

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
30 March 2006 (30.03.2006)

PCT

(10) International Publication Number  
WO 2006/032495 A1

(51) International Patent Classification<sup>7</sup>: B25F 5/00, 5/02, H01H 13/08, 13/62

(21) International Application Number:  
PCT/EP2005/010252

(22) International Filing Date:  
22 September 2005 (22.09.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
04255746.2 22 September 2004 (22.09.2004) EP

(71) Applicant (for all designated States except US): BLACK & DECKER INC [US/US]; 1207 Drummond Plaza, Newark, DE 19711 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): KUNZ, Michael [DE/DE]; Black & Decker Gmbh, Black & Decker Strasse 40, 65510 (DE).

(74) Agents: CAVALIER, Marcus, Alexander, Mawson et al.; Black & Decker, 210 Bath Road, Slough SL1 3YD (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, 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, 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).

**Declarations under Rule 4.17:**

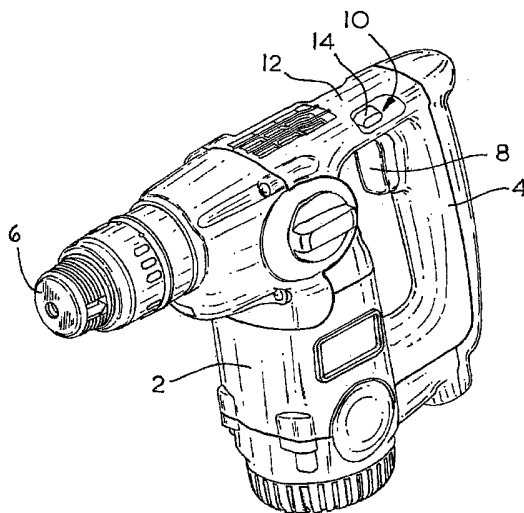
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designation US
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designation US
- of inventorship (Rule 4.17(iv)) for US only

**Published:**

- with international search report

[Continued on next page]

(54) Title: LOCKABLE TRIGGER BUTTON FOR HAMMER DRILL



(57) Abstract: A hammer drill, in particular a chipper comprising: a body (2) having at least one support handle (4); an electric motor mounted within the body (2); an electric switch (22), capable of being switched on and off by a trigger button (8) connected to it, to activate or deactivate respectively the electric motor, wherein the trigger button (8) is moveable between two positions, a first position where the electric switch (22) is off and a second position where the electric switch (22) is on; a locking arm (38) moveably mounted on the electric switch (22) which, when the trigger button (8) is located in its second position, is moveable between two positions, a first position where it is disengaged from the trigger button (8) and a second position where it engages with the trigger button (8) and holds the trigger button (8) in its second position. When the locking arm is in its second position it causes the hammer to remain switch on even if the operator removes their fingers from the trigger button.

WO 2006/032495 A1



---

*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.*

## LOCKABLE TRIGGER BUTTON FOR HAMMER DRILL

The present invention relates to a hammer drill and in particular, a chipper.

5 A chipper is a power tool which is used to chisel a workpiece such a block of stone. Typically, such chippers are powered by an electric motor which are either powered by a mains electricity power supply or by a battery. A tool bit, usually in the form of a chisel, is mounted in a tool holder located at the front of the chipper. The tool holder prevents the tool bit from rotation. However, the tool bit is capable of  
10 axially sliding within the tool holder over a limited range of movement.

The electric motor is activated by depression of the trigger switch which is usually mounted on a handle attached to the body of the chipper. The electric motor reciprocatingly drives a striker via gears, a rotary to linear movement conversion  
15 mechanism, typically a crank or wobble bearing, and an air spring, typically in the form of a piston, cylinder and ram, mounted within the chipper in well-known manner. The striker repeatedly hits the end of the drill bit located within the tool holder causing the tool bit to be repeatedly driven forwards. In use, the cutting tip the tool bit is placed against the work piece to be chiseled. The striker repeatedly hits end of the  
20 tool bit within the tool holder, causing tool bit to chip or chisel away at the work piece.

Ideally, such chippers can operate in two modes of operation.

The first mode of operation is where depression of the trigger switch by an  
25 operator causes the motor to be activated. The operator can then use the chipper whilst the trigger switch remains depressed. In order to keep the electric motor activated, the operator must keep the trigger switch depressed. Upon release of the trigger switch, the electric motor is deactivated and the chipper is switched off.

30 In the second mode of operation, the chipper can be "locked on". This means that once the trigger switch has been depressed and the electric motor activated, the chipper can be "locked on" so that the electric motor remains constantly activated even when the operator releases the trigger switch. This enables the operator to move their hands around the handle and body of the chipper to support it in different

places whilst the chipper remains activated. Once the operator wishes to stop the chipper, the "lock on" is switched off, allowing the electric motor to be deactivated when the trigger switch is released. If the "lock on" is switched off whilst the trigger switch is not depressed, the motor stops immediately.

5

Accordingly there is provided a hammer drill comprising:

a body having at least one support handle;

an electric motor mounted within the body;

an electric switch, capable of being switched on and off by a trigger button  
10 connected to it, to activate or deactivate respectively the electric motor, wherein the trigger button is moveable between two positions, a first position where the electric switch is off and a second position where the electric switch is on;

a locking arm moveably mounted on the electric switch which, when the trigger  
button is located in its second position, is moveable between two positions, a first  
15 position where it is disengaged from the trigger button and a second position where it engages with the trigger button and holds the trigger button in its second position.

Though the embodiment below relates to a chipper, it is clear to a person  
skilled in the art that the invention is applicable to any type of hammer drill.

20

An embodiment of the present invention will now be described with reference to the accompanying drawings of which:

Figure 1 shows a front perspective view of a hammer drill;

25 Figure 2 shows a rear perspective view of a hammer drill

Figure 3 shows the rear clam shell of the chipper with the sliding "lock on" activator;

Figure 4 shows part of the rear clam shell with the electric switch, the trigger button, the pivotal latch and the sliding "lock on" activator;

30 Figure 5 shows the trigger button, the pivotal latch and the sliding "lock on" activator;

Figure 6 shows the trigger button, the pivotal latch with biasing spring;

Figure 7 shows the electric switch and the trigger button;

Figure 8 shows the inside of the trigger button with the catch;

Figure 9 shows the underside of the sliding "lock on" activator;

Figure 10 shows the rear of the trigger button with the sliding "lock on" activator; and

Figure 11 shows part of the rear clam shell with the electric switch, the pivotal  
5 latch and the sliding "lock on" activator.

Referring to figures 1 and 2, the chipper comprises a body 2 attached to the  
rear of which is a rear support handle 4. An electric motor (not shown) is mounted  
within the body. The electric motor is powered by a mains electricity power supply  
10 (not shown).

Mounted on the front of the body 2 of chipper is a tool holder 6. A chisel (not  
shown) can be mounted in the tool holder 6. The tool holder prevents the chisel from  
rotation. However, the chisel is capable of axially sliding within the tool holder 6 over  
15 a limited range of movement.

The electric motor is activated by depression of a trigger button 8 which is  
mounted on the inside of the rear support handle 4. The electric motor reciprocatingly  
drives a striker (not shown) via gears (not shown) and a wobble bearing (not shown)  
20 and an air spring in the form of a piston, cylinder and ram (not shown) mounted  
within the body 2 of the chipper in well-known manner. The striker repeatedly hits  
the end of a chisel located within the tool holder 6 causing the chisel to be repeatedly  
driven forwards. In use, the cutting tip the chisel is placed against the work piece to  
be chiseled. The striker repeatedly hits end of the chisel within the tool holder 6,  
25 causing chisel bit to chip or chisel away at the work piece.

The chipper can operate in two modes of operation.

The first mode of operation is where depression of the trigger button 8 by an  
30 operator causes the motor to be activated. The operator can then use the chipper  
whilst the trigger button 8 is depressed. In order to keep the electric motor activated,  
the operator must keep the trigger button 8 depressed using their fingers. Upon  
release of the trigger button, the electric motor is deactivated and the chipper is  
switched off.

