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(12) # EUROPEAN PATENT APPLICATION

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(54) **Method of removing stuck gaskets and pneumatic impact tool therefor.**

(57) A method and pneumatic impact tool for removing stuck gaskets. The tool has a tubular housing (10) with an impact head (12) secured in and extending outwardly from one end of the housing and a valve (15) secured within the housing but spaced from the impact head so that a piston chamber (16) is formed within the housing. The valve has an inlet port (33) adapted to be connected to a source of pressurized fluid and two outlet ports (25,26) for the alternate release, respectively, of pressurized fluid. One outlet port (25) opens directly into the piston chamber (16) while the other (26) is connected by a passage (29) to the piston chamber immediately adjacent the impact head. At least one exhaust port (18,19) is provided through the housing for exhausting pressurized fluid from the piston chamber when the piston (17) reaches the end of its travel in each direction of its stroke. The housing is adapted to be connected to a source of pressurized fluid so that pressurized fluid enters the inlet port (31-32) of the valve.

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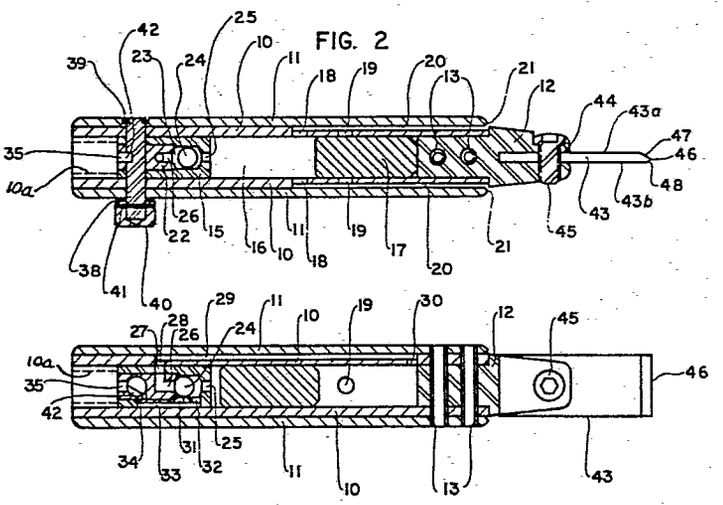
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FIG. 2
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FIG. 3

METHOD OF REMOVING STUCK GASKETS AND PNEUMATIC IMPACT TOOL THEREFOR

The invention concerns a method of removing stuck gaskets and a pneumatic impact tool for removing stuck gaskets from engine blocks and the like.

In the repair of automobile and other types of engines it is sometimes necessary to remove the cylinder head from the engine block or to remove other parts which are sealed using a gasket. In most cases, the gasket sticks to one or the other of the pieces or to both and then must be removed before a new one can be installed. Present practice is normally to remove the gasket with a hand chisel with or without a hammer, or by chemical means using an acid solution. Using a chisel is time consuming, and, if the chisel is not held correctly, damage may result to the engine block or to the person using the chisel. Using an acid solution requires precautions to avoid getting the solution on areas other than the gasket and to avoid getting the solution on the user.

Conventional power chisels cannot be used satisfactorily for removing stuck gaskets, because the stroke of the chisel blade is too long and powerful and may damage the engine block. Further, a blade moving in relation to the tool itself makes the tool very difficult to control. In such cases, the tool tends to jump around during use, thereby further damaging the engine block and allowing the blade thereon to rotate. No small, hand-held impact tool has been available which will produce between about 8 and 20 pounds of impact, that is easily controllable and manipulated, and that has a blade suitable for use in removing gaskets.

According to the invention, there is provided

a method of removing a stuck gasket from an engine block or the like, characterized by the steps of: holding a power impact tool that produces between about 8 and 20 pounds of impact force (3.6 to 9 kg.) and that has a blade attached thereto wherein at least one blade-edge defines a surface which is beveled and rests flat on the engine block surface and which blade is not movable apart from the tool itself, so that the blade edge is against the gasket at its interface with the engine block; and impacting the tool against the gasket for controlled removal of the gasket without damage to the associated surface.

Further, there is provided a pneumatic impact tool for removing a stuck gasket from an engine block or the like, comprising a housing which is adapted to have an implement attached to its outward end, characterized by an impact head secured in and extending from one end of the housing; valve means secured within said housing but spaced from said impact head defining a piston chamber within said housing, said valve means having an inlet port means adapted to be connected to a source of pressurized fluid and two outlet ports for the alternate release, respectively, of pressurized fluid, only one of said outlet ports, opening directly into said piston chamber; a piston freely slidably mounted within said piston chamber; passage means connecting the other outlet port with the piston chamber immediately adjacent to the impact head, at least one exhaust port through said housing for exhausting pressurized fluid from said piston chamber when the piston reaches the end of its travel in each direction of its stroke; and means for connecting a source of pressurized fluid to said housing to supply pressurized fluid to the valve inlet port means.

