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(54) Pull-type fastener-setting tool.

(57) The invention concerns a pull-type fastener-setting tool comprising a pulling device (40) arranged to grip a pulling stem of the fastener, the pulling device being movable to pull the pulling stem by means of a rotatable cam (62) turned by a rotatable handle (76). The pulling device (40) having an arm (80) pivoted thereon and carrying a cam follower (84) which bears on the rotatable cam (62) the arm being pivotally connected to a link (90) which guides the cam follower in alignment with the pulling device. The link is also pivotally connected to the housing of the tool within a handle portion thereof.

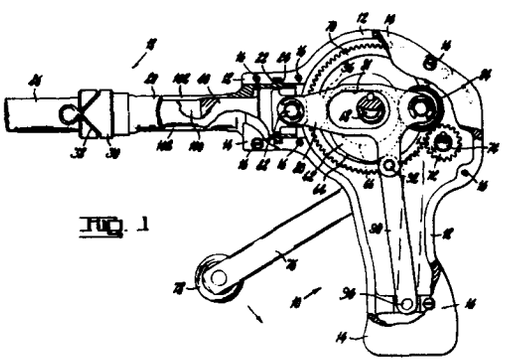

FIG. 1

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Pull-type fastener-setting tool

This invention concerns a pull-type fastener-setting tool suitable for use in setting blind rivets and lockbolts. Such tools engage a pulling stem of the fastener while holding stationary the fastener itself by engagement between an abutment of the tool and a head or collar of the fastener. One known tool which operates in this manner comprises a housing having a configuration resembling that of a pistol comprising a barrel portion which provides an abutment for engagement with a head portion of a fastener and a hand-grip portion. This tool also comprises a pulling device slidable in the barrel portion and arranged to grip a pulling stem of the fastener. This tool also comprises a rotatable handle mounted on the housing and connected by gears to a rotatable cam mounted in the housing and arranged to be rotated by rotation of the handle. This known tool also comprises a cam follower in engagement with a peripheral face of the cam and coupled to the pulling device so that, upon rotation of the cam by means of the handle, the pulling device is retracted relative to the abutment thereby setting the fastener.

In the known tool described above, since it is necessary that the cam follower be maintained substantially in alignment with the pulling device, a slideway is provided on which the cam follower moves. This slideway

complicates the construction of the tool and increases its length so that the tool is more difficult to manoeuvre. It is an object of the present invention to provide a pull-type fastener-setting tool which does not require such a slideway and is therefore of simpler and more compact construction.

According to the invention, the cam follower of the tool is mounted on an arm which is pivoted to the pulling device and the arm is pivoted to a link which is also pivoted to a part of the hand-grip portion of the tool remote from the arm. The link controls the arm so that the cam follower, although moving with the arm, will remain substantially aligned with the pulling device of the tool.

The known tool described above also comprises a second cam follower arranged to engage a second peripheral face of the cam to advance the pulling device towards the abutment of the tool on continued rotation of the handle. In the known tool, the second cam follower is provided by a cam roll mounted on the pulling device. However, in order to further simplify the tool, according to a further aspect of the invention, the second cam follower is provided by a shoulder of the arm on which the first cam follower is mounted.

In the known tool described above, a spring is provided to absorb the shock created when the pulling stem of the fastener breaks. In order to prevent an operator of the tool from being subjected to a shock when the pulling stem breaks and to achieve greater reliability, according to a further aspect of the invention, the spring is omitted and the second peripheral face of the cam is so shaped that, at the time when the pulling stem of the fastener breaks, the second peripheral face is closely adjacent to the second cam follower so that the cam can absorb the shock.

A pull-type fastener-setting tool which embodies the invention is described hereafter and is shown in the

accompanying drawings. In the accompanying drawings:-

Figure 1 is a side elevational view, partly in section,of the tool;

Figure 2 is a plan view, partly in section, of the tool; and

Figure 3 is a longitudinal sectional view of a nosepiece portion of the tool, on a larger scale than Figures 1 and 2.

