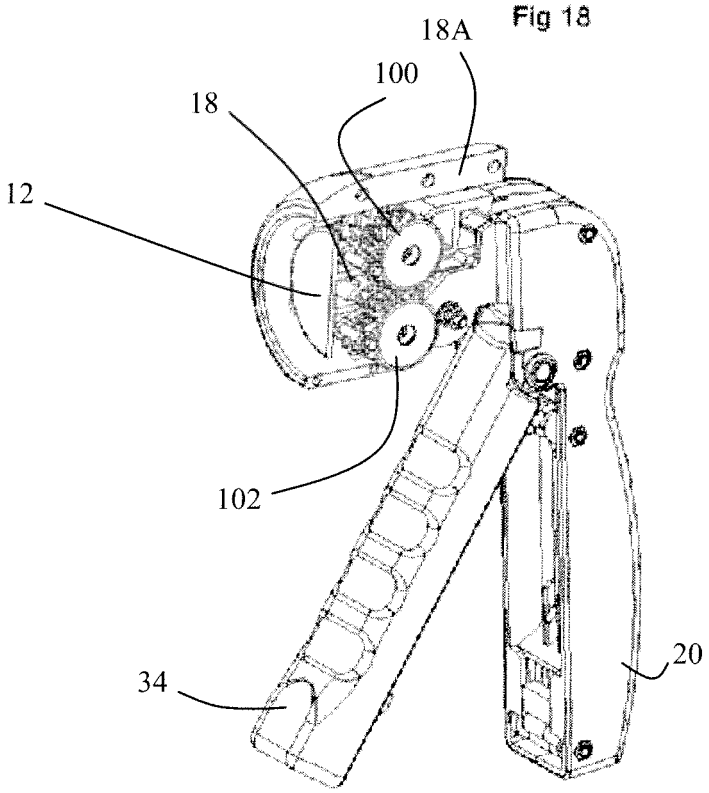


Fig 19

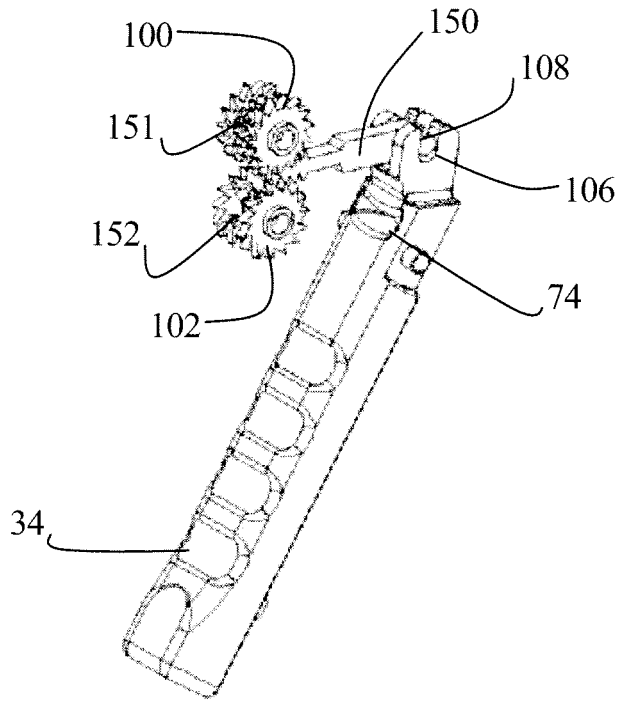

100
150
108
151
106
152
74
102
34

Fig 20

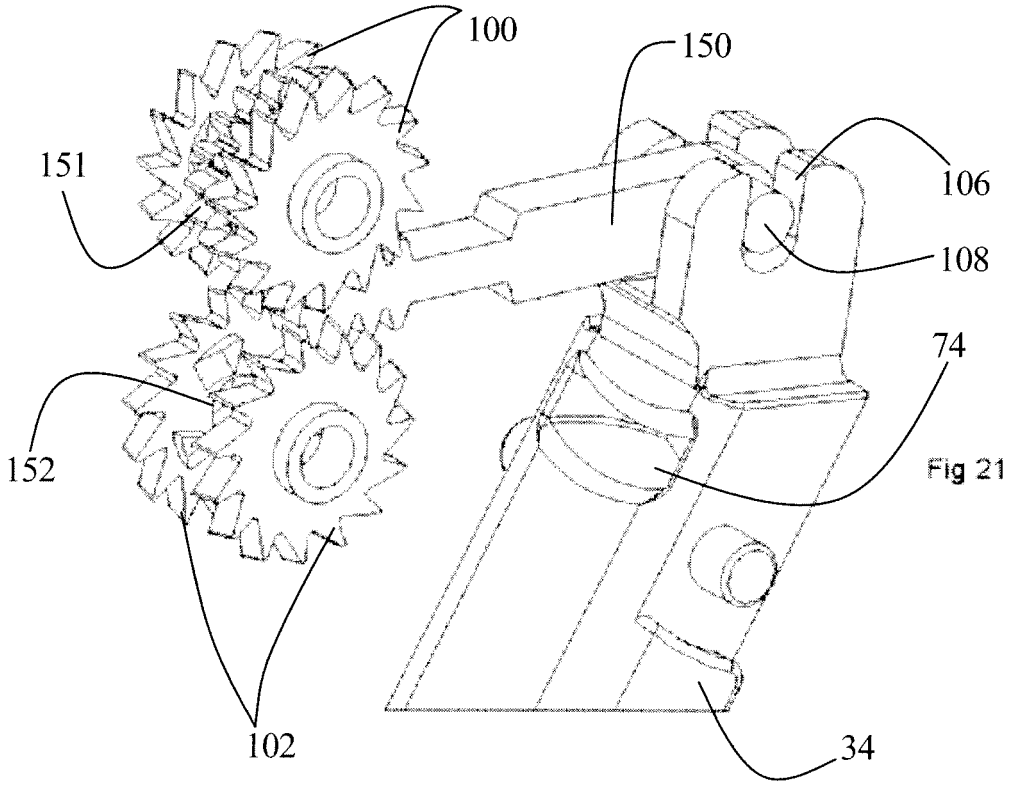

100
150
151
106
108
74
152
102
34

Fig 21

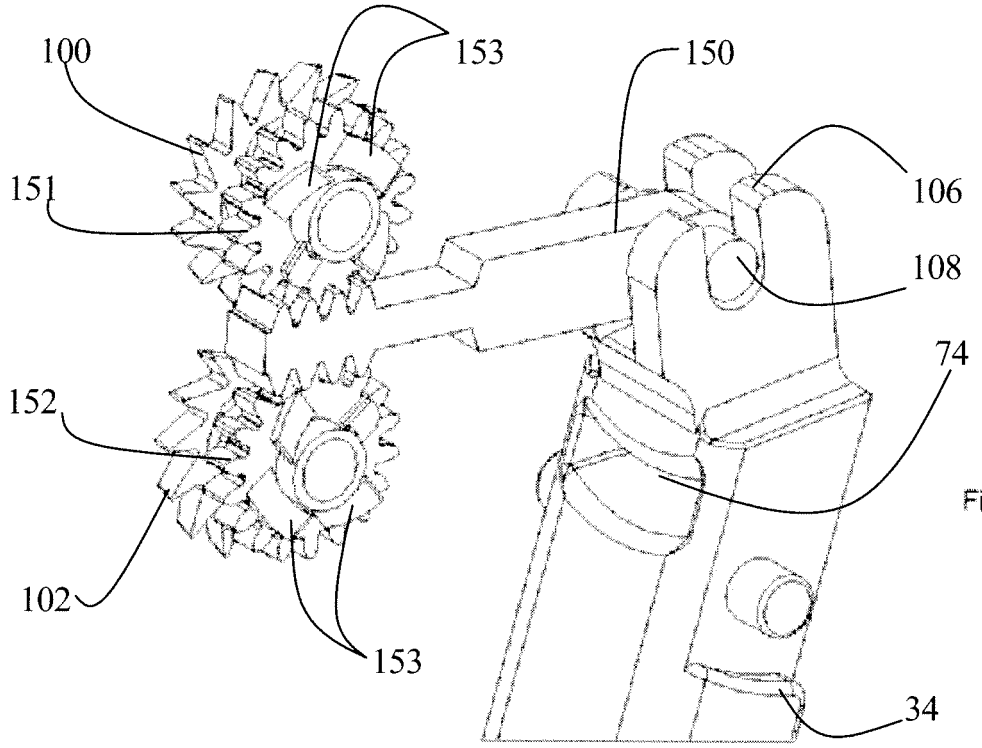

100
153
150
151
106
108
74
152
102
153
34

Fig 22

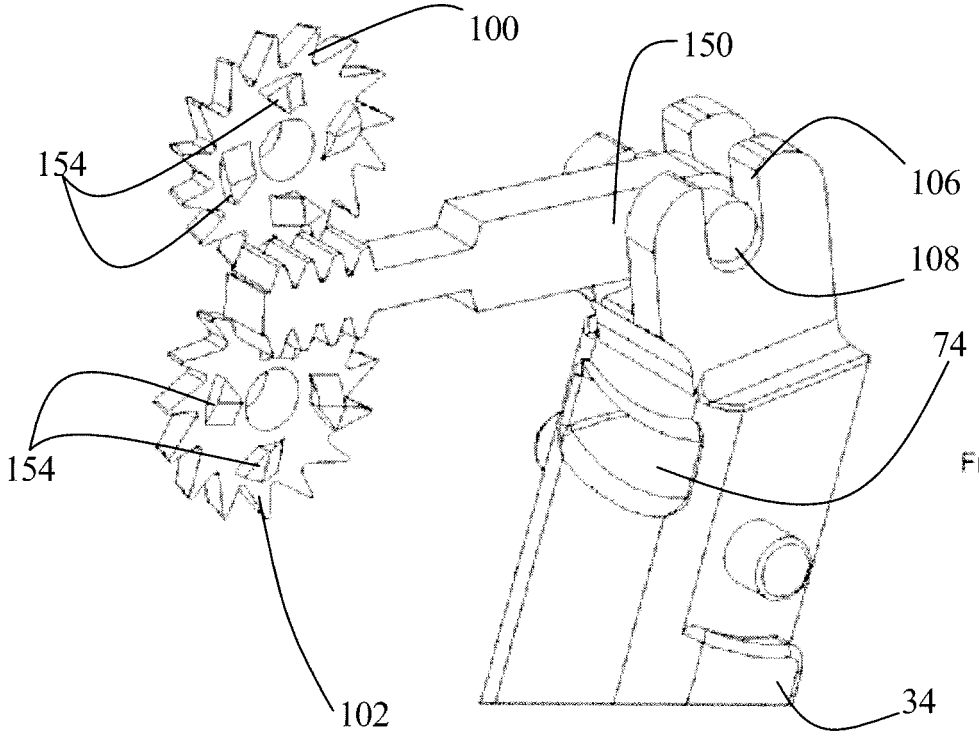

100
150