In the second mode of operation, the chipper can be "locked on". This means that once the trigger button 8 has been depressed and the electric motor activated, the chipper can be "locked on" so that the electric motor remains constantly activated even when the operator releases the trigger button 8. This enables the operator to  
5 move their hands around the body 2 and rear support handle 4 of the chipper to support it in different places whilst the chipper remains activated. Once the operator wishes to stop the chipper, the "lock on" is switched off, allowing the electric motor to be deactivated when the trigger button 8 is released.

10 The "lock on" is switched on by the sliding movement of a sliding "lock on" activator 10. The sliding "lock on" activator comprises a bar which is located within the top section 12 of the rear support handle 4 and which extends through the sides of the rear clamshell which forms the rear support handle 4. One end 14 of the bar extends through an aperture formed in one side (shown in Figure 1) of the rear  
15 support handle 4, the other end 16 extends through a second aperture formed in the opposite side (shown in Figure 2) of the rear support handle 4, the two ends 14, 16 being visible externally whilst the centre section of the bar remains internally within the top section 12 of the rear support handle 4. The bar can slide axially within the top section 12 of the rear support handle across the width of the rear support  
20 handle 4 from a first position where one end 14 projects substantially from one side of the chipper to a second position where the other end 16 projects substantially from the other side of the chipper, and then back to the first position.

The mechanism by which the chipper is "locked on" will now be described in  
25 detail with reference to figures 3 to 11.

Referring to figure 3, the rear support handle is formed from a plastic clamshell  
18. Mounted within the rear support handle 4 is an electric switch 22 as best seen in  
Figure 4. Connected to the electric switch 22 is the trigger button 8. The trigger  
30 button 8 connects to the electric switch 22 via an elongate rod 24 of circular cross-section. The elongate rod 24 is capable of being axially slid along its elongate axis over a limited range of movement. Depression of the trigger button 8, so that it moves into the rear support handle 4, causes the elongate rod 24 to move along its elongate axis and be pushed into the body of the electric switch 22 causing the

electric switch to make an electrical connection thus allowing electric current to pass through it which in turn activates the electric motor.

5 Figure 6 shows the elongate rod 24 connecting into the rear of the trigger button 8. Figure 8 shows a rear view of the trigger button 8 together with a recess 26 of circular cross section in which the end of the elongate rod 24, which projects from the electric switch 22, locates and connects to the trigger button 8. The elongate rod is biased outwardly from the body of the electric switch 22 via a spring (not shown) within the electric switch 22 to a maximum outward position. When the  
10 elongate rod 24 extends to its maximum position due to the biasing force of the spring, the electric switch 22 is switched off, with no electric current being able to pass through the switch 22. Depression of the trigger button 8 moves the elongate rod 24 against the biasing force of the spring into the body of electric switch 22 switching the electric switch 22 on.

15

The sliding "lock on" activator 10 will now be described in detail.

The sliding "lock on" activator (indicated by reference number 10 in Figure 1) comprises a bar as best seen in Figure 4 and 5 which has a central section 28, and  
20 two ends 14, 16. The bar, as described previously, extends through the top section 12 of the rear support handle 4, the two ends 14, 16 projecting through apertures formed in the clamshell 18 which forms the rear support handle 4. The bar is capable of sliding within the clam shell 18 into and out of the apertures, along its longitudinal axis.

25

The bar is mounted transversely across a support rod 30, the longitudinal axis of the bar being substantially perpendicular to that of the support rod 30. When the sliding "lock on" activator 10 is mounted within the top section 12 of the rear support handle 4, both the longitudinal axes of the support rod 30 and of the bar are  
30 substantially horizontal. The bar is mounted part way along the length of the support rod 30 as shown in the Figures 4 and 5.

The movement of the bar and support rod 30 is controlled by the bar which is capable of sliding along its longitudinal axis only. Thus the support rod 30 is only

capable of sliding width ways, horizontally from left to right within the clam shell 18. The support rod 30 limits the amount of sliding movement of the bar 28.

Attached to one end of the support rod 30 is a circular disk 32 as shown. The  
5 circular disk 32 is provided as a grip by which a person assembling the chipper can hold the "lock on" mechanism during production. The circular disk performs no function in the operation of the "lock on" mechanism when the tool is assembled.

Formed in the other end of the support rod 30 opposite to that to which the  
10 circular disk 32 is attached, is a U-shaped recess 36.

The sliding "lock on" activator 10 comprising the bar, the support rod 30 with  
the U-shaped recess 36 and circular disk 32 are formed from plastic in a one-piece  
15 construction.

The pivotal latch 38 with biasing spring 46 will now be described in detail with  
reference to the figures.

The pivotal latch is best seen in figure 6. The pivotal latch comprises a central  
20 pivot mount 40 of circular cross-section about the longitudinal axis 42 of which the pivotal latch 38 is capable of pivoting.

Extending from one side of the pivot mount 40 substantially perpendicular to  
the longitudinal axis 42 of the pivot mount 40, is a first arm 44. Attached to the side  
25 of the first arm 44 is a helical spring 46 the axis of which extends substantially perpendicular to the longitudinal axis of the first arm 44 and to the longitudinal axis 42 of the pivot mount 40.

Extending from the other side of the pivot mount 40 in the opposite direction to  
30 the first arm 44 is a second arm 48. The second arm 48 extends in a direction which is substantially parallel to the first arm 44. Mounted on the top side of the second arm 48, towards the end of the second arm 48, remote from the pivot mount 40, is a drive peg 50. The drive peg 50 is substantially circular in cross-section and extends in a direction parallel to that of the longitudinal axis 42 of the pivot mount 40. Mounted on



the underside of the second arm 48 towards the end of the second arm 48 remote from the pivot mount 40, is a latch arm 52. The latch arm 52 extends downwardly in the opposite direction to the drive peg 50 but substantially parallel to it.

5 Referring to Figure 7, the top of the body of the electric switch 22 comprises a tubular recess 54 of circular cross-section. The longitudinal axis 56 of the tubular recess 54 is vertical.

10 The underside of the pivot mount 40 locates within the tubular recess 54 of the electric switch 22 such that the two axes 42, 56 are coaxial. The pivotal latch 38 is capable of pivoting about the longitudinal axis 42 of the pivot mount 40 within the tubular recess 54 of electric switch 22. The free end of the helical spring 46 which is attached to the first arm 44 attaches to the side of the body of electric switch 22 as shown in Figure 7. The helical spring 46 biases the end of the first arm 44 away  
15 from the side of the body of the switch 22.

The drive peg 50 mounted on the topside of the second arm 48 locates within the U-shaped recess 36 formed in the support rod 30 of the "lock on" activator as best seen in Figure 4.

20

When an operator slides the bar 28 of the "lock on" activator 10, the "lock on" activator 10 slides width ways within the clam shell 18 causing the U-shaped recess 36 formed in the end of the support rod 30 to move from left-to-right (or vice-versa). This in turn causes the drive peg 50 which is located within the U shaped recess 36  
25 to move from left-to-right (or vice versa) as shown in Figure 6 causing the pivotal latch 38 to pivot about the longitudinal axis 42 of the pivot mount 40. Movement of the pivotal latch 38 causes compression or expansion of the helical spring 46 connected between the first arm 44 the pivotal latch 38 on the body of the electrical switch 22.

30

The pivotal latch 38 is made from plastic in a one piece construction.

Referring to Figure 8, it can be seen that the trigger button 8 is hollow. A horizontal shelf 60 is formed across the width of the inside of the trigger button 8

approximately halfway up within the trigger button 8. Formed on the top surface of the shelf 60 is a catch 62. The catch 62 comprises an elongate ridge 64 which extends forward within the trigger button 8. Formed adjacent to one end of the elongate ridge 64 is a second smaller ridge 66 which extends sideways,  
5 perpendicular to that of the elongate ridge 64. A chamfer 68 is formed on the corner of the elongate ridge 64 at the same end as that from which the smaller ridge 66 extends, on the opposite side from that which the smaller ridge 66 extends. The junction of the smaller ridge 66 and the forward end of the elongate ridge 62 forms a recess 70.