The tool shown in the drawings comprises a housing which is generally pistol-shaped and comprises a hand-grip portion 10 (Figure 1) formed by two castings 12 and 14 bolted together at 16, and a barrel portion 18. A part 20 of the barrel portion 18 is secured to the castings 12 and 14 by an annular flange 22 accommodated in grooves 24 in the castings. A nosepiece 26 is detachably mounted on the part 20 by having a cylindrical rear part 28 thereof mounted in a bore in the part 20 and an annular flange 29 thereof abutting the front end of the part 20. The nosepiece 26 is held in position by a collar 30 and a retaining spring 32. The nosepiece 26 of the barrel portion 18 provides at its front end an abutment 34 for engagement with a head portion provided by a collar C of a lockbolt (Figure 3) which comprises a bolt B and a pulling stem S.

A pulling device is mounted to slide axially within the barrel portion 18. The pulling device comprises a plunger 40, and a jaw case 42 threaded to the forward end of the plunger 40. The jaw case 42 has an internal frusto-conical surface 44 and a cylindrical extension 46 accommodated within the abutment 34. The pulling device also comprises three jaws 48 (only two visible in Figure 3) which engage the surface 44 and are urged forwardly by a spring 50 contained between two flanged sleeves 52 and 54, the sleeve 52 abutting the jaws 48 while the sleeve 54 abuts the front end of the plunger 40. The jaws 48 are provided with teeth which are complementary in shape to

radial grooves G on the pulling stem S. The jaws 48 are arranged to grip the pulling stem S. The arrangement is such that ready replacement of the nosepiece 26, the jaw case 42, the jaws 48 and the spring 50 can be achieved so that a different size of lockbolt can be set.

The castings 12 and 14 support bearings 60 on which a rotatable cam 62 is mounted within the housing. The cam 62 has two peripheral cam surfaces 64 and 66 and is keyed on a spindle 68 which also carries a gear wheel 70. The gear wheel 70 is meshed with a smaller gear wheel 72 keyed on a spindle 74 also mounted on bearings supported by the castings 12 and 14. A rotatable handle 76 is mounted on the spindle 74 outside the housing and carries a knob 78. Rotation of the handle 76 by an operator, who grips the knob 78, causes rotation of the cam 62 since the handle 76 rotates the gear wheel 72 which in turn rotates the gear wheel 70 and the cam 62.

An arm 80, consisting of two parallel plates each containing a clearance hole 81 around the spindle 68, is pivoted at 82 to a rear end portion of the plunger 40 and has mounted thereon, at its rear end portion, a cam follower 84. The cam follower 84 is in the form of a roll and is in engagement with the cam surface 64 of the cam 62. The cam follower 84 is coupled to the pulling device by the arm 80 so that, upon rotation of the handle 76 and therefore of the cam 62, the cam follower 84 is moved rearwardly by the cam surface 64 and the pulling device is retracted relative to the abutment 34. This retraction of the pulling device sets a lockbolt by pulling the stem S thereof and swaging the collar C into locking grooves L of the bolt B. The stem S subsequently breaks at a neck N thereof. The arm 80 is also pivoted on a link 90 which is itself pivoted at 94 to parts of the castings 12 and 14 at the base of the hand-grip portion 10 of the housing, i.e. remote from the arm 80. The link 90 supports the arm 80 and prevents it from swinging to an extent which will

bring the cam follower significantly out of alignment with the pulling device.

A shoulder 96 on one of the plates forming the arm 80 provides a second cam follower in front of the spindle 68 and arranged to engage the cam surface 66 of the cam 62 (Figures 1 and 2). Rotation of the handle 76 first presses the cam follower 84 rearwardly setting the lockbolt and then advances the pulling device back towards the abutment 34 by the second cam follower 96 being pressed forwardly by the cam surface 66. Forward movement of the pulling device causes the extension 46 of the jaw case to push the swaged collar C so that the abutment 34 is pulling off the collar C. The broken off pulling stem S of the lockbolt is retained by the jaws 48 during the forward movement of the pulling device and insertion of the next lockbolt to be set causes the broken off stem to be released by the jaws 48 and be projected through the sleeves 52 and 54 and out through slots 100 and 102 in the plunger 40 and the part 20. The jaws 48 then engage the pulling stem of the next lockbolt to be set.

The cam surface 66 of the cam 62 is so shaped that, at the time when the pulling stem of the lockbolt breaks, the surface 66 is closely adjacent to the second cam follower 96 so that the shock of the breakage of the pulling stem is taken by the cam 62.