154
106
108
74
154
102
34

Fig 23

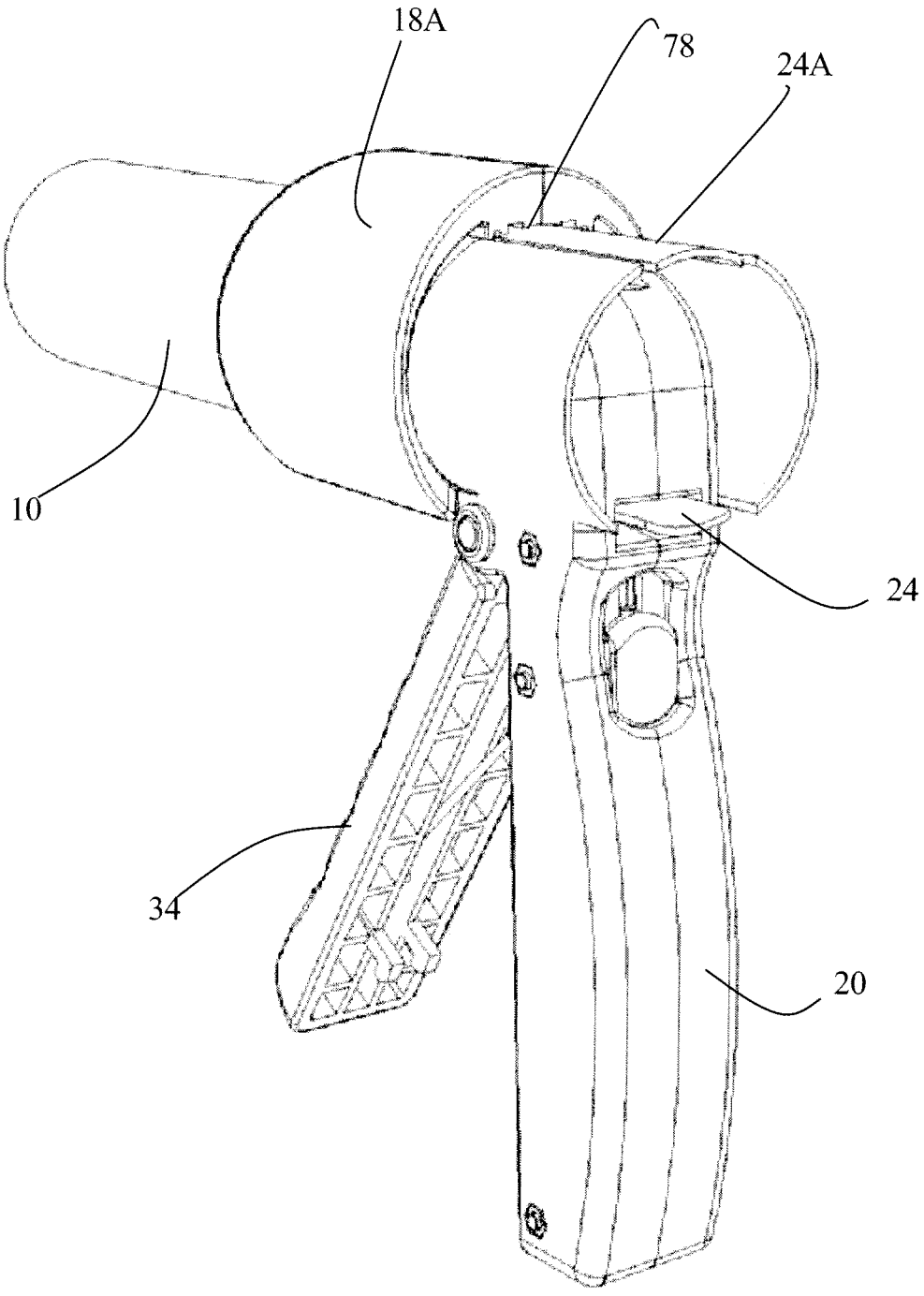


Fig 24

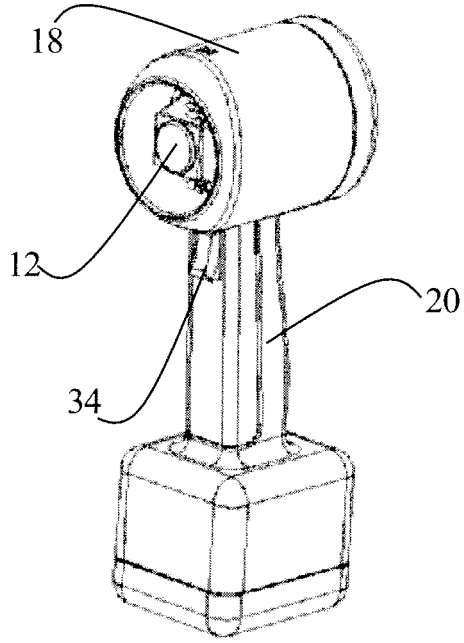


Fig 25

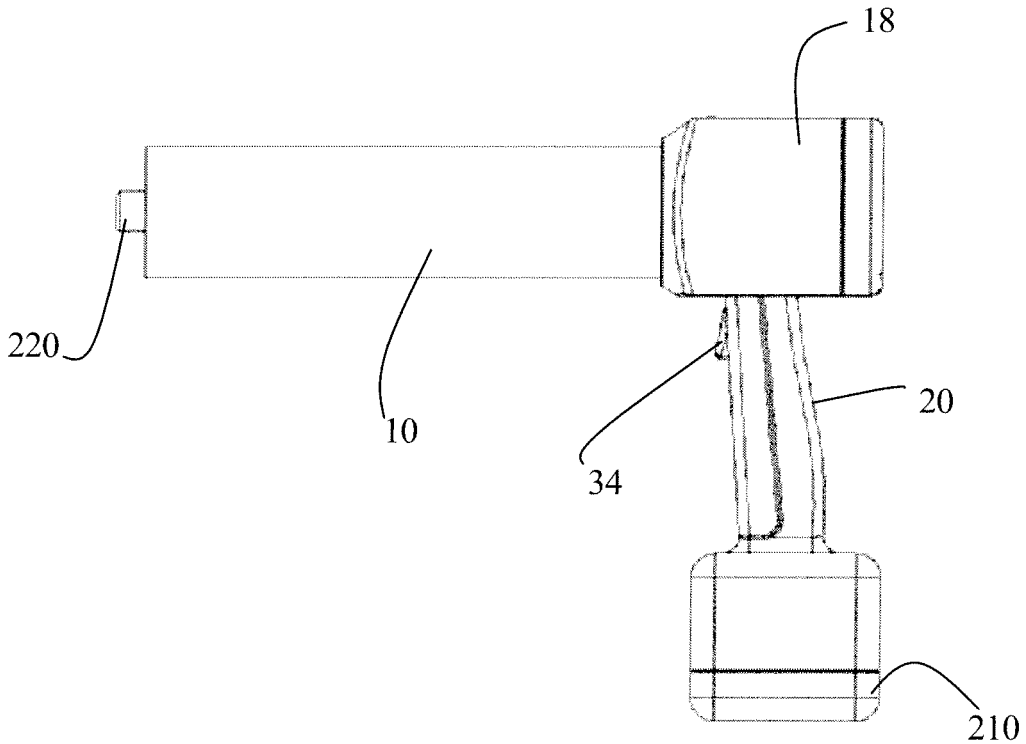


Fig 26

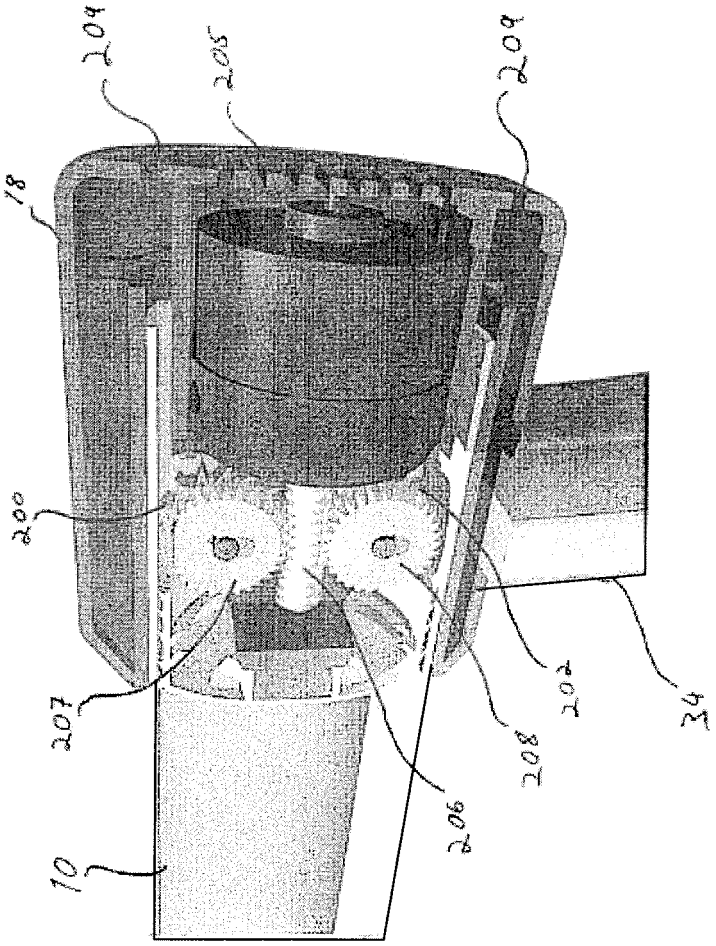


Fig. 27

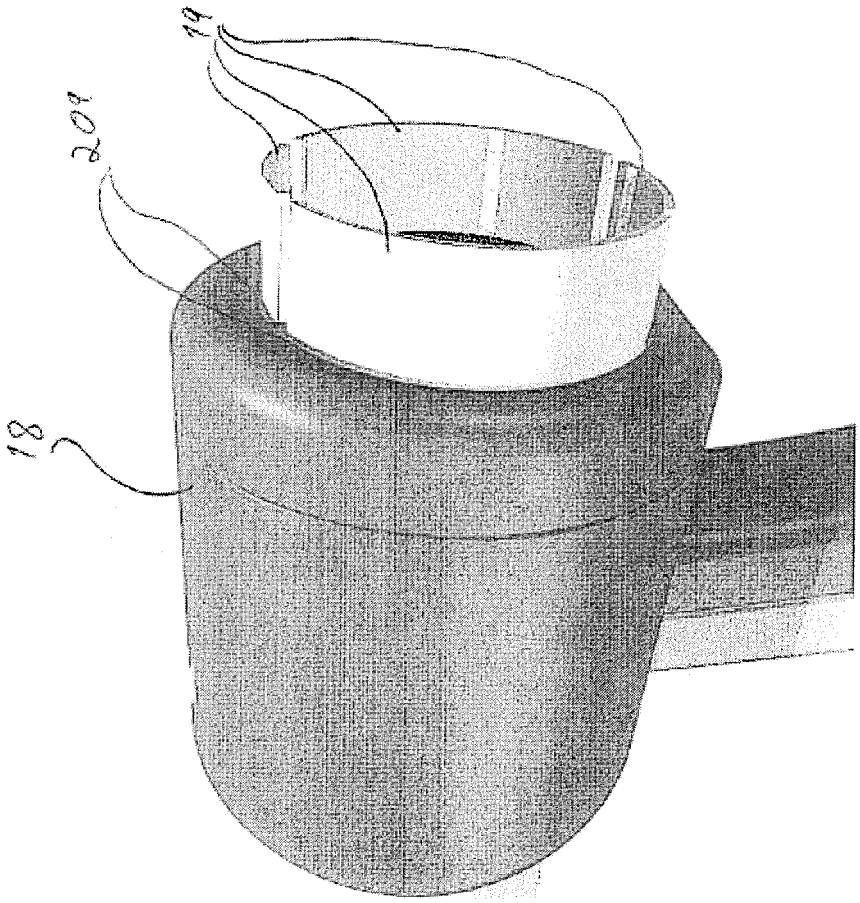


Fig. 28

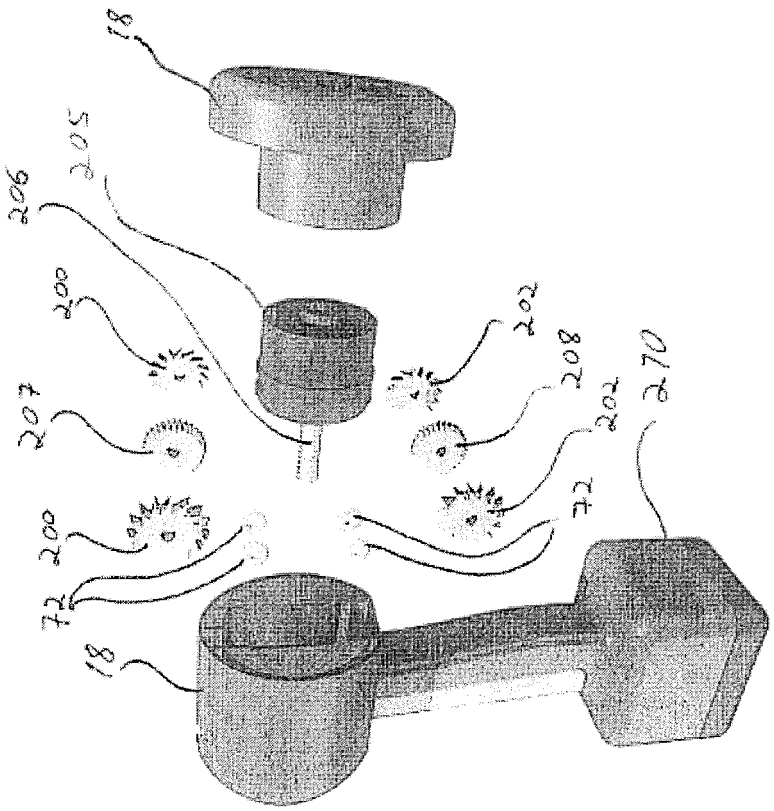


Fig. 29