10

Formed on the bottom end of the latch arm 52 is a stop 72 as shown in Figure 9. When the pivotal latch 38 is mounted on the electrical switch, the latch arm 52 extends into the inside space of the trigger button 8 formed by the inner walls 74 of the trigger button 8 and the shelf 60. When the pivotal latch 38 is pivoted due to the  
15 sliding movement of the bar 28 of the "lock on" activator 10, the latch arm 52 pivots inside the trigger button. The height of the stop 72 within the trigger button 8 is a same as that of the catch 62 such that pivotal movement of the latch arm 52 causes the stop 72 to engage with the side of the catch 62.

20

When the chipper is switched off with trigger button 8 located by its maximum amount away from the electrical switch 22, the latch arm 52 is located to the right to the catch 62 as shown in Figure 8 such that it is on the opposite sides to the elongate ridge 64 of the catch 62 to that of smaller ridge 66. In this position, the "lock on" mechanism is switched off and the chipper only operates in the first mode of  
25 operation. When an operator tries to pivot the latch arm 52 by a sliding movement of the bar, the stop 72 engages the side of the catch thus preventing movement of the latch arm 38 and hence the pivotal latch 38. This in turn blocks the sliding movement of the "lock on" activator 10 and thus the bar which forms part of it. Thus the chipper is prevented from starting the second mode, namely the "lock on" mode whilst the  
30 chipper is switched off.

When the trigger button 8 is depressed, the trigger button 8, together with the catch 62, is move towards the electrical switch 22. However the latch arm 52 remains stationary as it is mounted on the electrical switch 22. Thus the relative

position of the latch arm 52 within the trigger button 8 moves. When the trigger button has been depressed sufficiently, the catch 62 will move sufficiently towards the electrical switch 22 that the stop 72 of the latch arm 52 is able to pass around the forward end of the catch 62. At this point, the operator can slidingly move the bar 28  
5 causing the pivotal latch 38 to pivot against the biasing force of the spring 46 causing the latch arm 52 to pivot within the inside of the trigger button 8 around the top end of the catch. Upon release of the trigger button 8 whilst the latch arm 52 is in this position, the stop 72 locates within the recess 70 of the catch 62 thus preventing the trigger button 8 from returning to its opposition. Whilst the stop 72 remains in this  
10 position, the trigger button 8 is held in an inward position thus maintaining the chipper activated in the second mode of operation, with the electrical switch constantly activated even when the operator removes the fingers from the trigger button 8. The latch arm 52 is prevented from pivoting backwards due to the biasing force of the spring 46 by the stop 72 being held within the recess 70.

15

In order to release the "lock on", the operator depresses the trigger button 8 which moves the stop 72 from the recess 70. This allows the latch arm 52 to pivot across the top of the catch 62 due to the biasing force of the spring 46 (unless it is held there by the operator preventing the bar from moving position) and locate on the  
20 right of the catch as shown in Figure 8. Then, upon release the trigger button 8, the trigger button 8 can move to allow electrical switch 22 to be switched off.

**CLAIMS**

1. A hammer drill comprising:
  - a body 2 having at least one support handle 4;
  - an electric motor mounted within the body 2;
  - an electric switch 22, capable of being switched on and off by a trigger button 8
- 5 connected to it, to activate or deactivate respectively the electric motor, wherein the trigger button 8 is moveable between two positions, a first position where the electric switch 22 is off and a second position where the electric switch 22 is on;
  - a locking arm 38 moveably mounted on the electric switch 22 which, when the trigger button 8 is located in its second position, is moveable between two positions,
- 10 a first position where it is disengaged from the trigger button 8 and a second position where it engages with the trigger button 8 and holds the trigger button 8 in its second position.
2. A hammer drill as claimed in claim 1 wherein the trigger button 8 slides linearly
- 15 towards or away from the electric switch 22 when it travels between its two positions.
3. A hammer drill as claimed in either of claims 1 or 2 wherein the trigger button 8 is biased towards its first position.
- 20 4. A hammer drill as claimed in any of claims 1,2 or 3 wherein the locking arm 38 is biased to its first position.
5. A hammer drill as claimed in any of the previous claims wherein the locking arm is held in its first position and prevented from moving to its second position when
- 25 the trigger button is located in its first position.
6. A hammer drill as claimed in any of the previous claims wherein, when trigger button is in its second position and the locking arm is in its second position, the locking arm is held in its second position and is prevented from moving to its first
- 30 position by the biasing force acting on the trigger button urging the trigger button towards its first position.

7. A hammer drill as claimed in claim 6 wherein the locking arm 38 is capable of being moved to its first position when an external force is applied to the trigger button 8 which overcomes the biasing force acting on the trigger button 8.

5 8. A hammer drill as claimed in any of the previous claims wherein the trigger button 8 comprise a catch 62 which engages with part 72 of the locking arm 38 when it is in its second position.

9. A hammer drill as claimed in any of the previous claims wherein the locking  
10 arm 38 is pivotally mounted on the electric switch and pivots between its first and second positions.

10. A hammer drill as claimed in claim 9 wherein there is further provided a lock  
15 on activator 10 mounted in a linear slidable manner within the body 2 or handle 4 which engages with the locking arm 38 so that, a linear sliding movement of the lock on activator results in pivotal movement of the locking arm.

11. A hammer drill as claimed in claim 10 wherein the axis 42 of pivot of the locking  
arm 38 is perpendicular to the direction in which the lock on activator slides.