The tool can be used with suitable modifications for setting fasteners other than lockbolts, e.g. blind rivets, and is of simple and compact construction.

Claims

1. A pull-type fastener-setting tool comprising a housing comprising a barrel portion (18) which provides an abutment (34) for engagement with a head portion of a fastener and a hand-grip portion (10), a pulling device (40, 42, 46, 48, 50) slidable in the barrel portion (18) and arranged to grip a pulling stem of the fastener, a rotatable handle (76) mounted on the housing, a rotatable cam (62) mounted in the housing and arranged to be rotated by rotation of the handle (76), and a cam follower (84) in engagement with a peripheral surface (64) of the cam (62) and coupled to the pulling device (40, 42, 46, 48, 50) so that, upon rotation of the cam, the pulling device is retracted relative to the abutment (34), characterised in that the cam follower (84) is mounted on an arm (80) which is pivoted to the pulling device (40, 42, 46, 48, 50) and the arm (80) is pivoted to a link (90) which is also pivoted to a part of the hand-grip portion (10) remote from the arm (80).

2. A tool according to claim 1 wherein a second cam follower (96) is arranged to engage a second peripheral surface (66) of the cam (62) to advance the pulling device (40, 42, 46, 48, 50) towards the abutment (34) on continued rotation of the handle (76), characterised in that the second cam follower (96) is provided by a shoulder of the arm (80).

3. A tool according to claim 2 characterised in that the second peripheral surface (66) of the cam (62) is so shaped that, at the time when the pulling stem of the fastener breaks, the second peripheral surface (66) is closely adjacent the second cam follower (96).