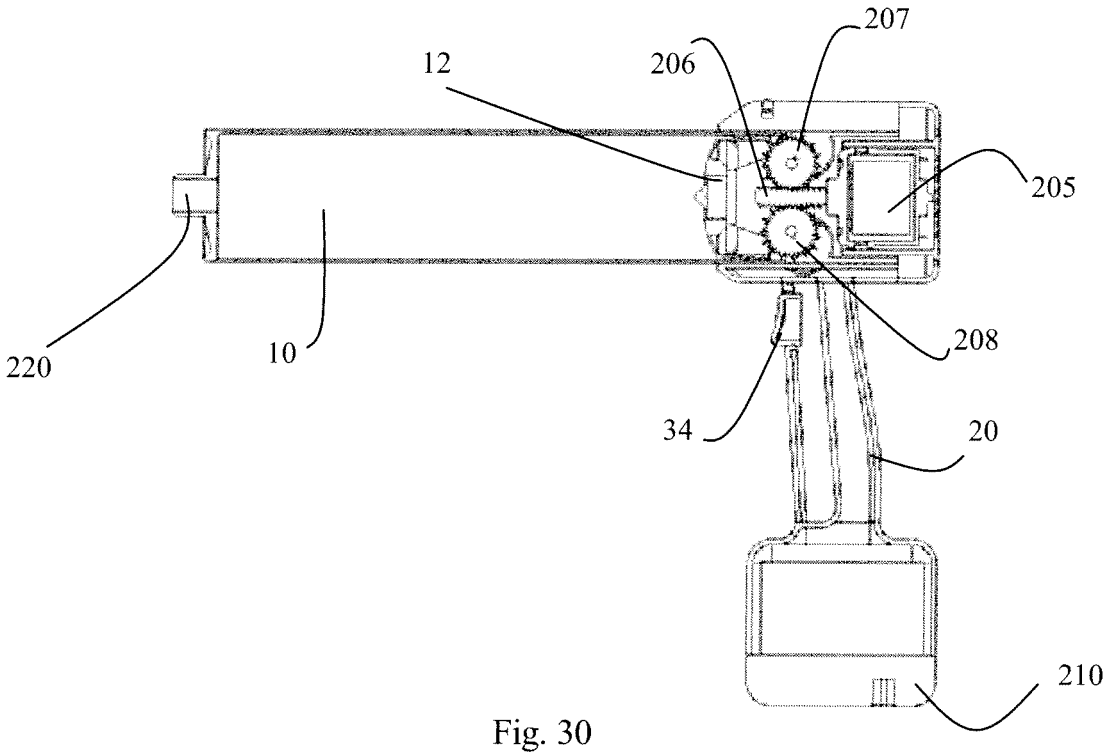

207
12
206
205
220
10
208
34
20
210

Fig. 30

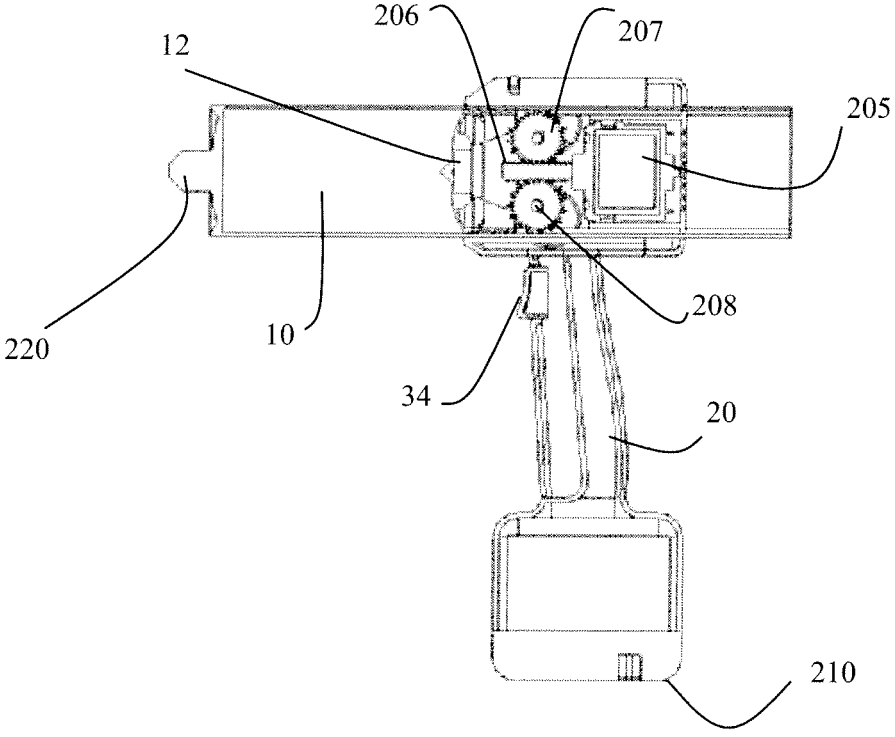

206
207
12
205
208
220
10
34
20
210

Fig. 31

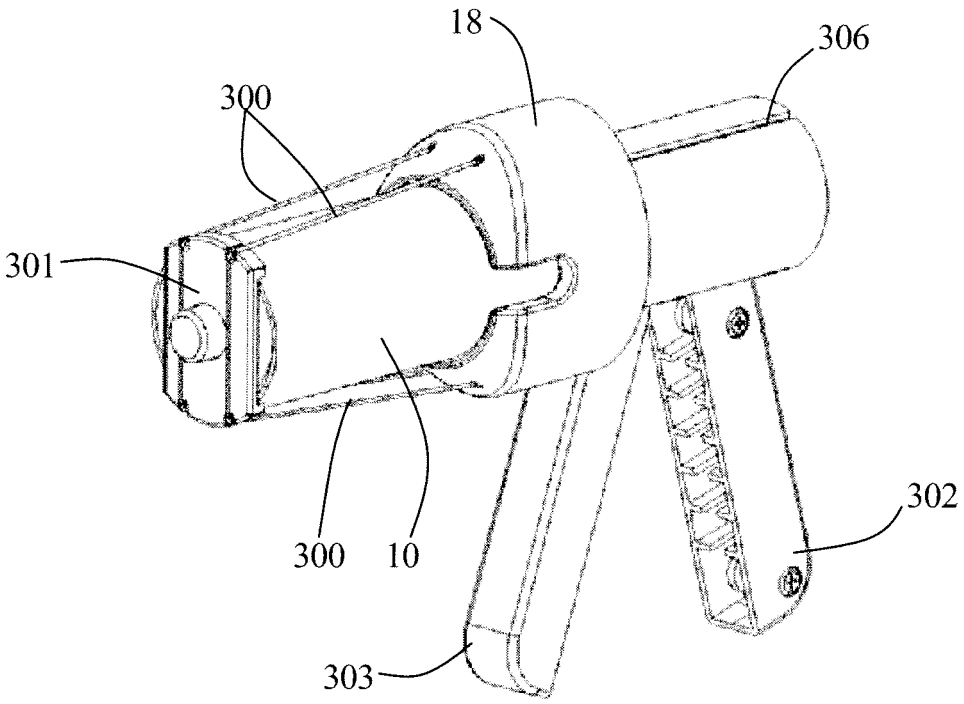


Fig. 32

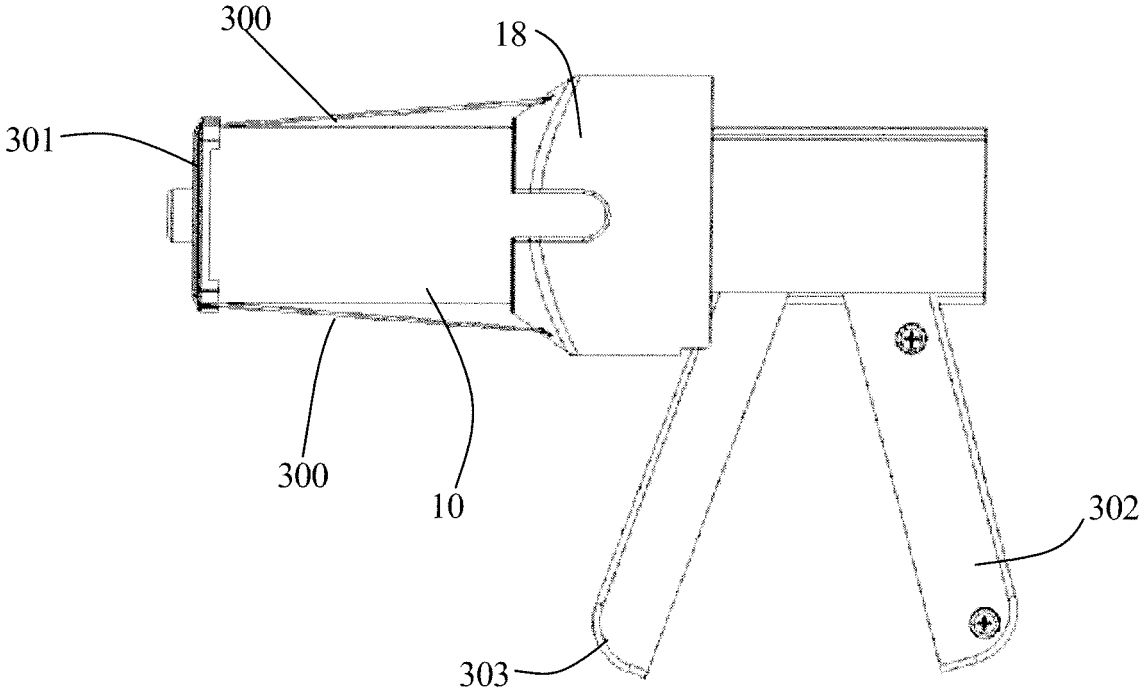


Fig. 33

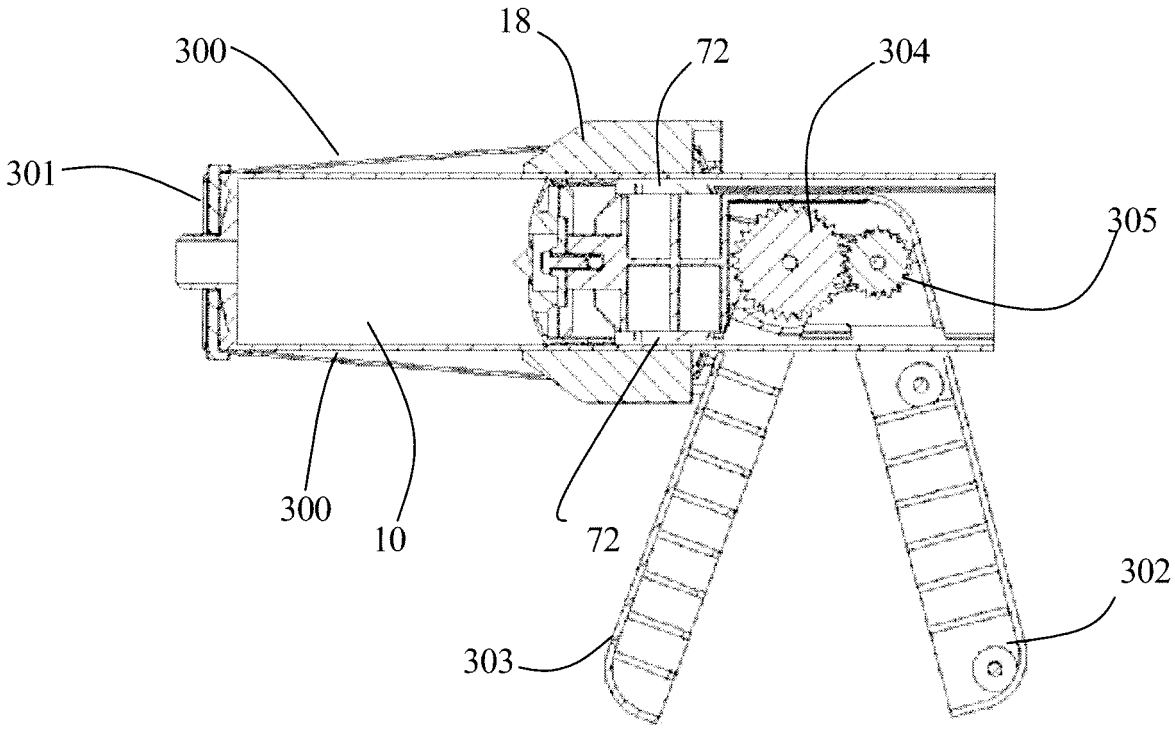

18
300
72
304
301
305
300
10
72
302
303

Fig. 34