20

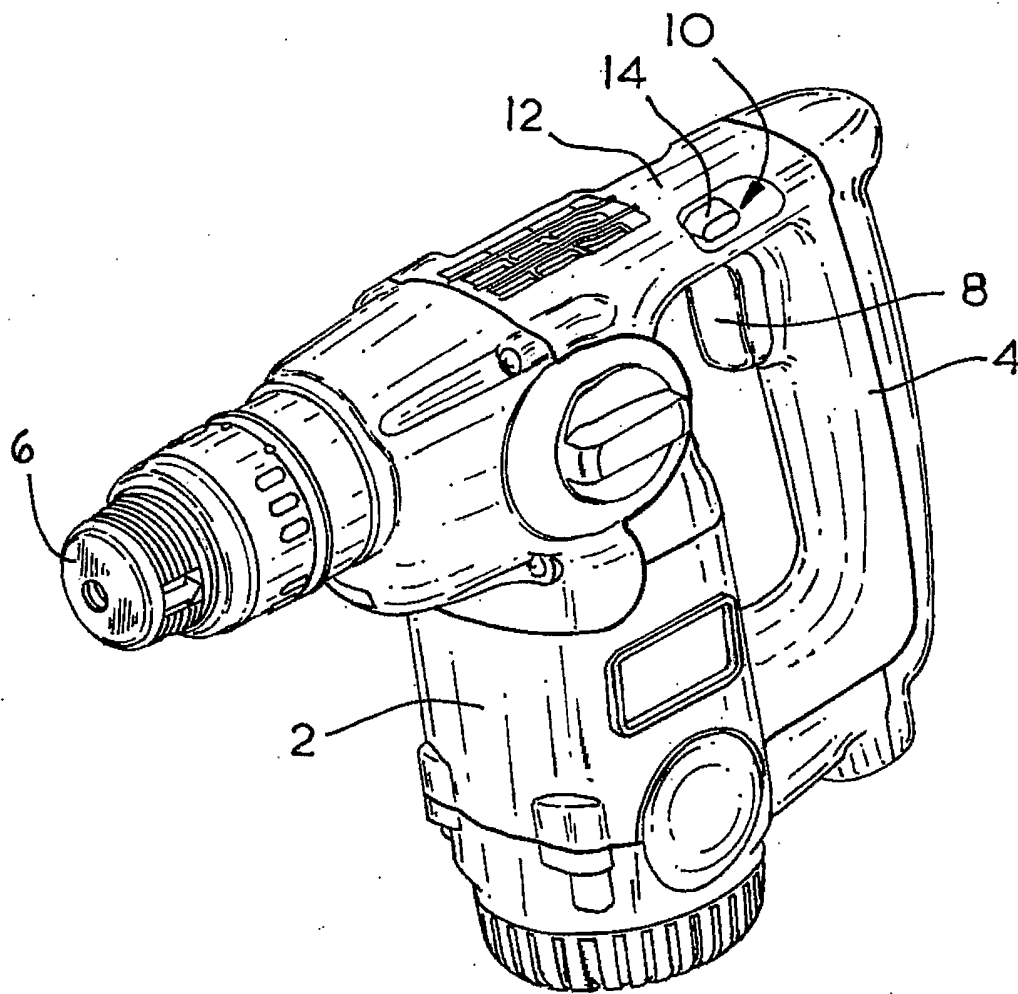


FIG. 1

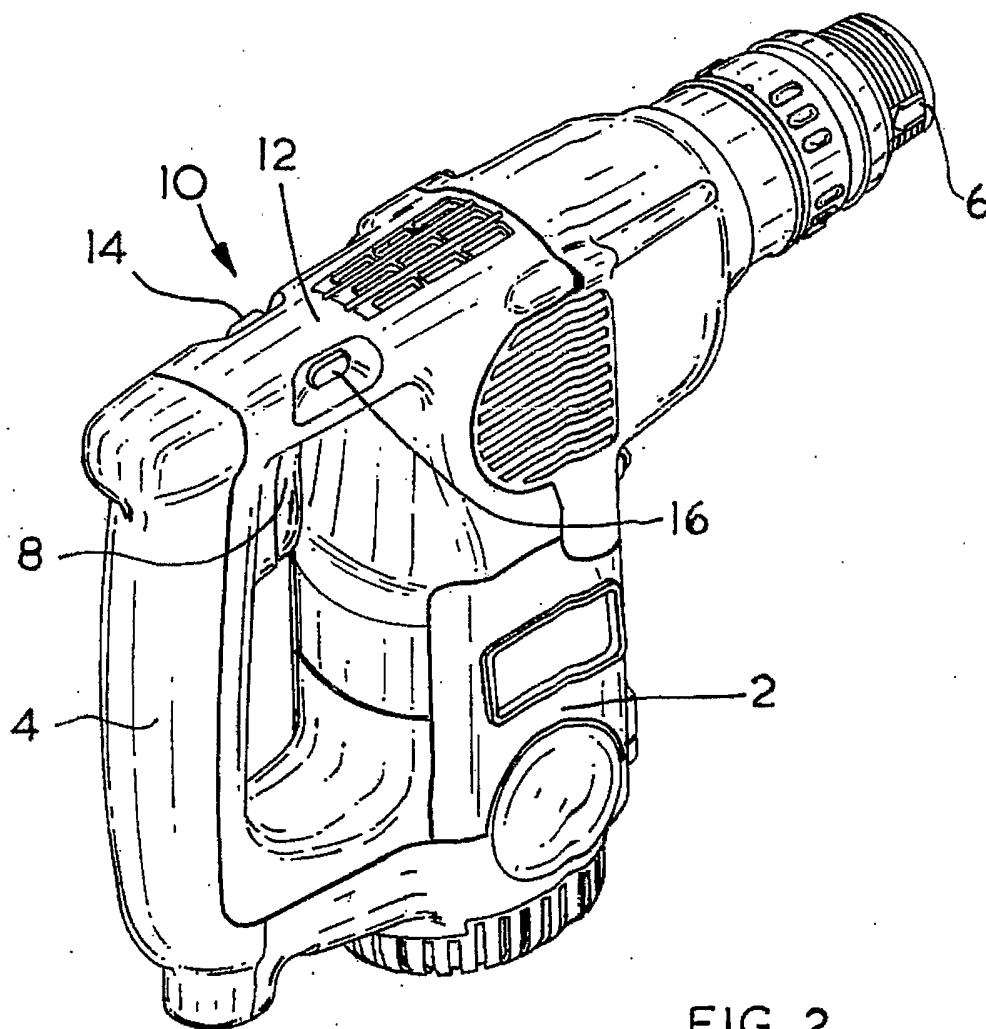


FIG. 2