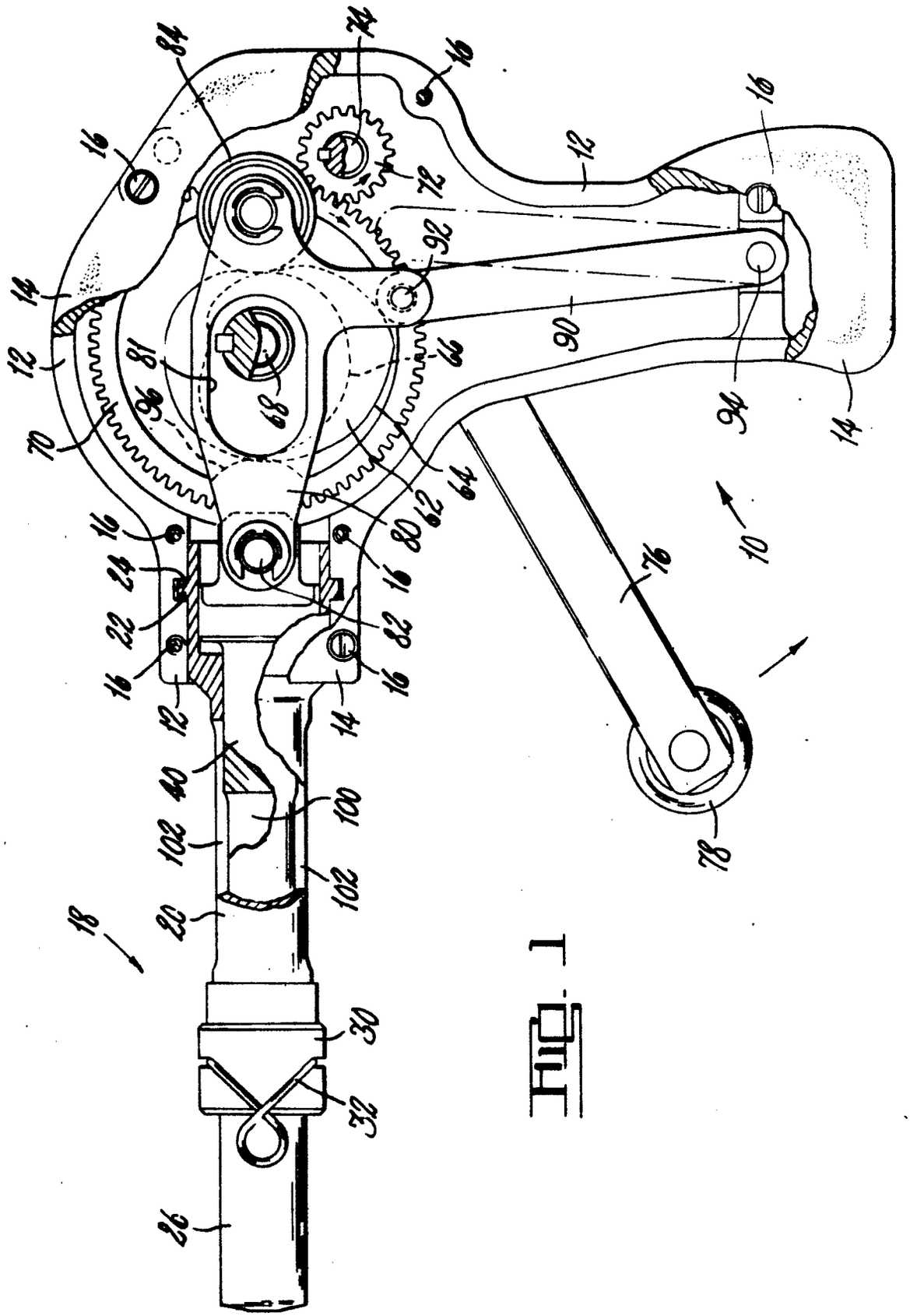
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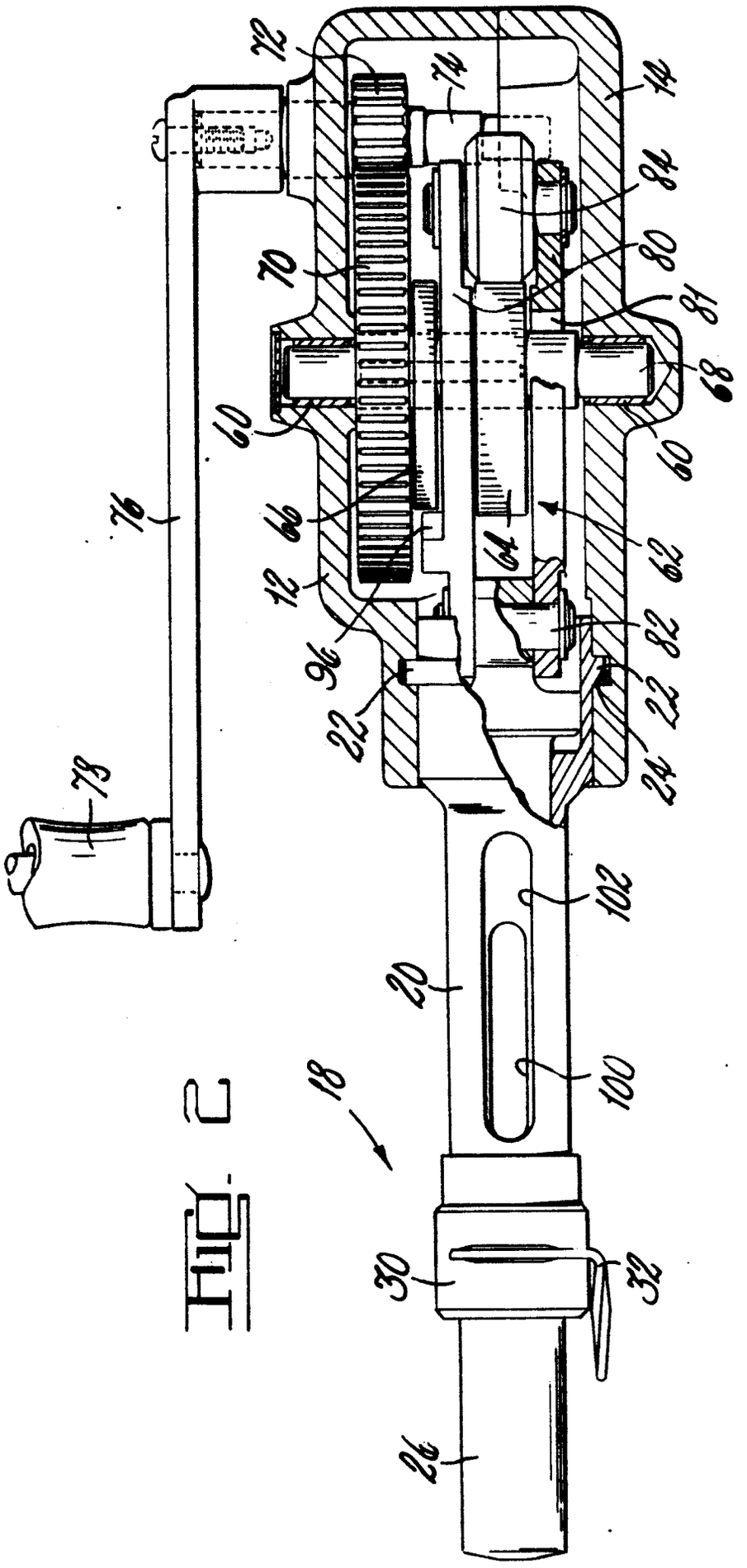
Fig. 1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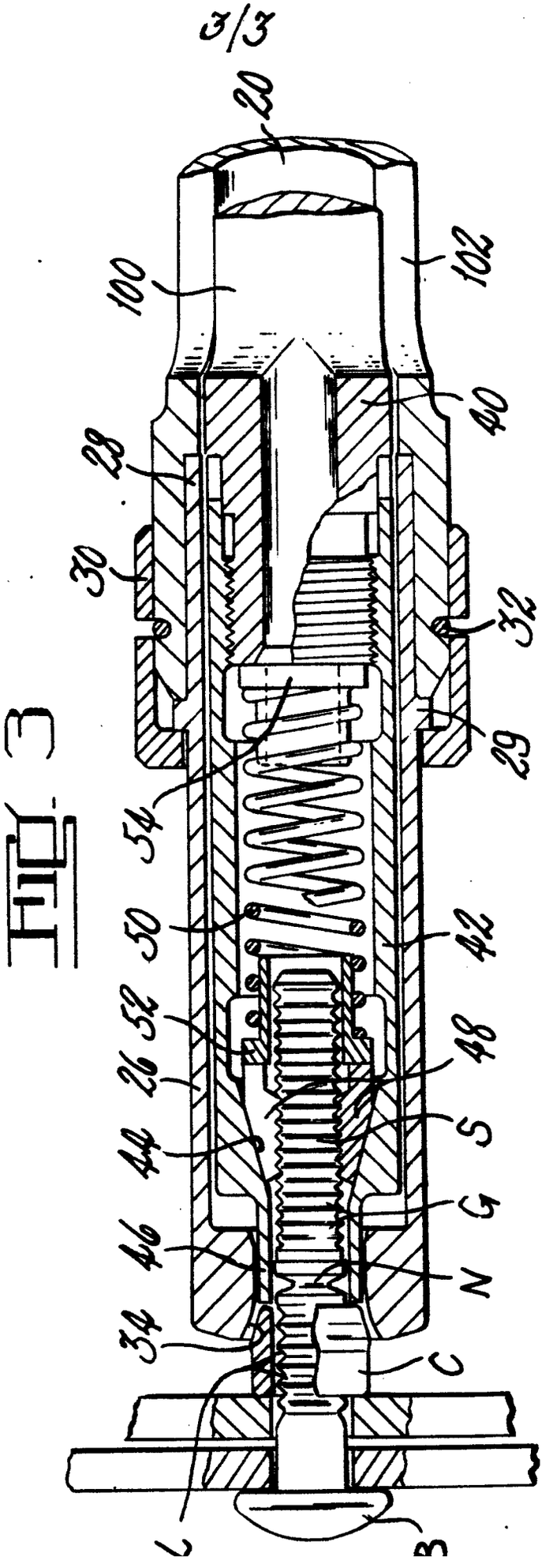

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 78 30 0114

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 3 033 410 (HANNEMAN) * Column 1, lines 53-68; column 3, lines 15-59; figures *	1
A	GB - A - 477 328 (CHOBERT) * Page 5, lines 42-87; figure 14 *	1
A	GB - A - 402 671 (BLERIOT) * Page 2; page 3, lines 1-14; figures *	1
A	FR - A - 741 414 (BLERIOT) * Page 2, lines 25-104; page 3, lines 1-10; figures *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.²)

B 25 B 27/00
B 21 J 15/04

TECHNICAL FIELDS SEARCHED (Int.Cl.²)

B 25 B 27/00
B 21 J 15/04
F 16 B 19/05
F 16 H 25/14

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25-10-1978	VAN GHEEL

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