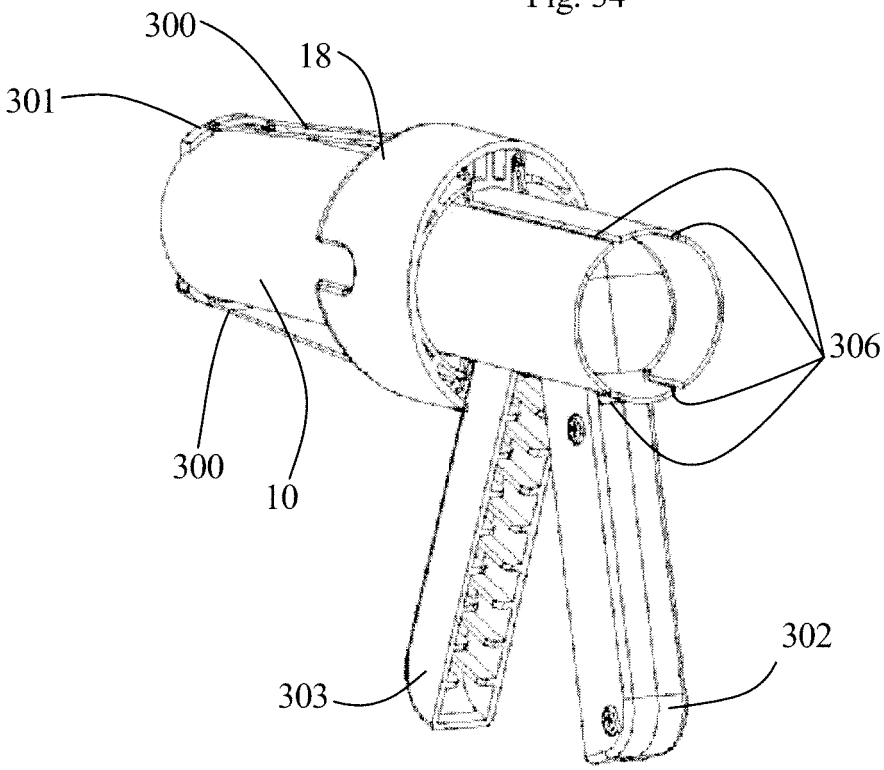

300
18
301
306
300
10
302
303

Fig. 35

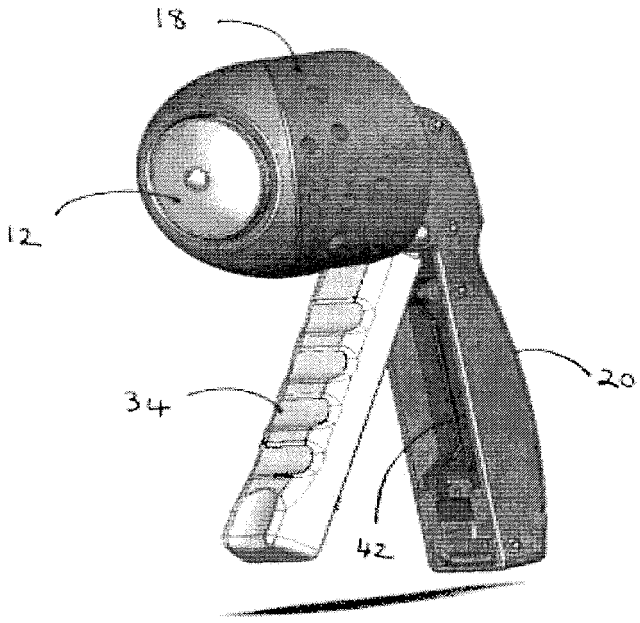

18
12
34
20
42

Fig. 36

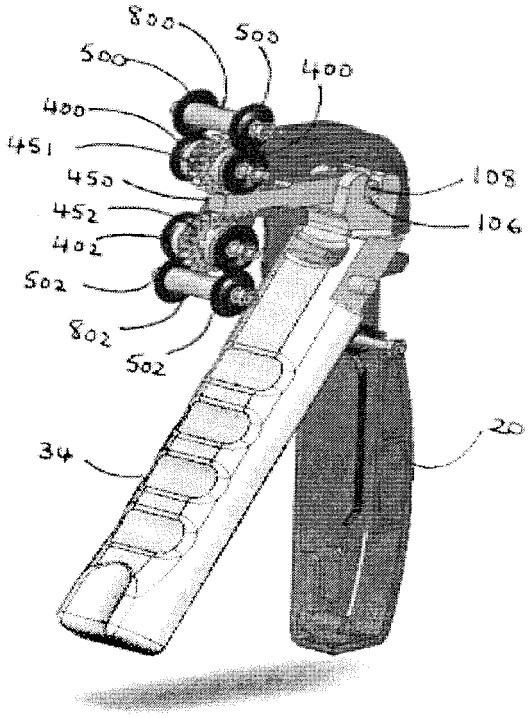

800
500
500
400
400
451
450
452
402
502
802
502
108
106
34
20

Fig. 38

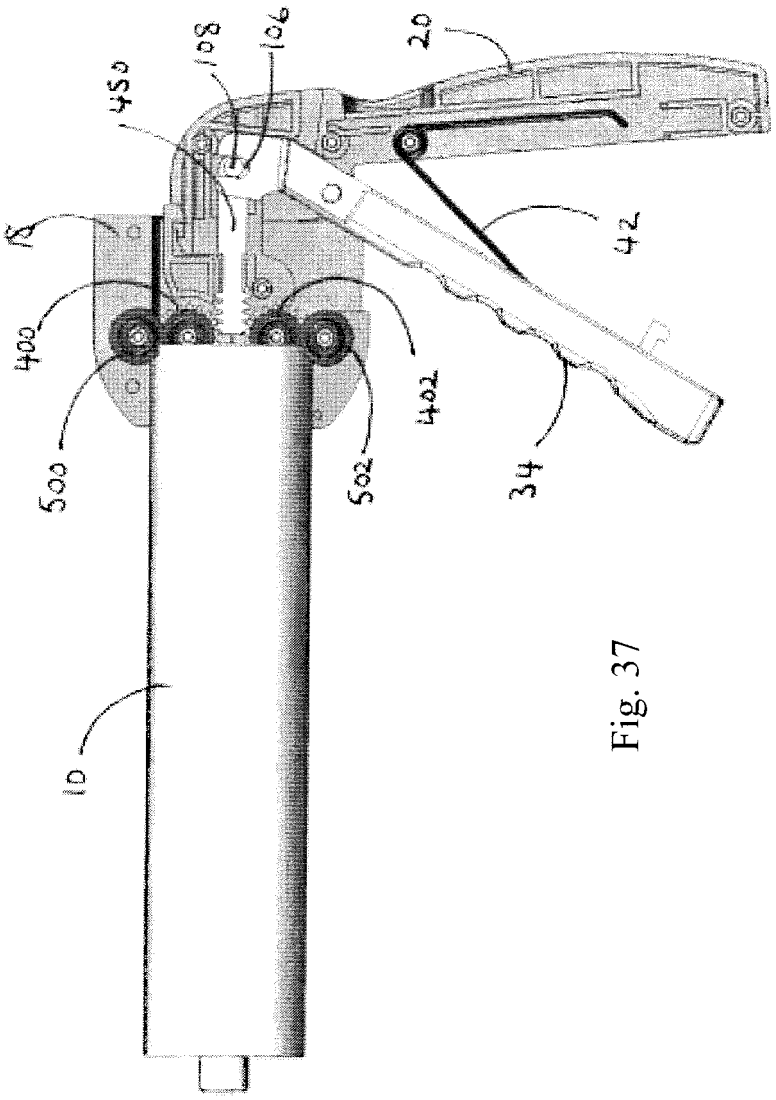


Fig. 37

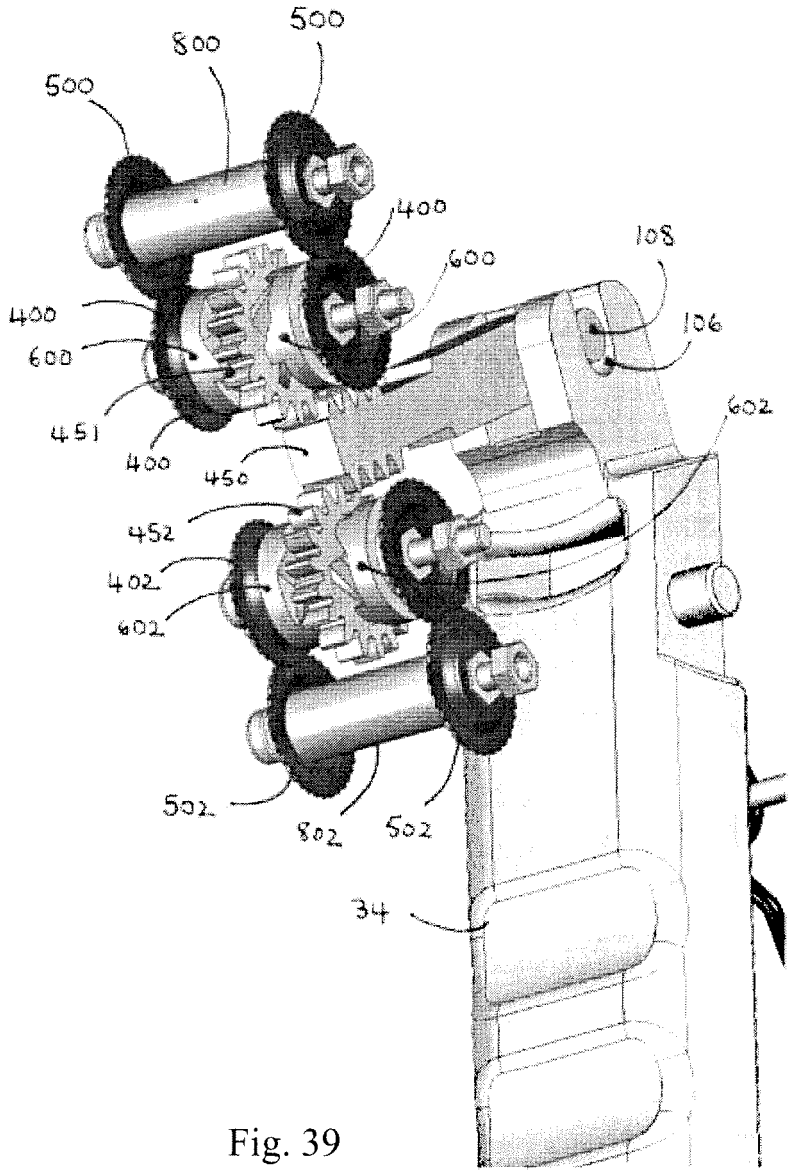

500
800
500
400