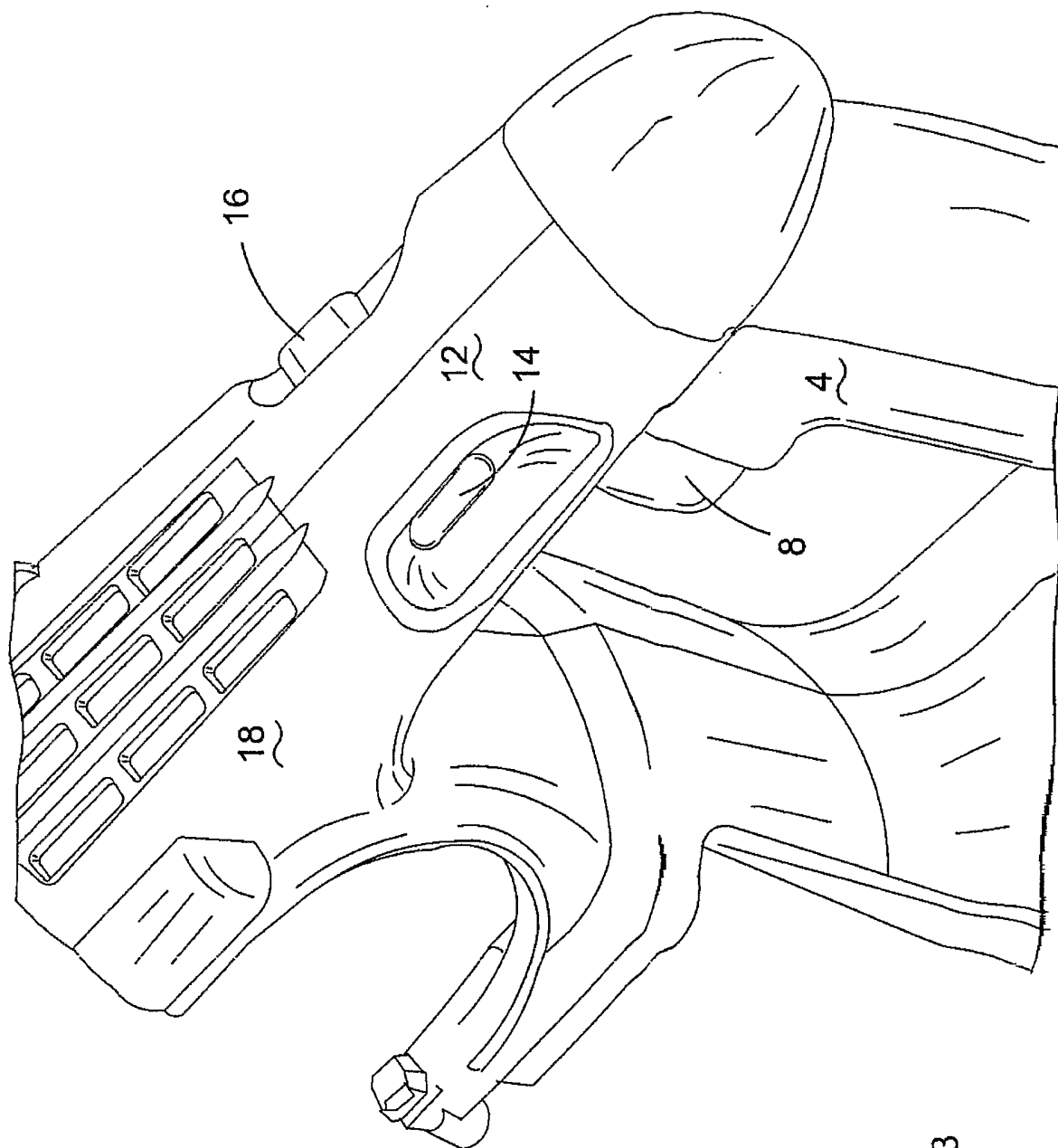


FIG.3



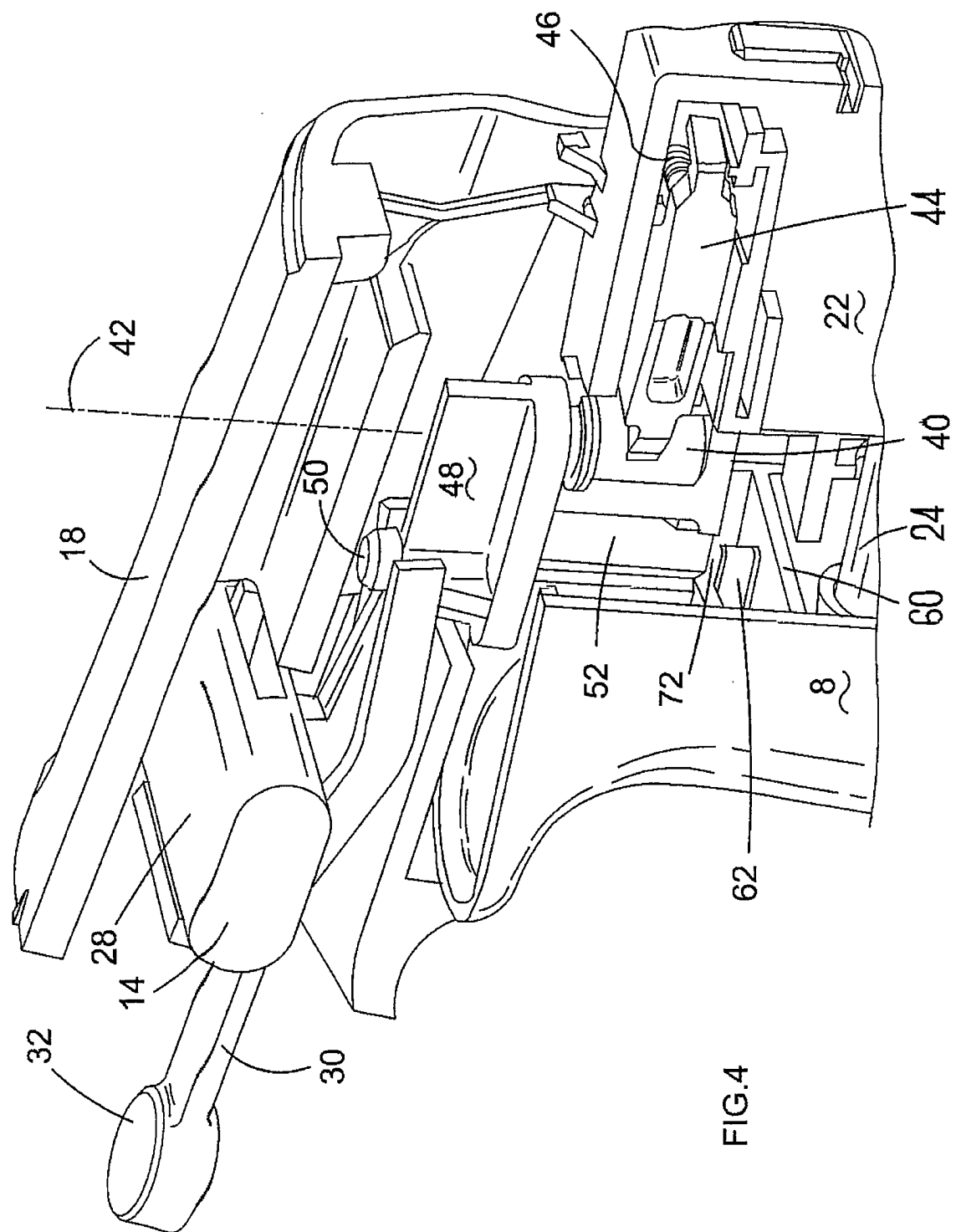


FIG.4