600
108
106
400
600
451
400
450
602
452
402
602
502
802
502
34

Fig. 39

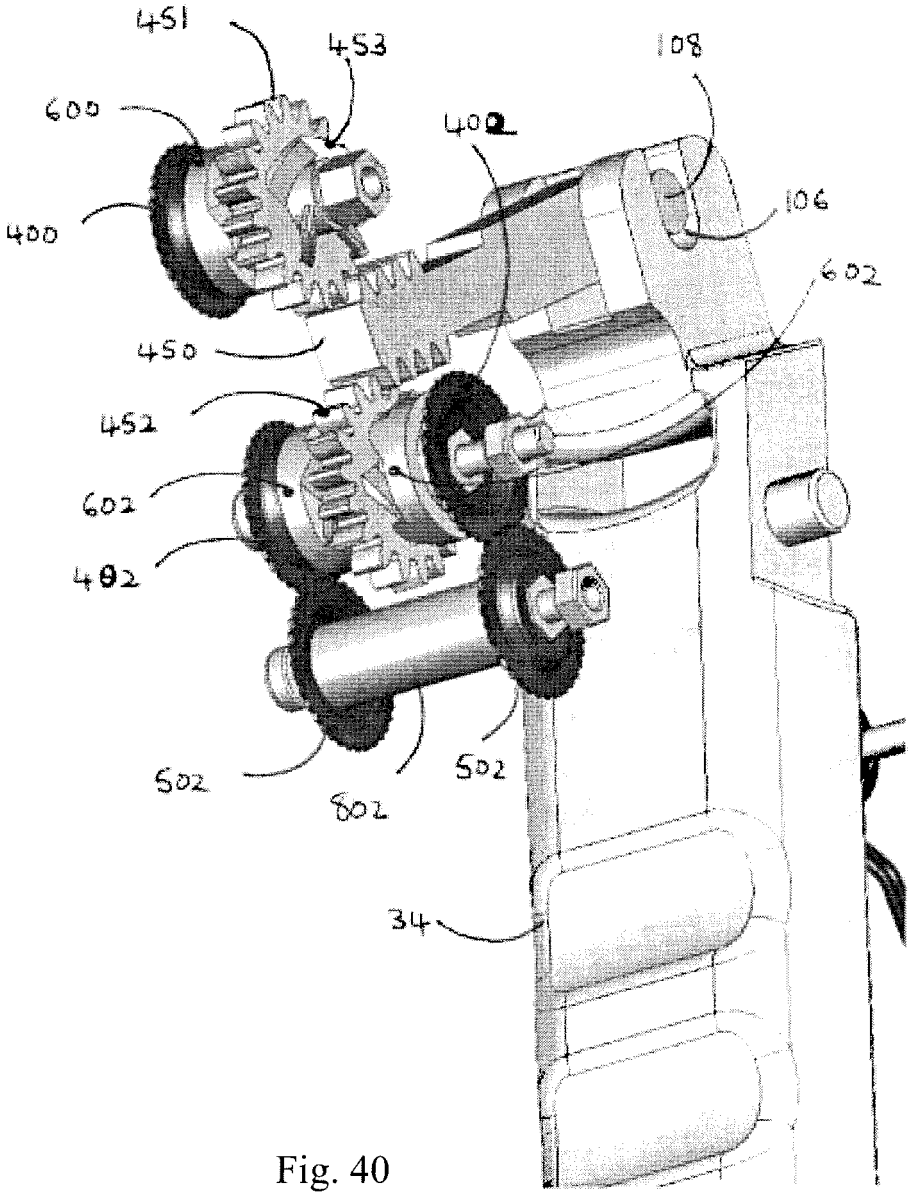


Fig. 40

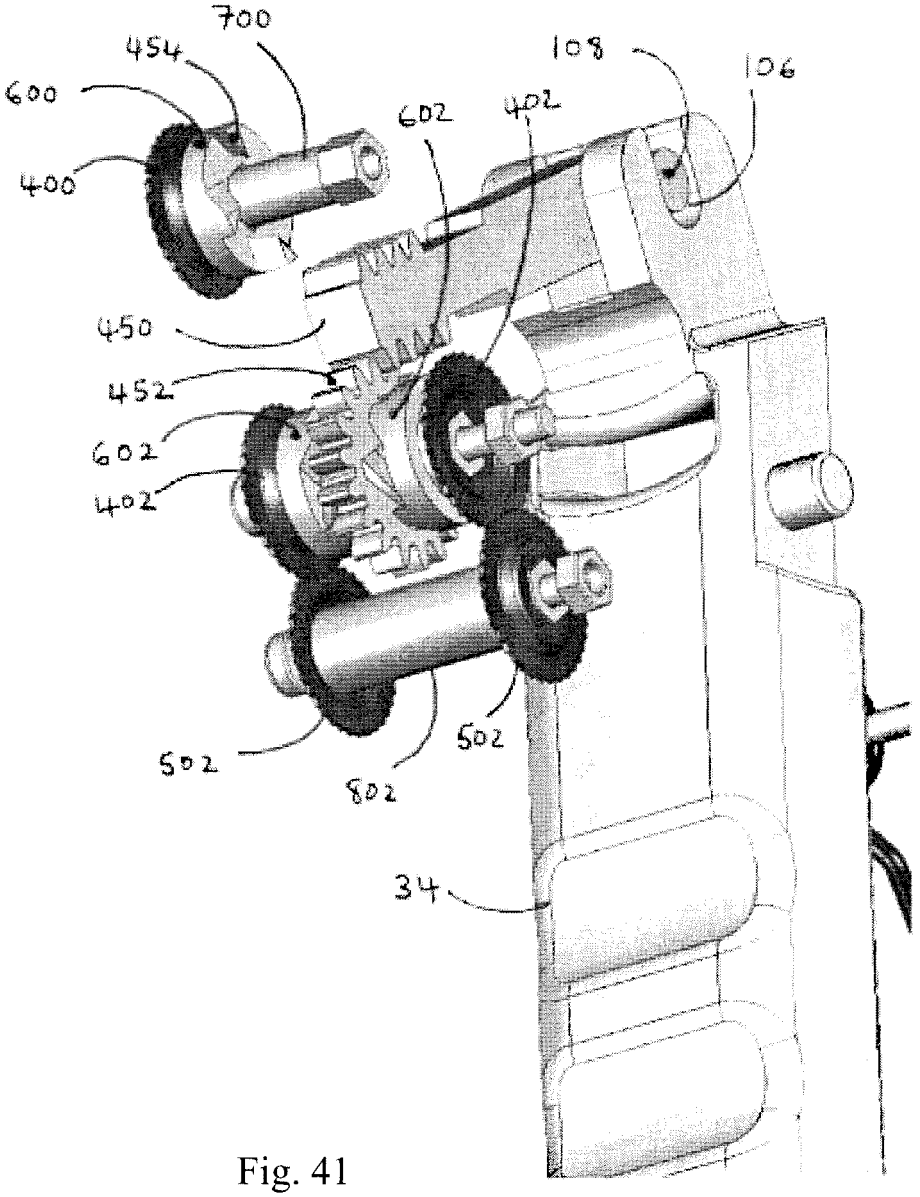


Fig. 41

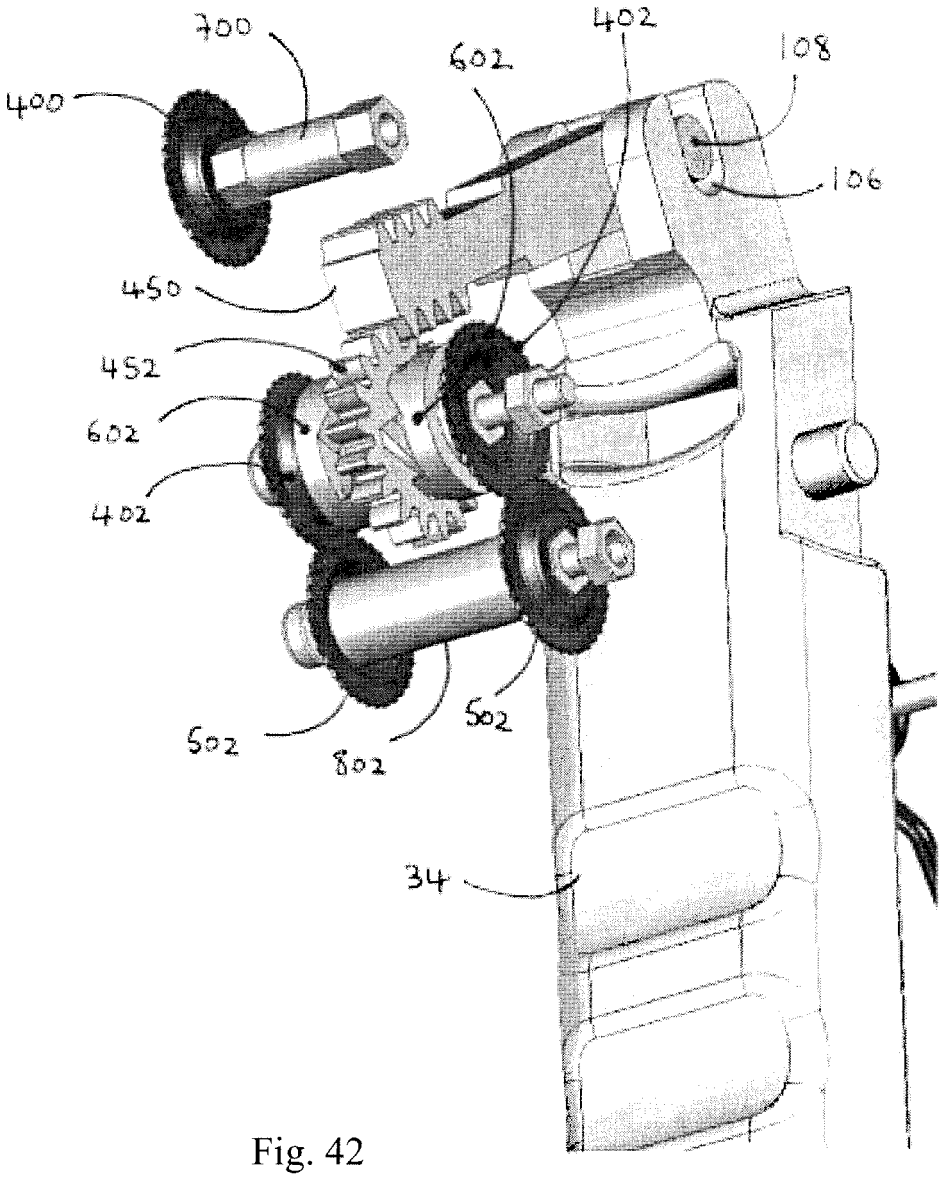


Fig. 42

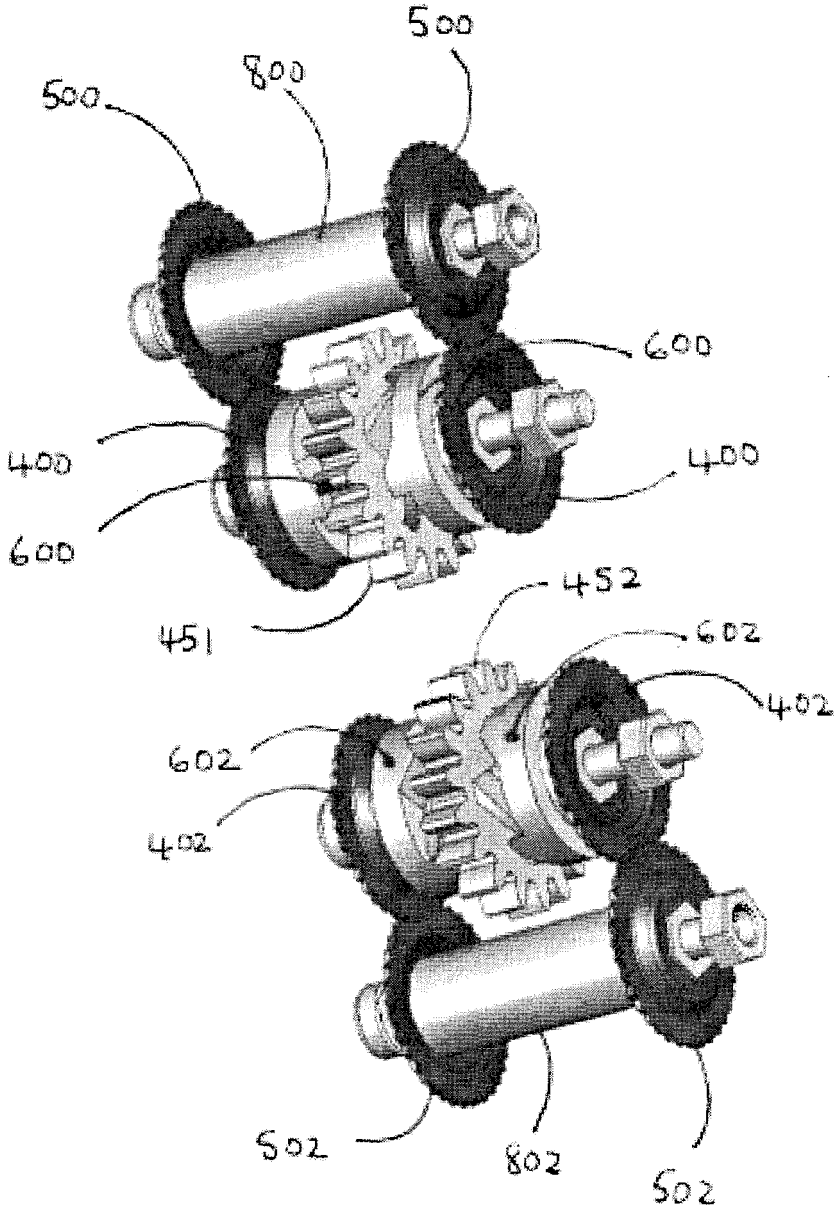


Fig. 43

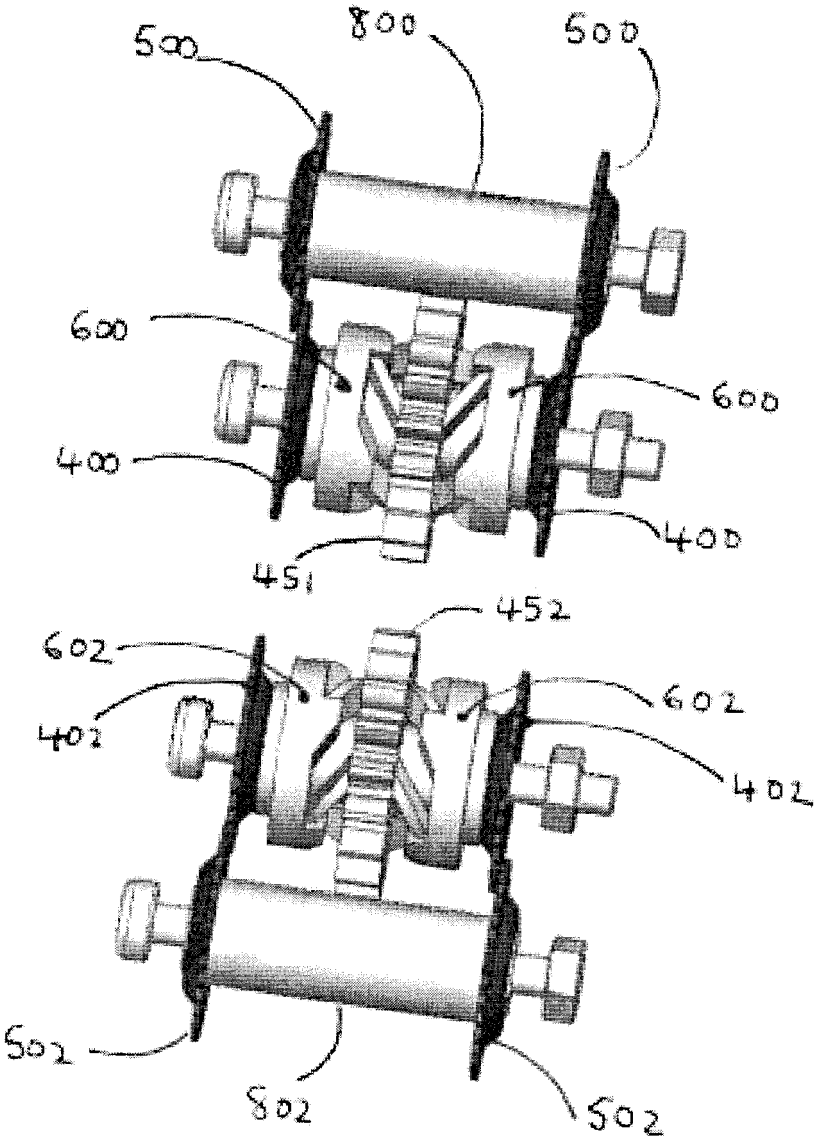


Fig. 44

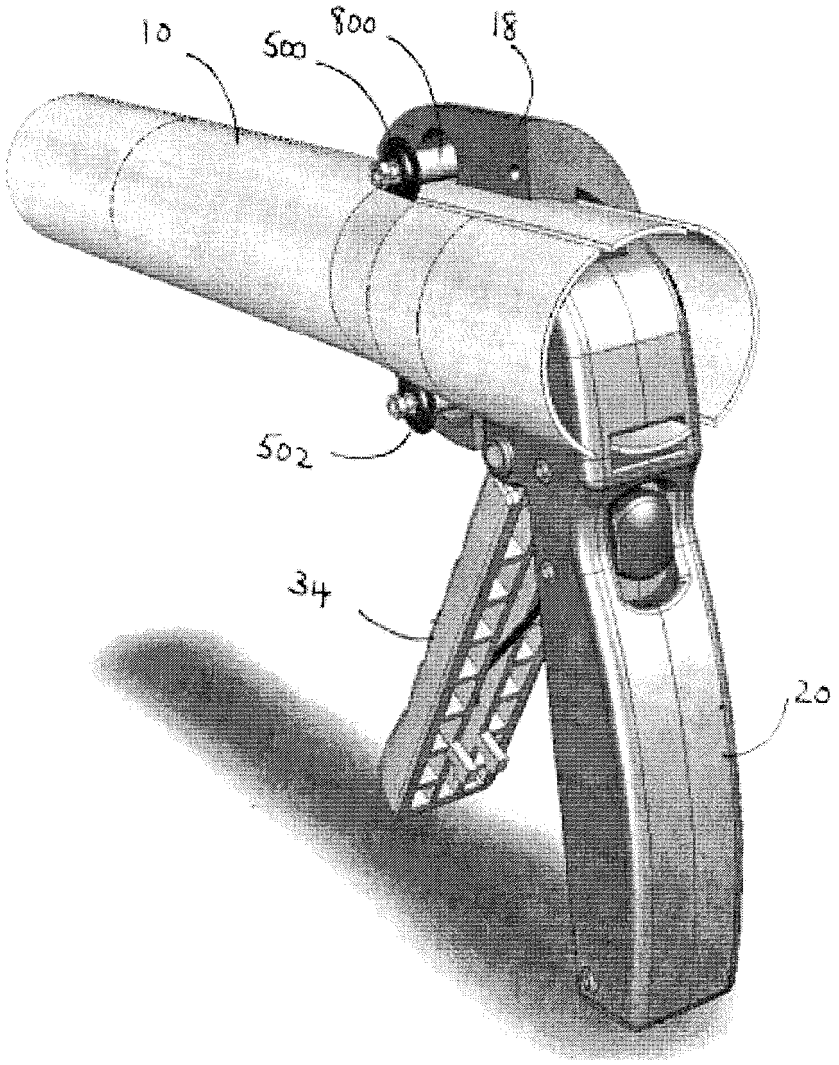