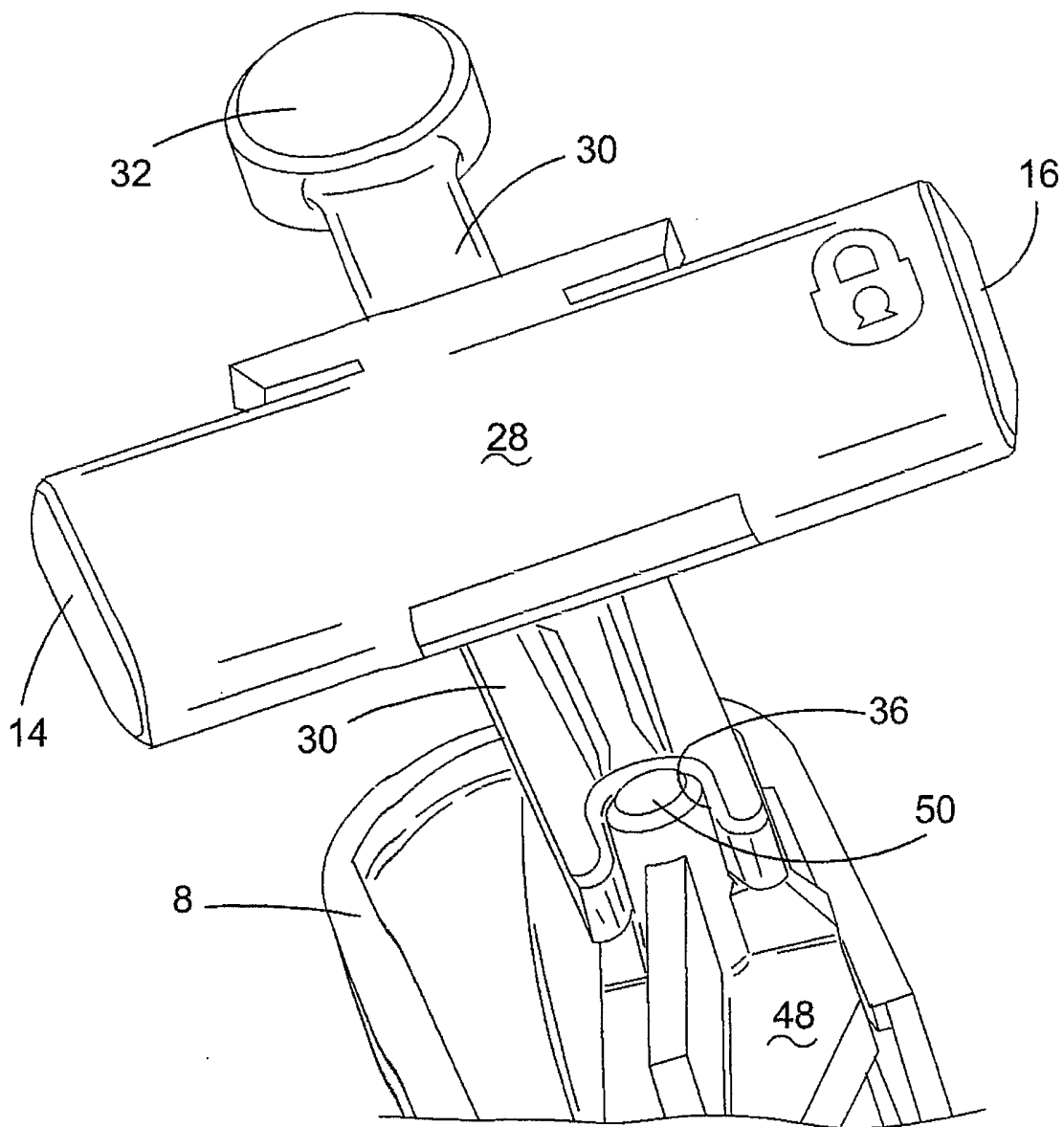


FIG.5

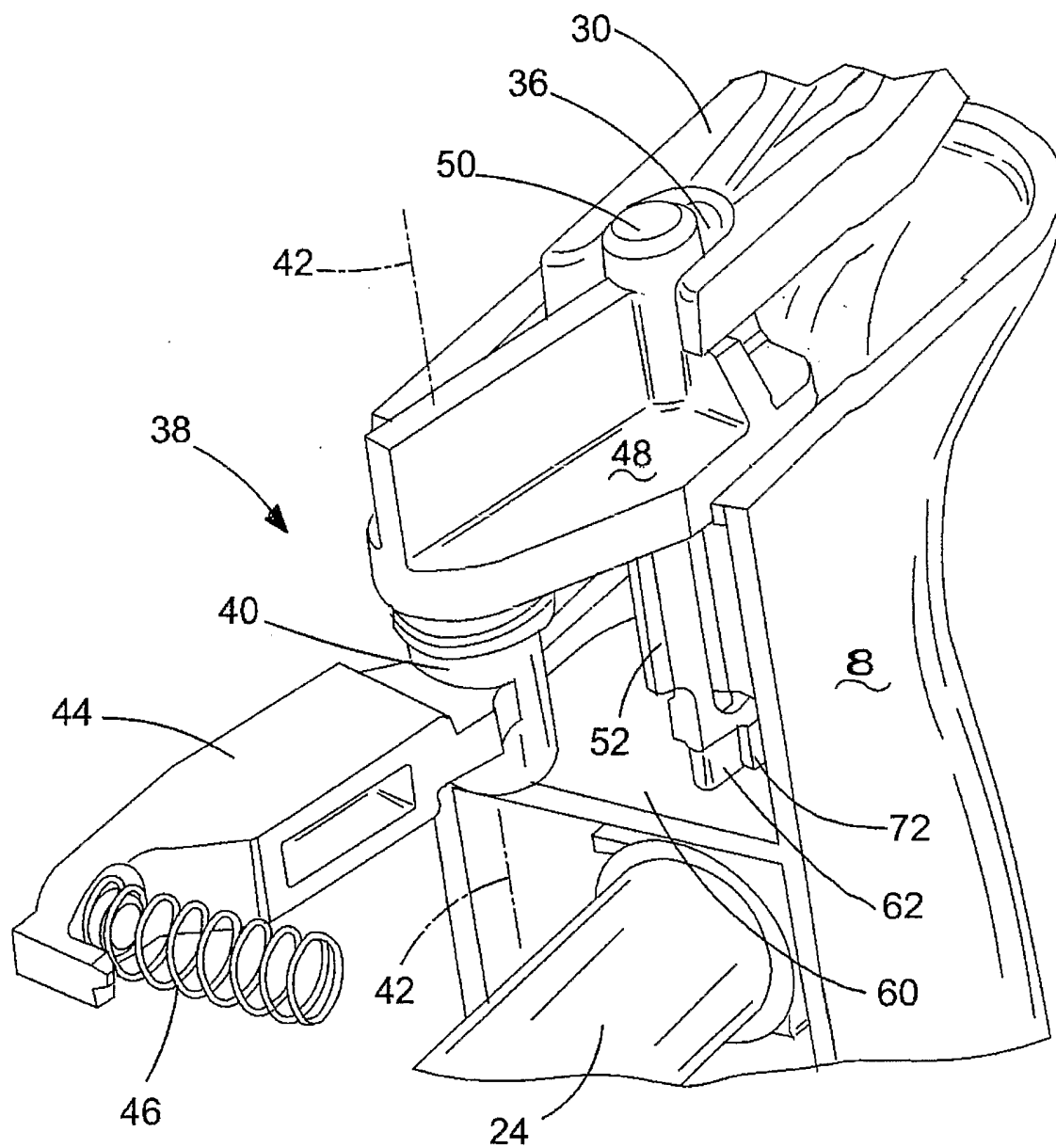
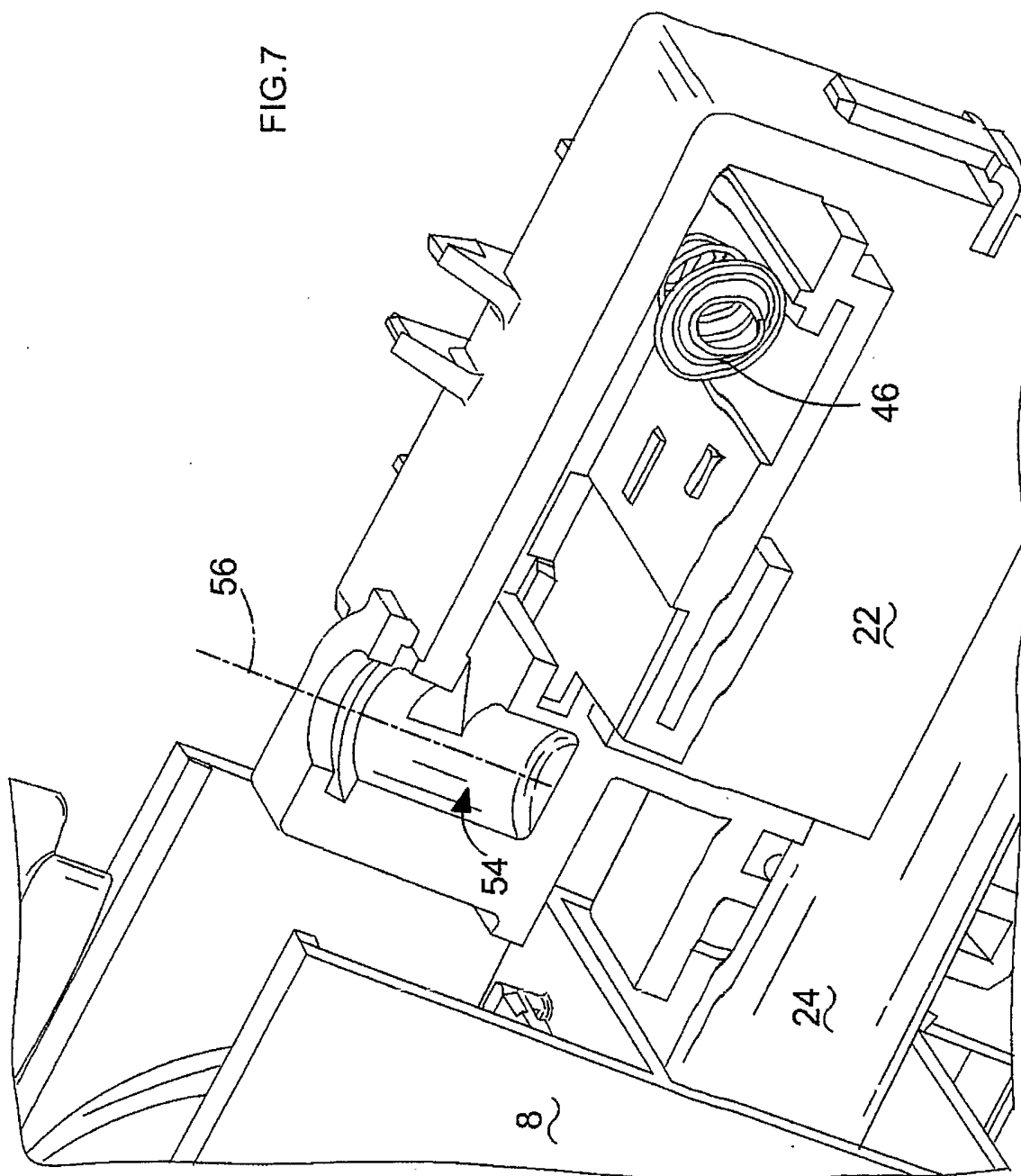