Fig. 45

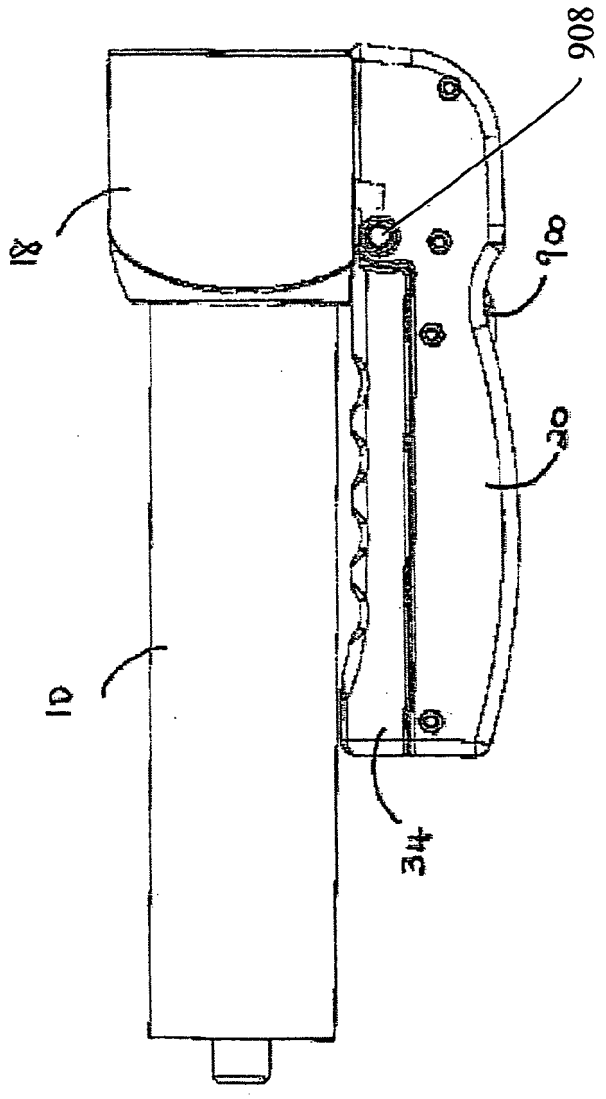


Fig. 46

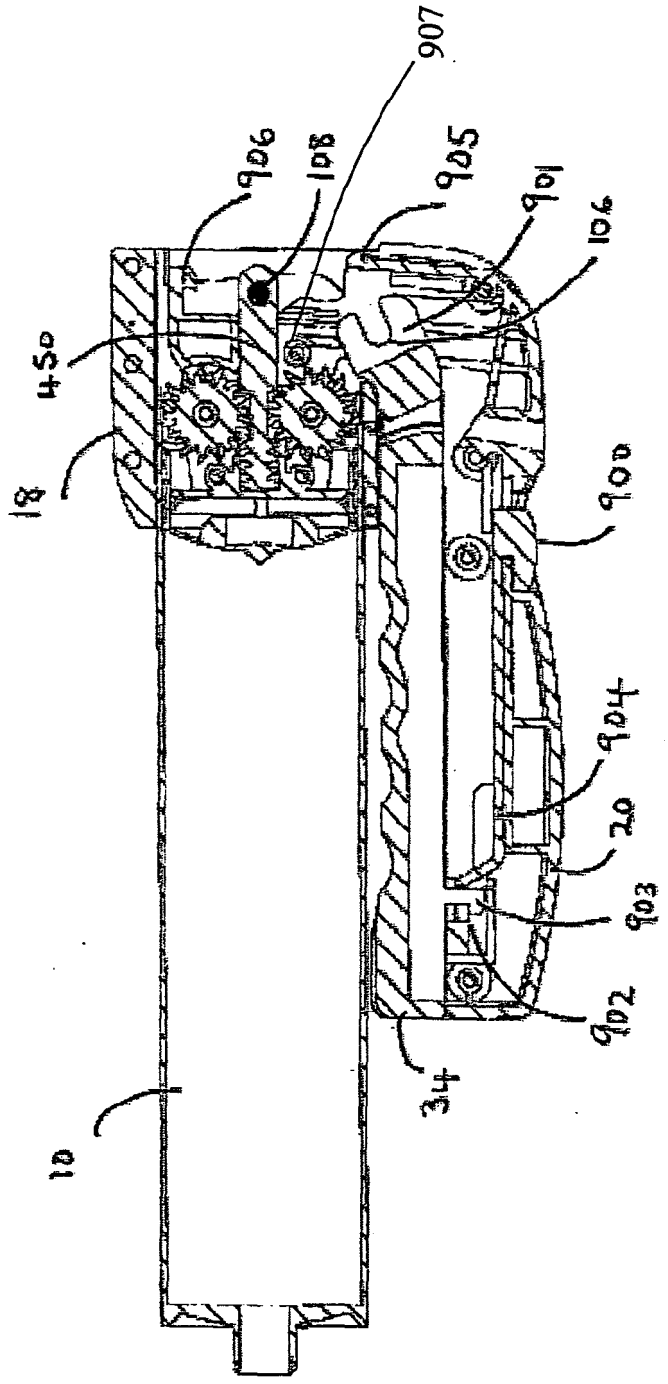


Fig. 47

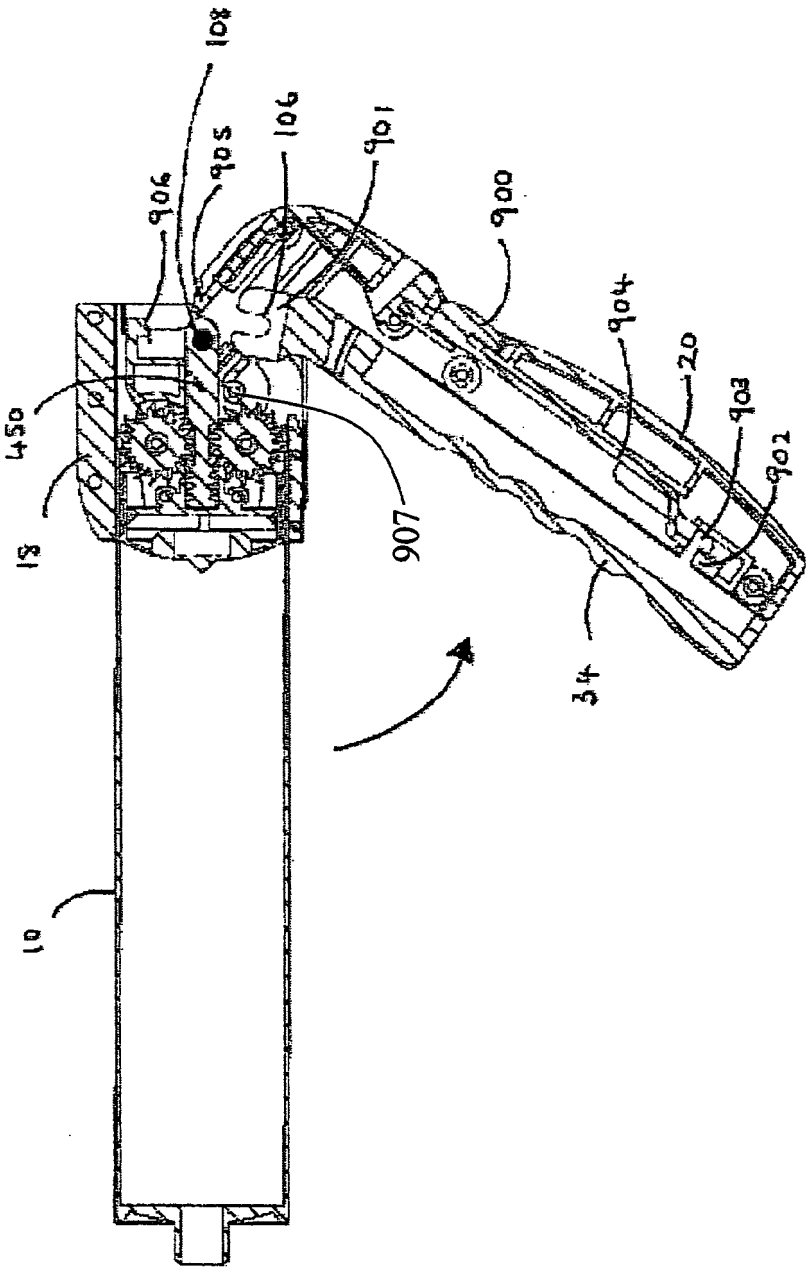


Fig. 48

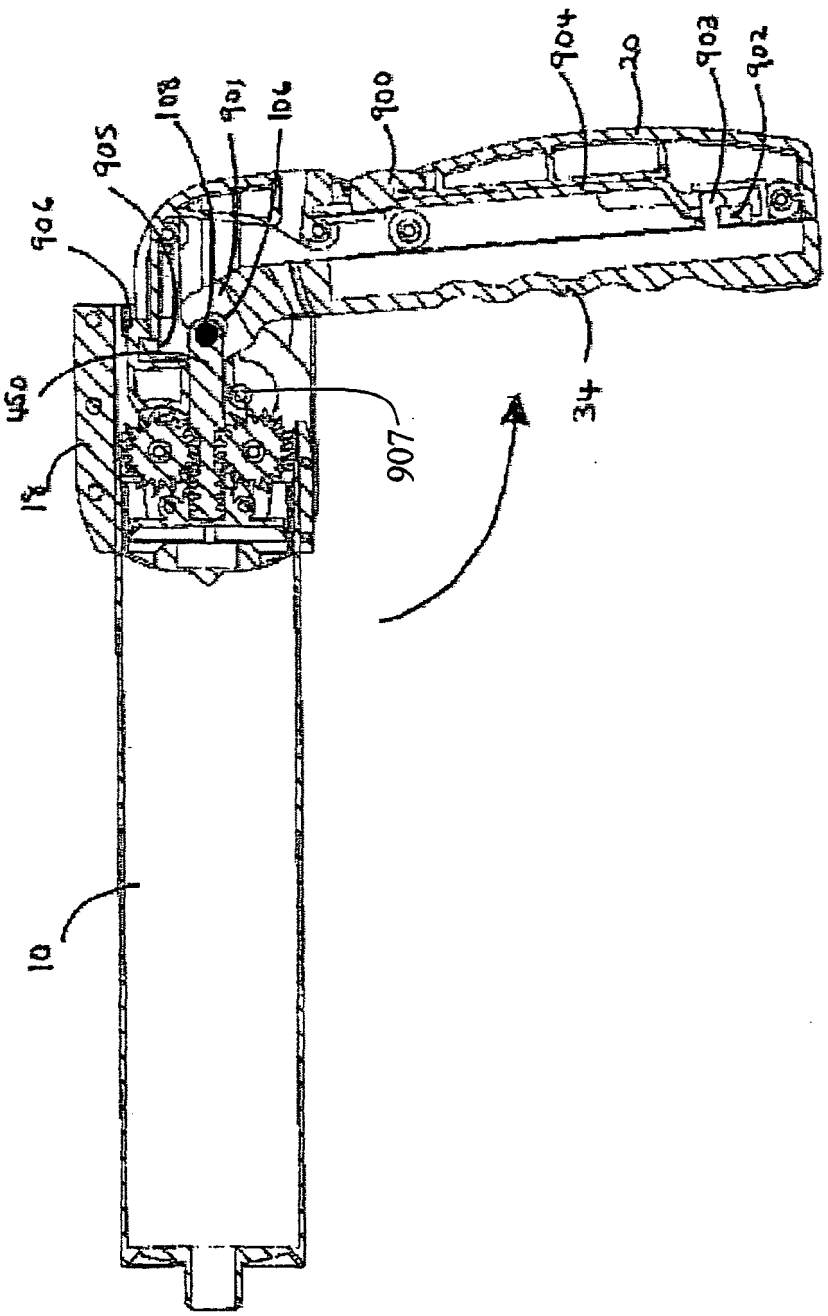


Fig. 49

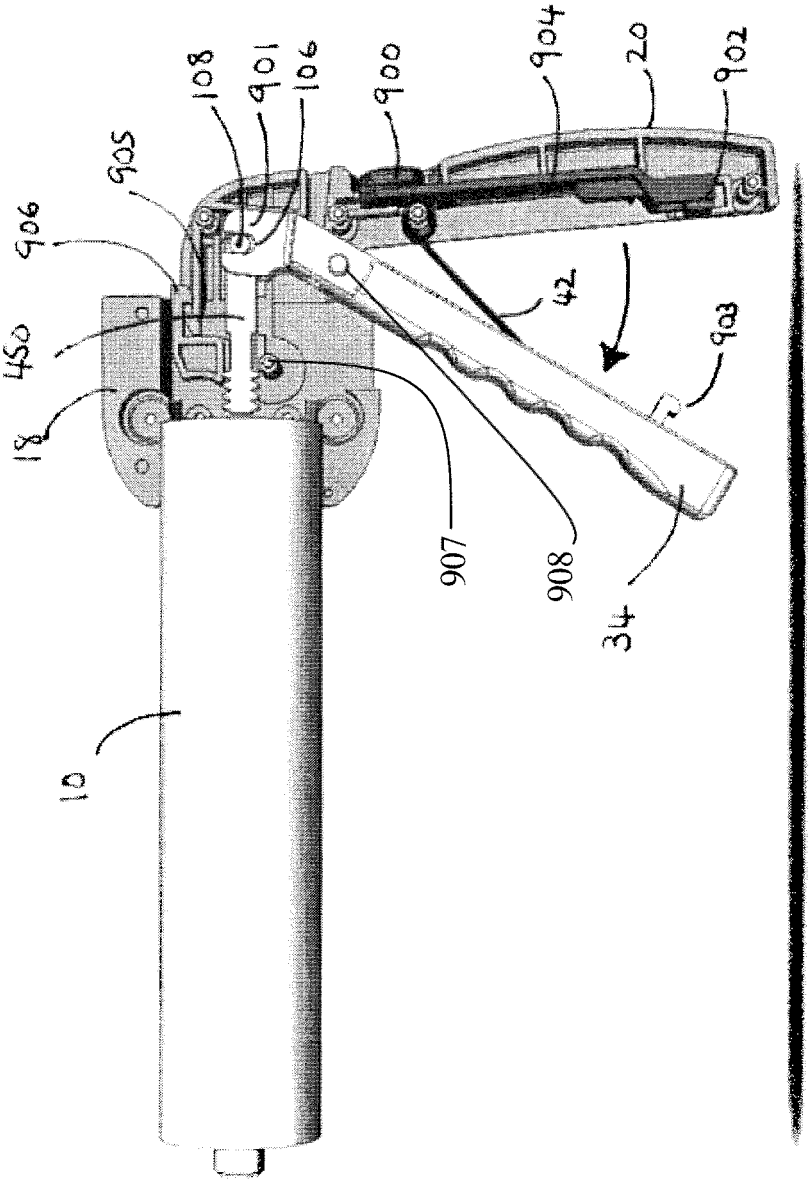


Fig. 50

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/056039

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05C17/01

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)
B05C

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 196 47 529 A1 (SCHUCKMANN ALFRED VON [DE]) 20 May 1998 (1998-05-20) the whole document	1-3
X	US 2002/108971 A1 (LAFOND LUC [CA]) 15 August 2002 (2002-08-15) the whole document	1-3

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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
11 September 2007	21/09/2007

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Eberwein, Michael

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2007/056039

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19647529 A1	20-05-1998	NONE	
US 2002108971 A1	15-08-2002	NONE	