FIG.6

FIG.7



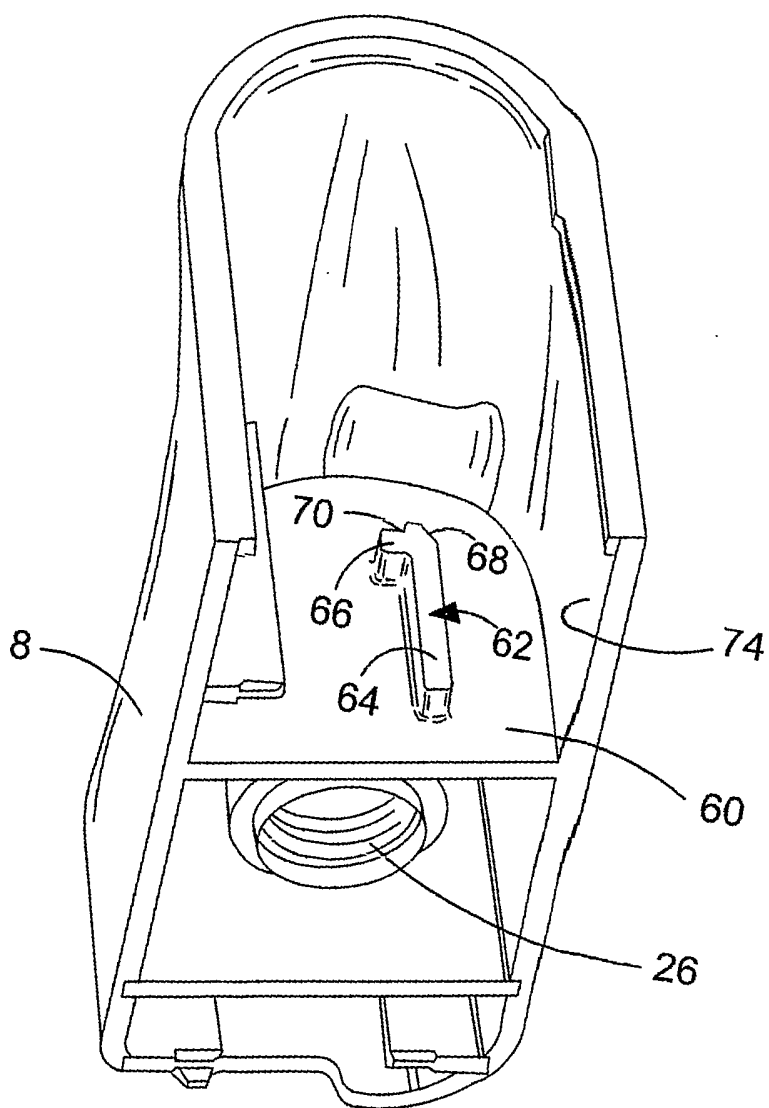


FIG.8

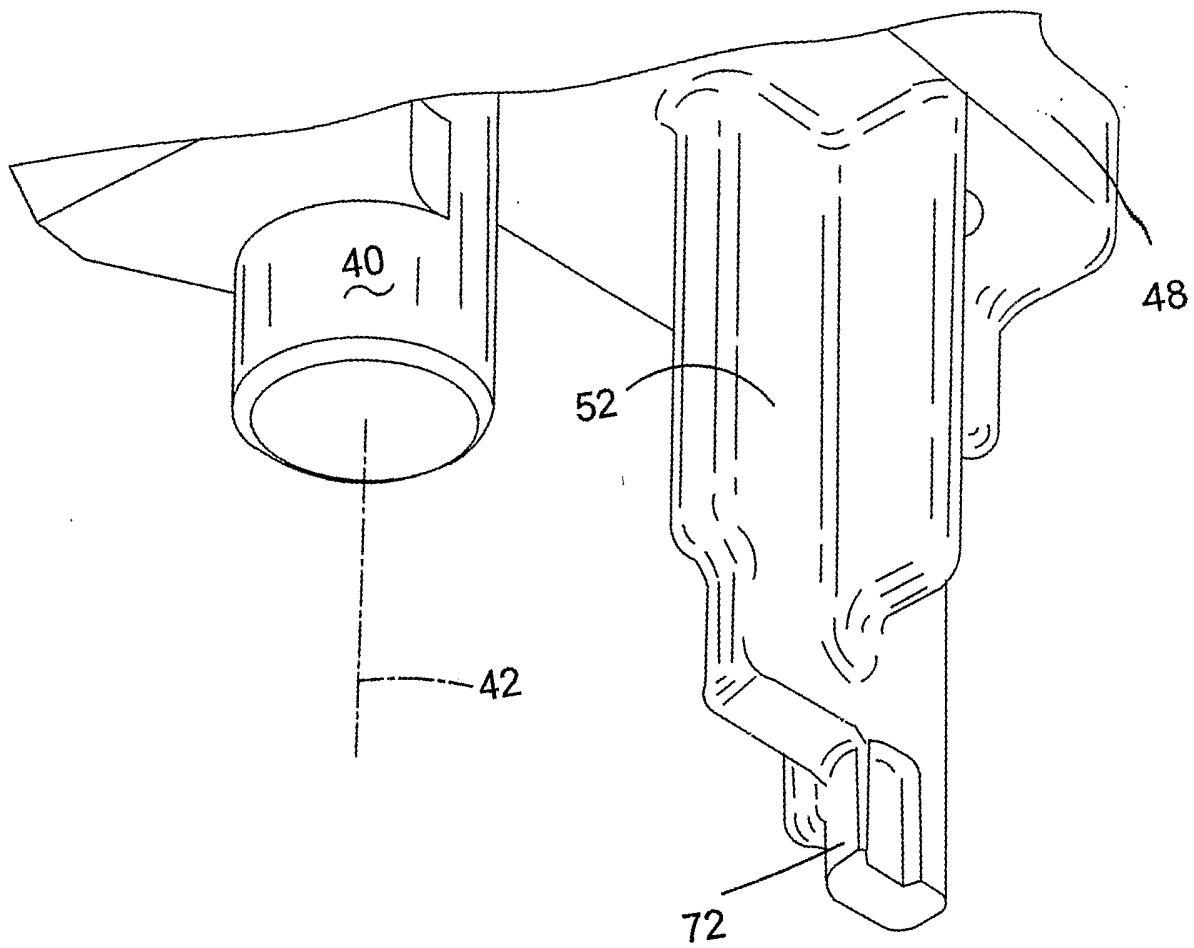


FIG.9

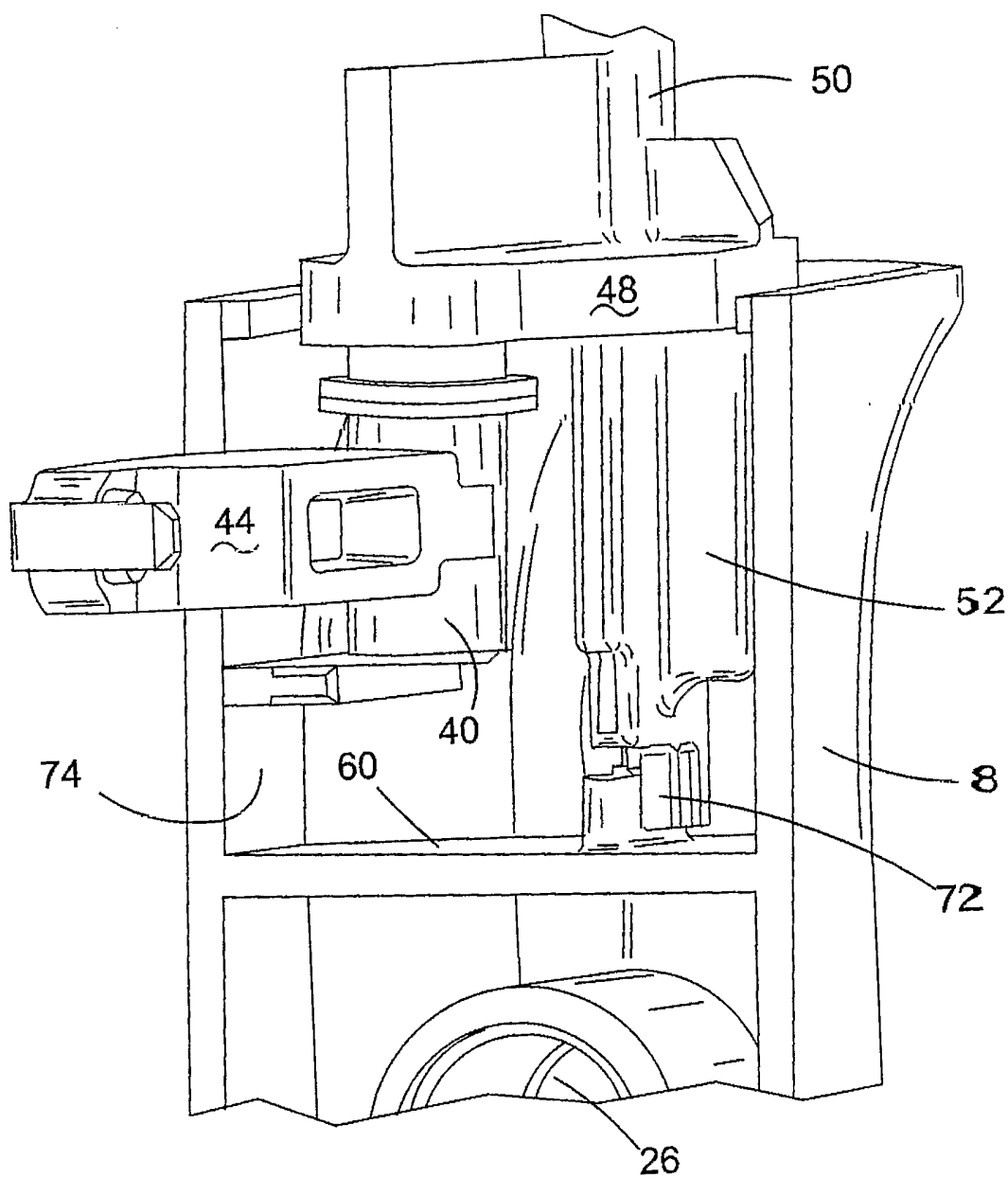


FIG.10

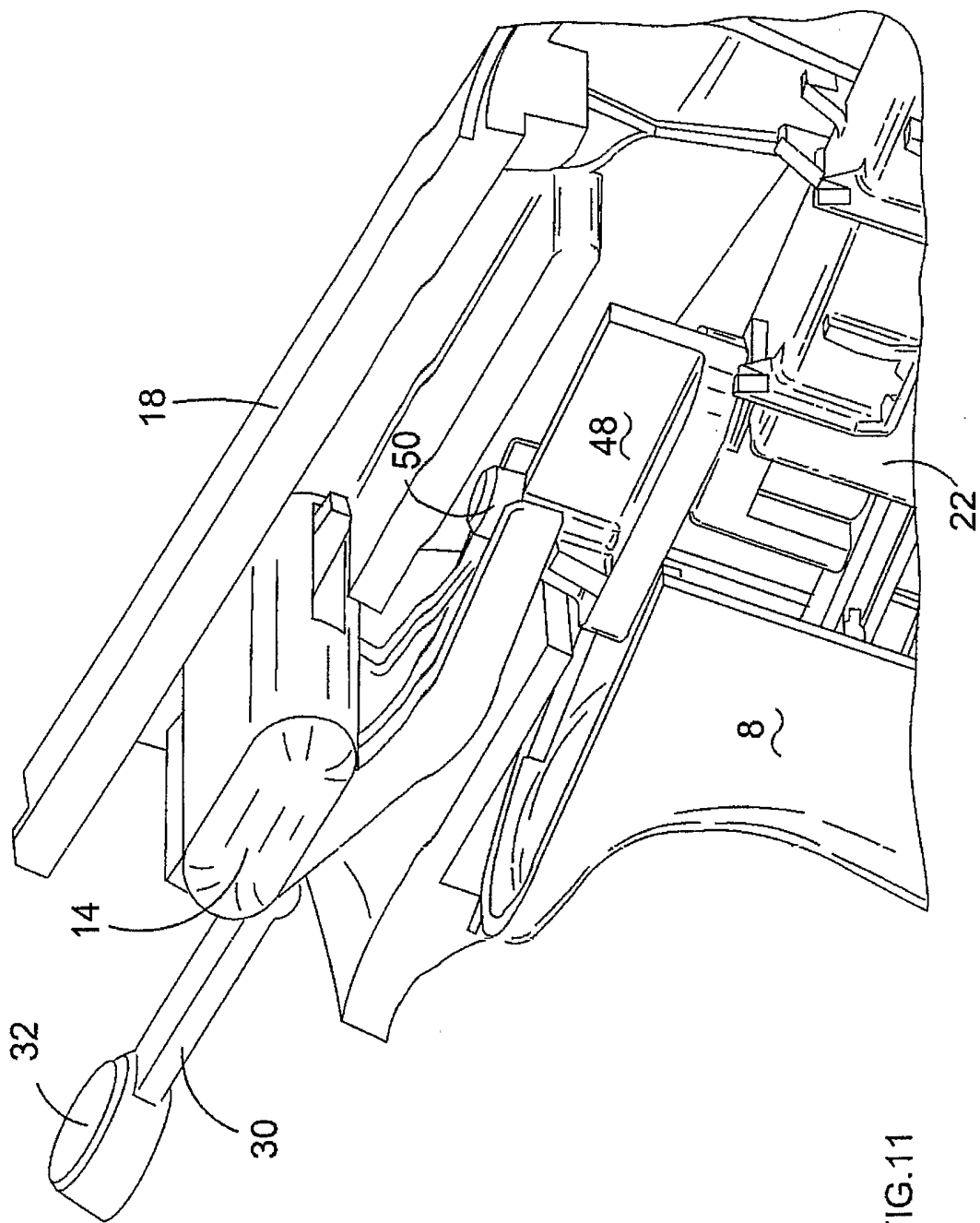


FIG.11



**INTERNATIONAL SEARCH REPORT**

International Application No  
PCT/EP2005/010252

**A. CLASSIFICATION OF SUBJECT MATTER**  
 B25F5/00      B25F5/02      H01H13/08      H01H13/62

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)  
 B25F H01H

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, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 971 906 A (SAHRBACKER ET AL) 27 July 1976 (1976-07-27) column 1, lines 40-45 column 1, line 62 - column 2, line 9 column 2, line 32 - column 3, line 32 figures	1-3,5,6, 8,9
Y	-----	4,7,10, 11
Y	DE 80 10 217 U (METABOWERKE GMBH & CO, 7440 NUERTINGEN) 10 July 1980 (1980-07-10) page 1, line 1 - page 2, line 5 page 6, line 12 - page 9, line 5 figures	4,7,10, 11
A	----- -/--	1

Further documents are listed in the continuation of box C.

Patent family members are listed in 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  <b>15 November 2005</b>	Date of mailing of the international search report  <b>22/11/2005</b>
--	---

Name and mailing address of the ISA 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	Authorized officer  <b>Chariot, D</b>
--	---

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2005/010252

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 313 116 A2 (BLACK & DECKER INC) 21 May 2003 (2003-05-21) paragraph '0020! figure 6	1,10
A	----- US 4 381 037 A (CUNEO ET AL) 26 April 1983 (1983-04-26) column 3, line 66 - column 4, line 21 figures 3,4 -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/EP2005/010252

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 3971906	A	27-07-1976	CA 1037530 A1	29-08-1978
			DE 2548656 A1	06-05-1976
			FR 2290016 A1	28-05-1976
			GB 1519315 A	26-07-1978
			IT 1048370 B	20-11-1980
			JP 1221364 C	26-07-1984
			JP 51069282 A	15-06-1976
			JP 58050802 B	12-11-1983
			<hr/>	
DE 8010217	U	10-07-1980	NONE	
<hr/>				
EP 1313116	A2	21-05-2003	CN 1420508 A	28-05-2003
			GB 2382226 A	21-05-2003
			US 2003094356 A1	22-05-2003
<hr/>				
US 4381037	A	26-04-1983	DE 3066019 D1	02-02-1984
			EP 0028029 A1	06-05-1981
<hr/>				