In the accompanying drawings:

Fig. 1 is a pictorial view of a tool showing it in use for removing a stuck gasket from an engine block;

Fig. 2, a vertical axial section taken through the tool of Fig. 1, disconnected from the air hose and

showing the piston against the impact head; and

Fig. 3 is a horizontal axial section of the tool but showing the piston at the opposite end of its stroke, the tool-carrying end of the impact head being shown in elevation.

In an illustrated embodiment a pneumatic impact tool has a tubular housing, namely an inner tubular housing 10, Figs. 2 and 3, surrounded by a snugly fitting, outer tubular housing 11. An impact head 12 is secured in one end of the inner tubular housing 10 by means of rollpins 13.

Fitted snugly within the inner tubular housing 10 and spaced from the impact head 12 is a valve housing 15. A piston chamber 16 is formed within tubular housing 10 between impact head 12 and valve housing 15, within which a piston 17 is free to slide. Respective sets of exhaust ports 18 and 19, as illustrated, extend through housing 10 to grooves or flattened areas 20 on the outer surface of housing 10. Each set of exhaust ports preferably has two ports located on respectively opposite sides of the housing, as shown in Fig. 2. The respective sets 18 and 19 are displaced from each other longitudinally along the length of the housing.

The grooves or flattened areas 20 extend from the innermost exhaust ports 18 on each side of the housing to the forward end of the housing, where they open to the atmosphere between outer housing 11 and impact head 12. Outer housing 11 is chamfered at its forward end about its inner edge 21 to facilitate the opening of the grooves or flattened areas 20 to the atmosphere.

While the arrangement illustrated is preferred, flattened areas 12a, Fig. 1, could be provided on the impact head to correspond with flattened areas 20 on the inner housing. It is preferred to have the exhaust fluid exit at the front of the tool to blow away any debris that is formed during the use of the tool so that the working area is kept clear. It is also preferable to route the exhaust fluid through a passage rather than directly out

into the atmosphere because it makes operation of the tool more quiet.

A valve means is formed by valve housing 15 with valve insert 22 within one end of such housing, so that a valve chamber 23 is formed. A valve ball 24 is located within valve chamber 23. An outlet port 25 opens from the center of one end of the valve chamber directly into piston chamber 16, and a passage 26 extends from the center of the opposite end of valve chamber 23 to intersect a port 27 that extends radially to the outside of the valve body 15. Port 27 in valve body 15 mates with port 28 through inner housing 10 which as illustrated connects with a groove or flattened area 29 that extends from port 28 longitudinally along the surface of inner housing 10 to a port 30. Port 30 extends from the groove or flattened area 29 through inner housing 10 to the piston chamber 16 immediately adjacent to impact head 12. With outer housing 11 in place, the groove or flattened area 29 forms a closed passageway between ports 28 and 30. Seats for ball 24 are provided at both ends of the valve chamber 23 about port 25 and passage 26, respectively.

Valve inlet ports 31 and 32 (Fig. 3) as illustrated extend from a groove or flattened area 33 on the outside of valve housing 15, through the valve housing to the respective ends of valve chamber 23. The other end of the groove or flattened area 33 connects with a passage 34 which intersects a passage 35. Passage 35 opens into the end of inner housing 10. The end of inner housing 10 is adapted to be connected to a source of pressurized fluid, such as to the usual compressed air line. For this purpose, the inside walls of the inner housing next to the valve may be threaded as at 10a so that a normal screw fitting 36, Fig. 1, of an air hose 37, may be easily connected. As illustrated, a valve stem 38 extends through the housings and the intersection of passages 34 and 35. Valve stem 38 is secured in place by an E clip 39 on one end and knob 40 secured to the other end by pin 41. A slot 42 is located

on stem 38 at the intersection of passages 34 and 35. As stem 38 is rotated, the slot moves from a position where stem 38 completely blocks the intersection of passages 34 and 35, to a position as shown in Fig. 3, where the slot interconnects passages 34 and 35 for flow of pressurized fluid. At positions in between, fluid flow is restricted to various degrees. With valve body 15 snugly fitted into tubular inner housing 10, flattened area 33 forms a closed passage for the flow of pressurized fluid from passage 34 to valve inlet ports 31 and 32.

During operation of the tool, pressurized fluid, preferably compressed air, is fed to valve chamber 23 via inlet ports 31 and 32. Piston 17 reciprocates within piston chamber 16 alternately uncovering exhaust ports 18 or exhaust ports 19 at respective ends of its stroke. With the piston as shown in Fig. 2, exhaust ports 18 are uncovered opening the piston chamber on the valve side of the piston to the atmosphere. This causes minimum pressure through valve outlet port 25. With this minimum pressure, the pressurized fluid through inlet port 31 tends to move ball 24 away from outlet passage 26 toward outlet port 25. Since exhaust ports 19 are blocked, pressure can build up in the piston chamber adjacent impact head 12. This pressure also builds up in port 30, passage 29, ports 28 and 27 and passage 26 leading from the valve to the piston chamber. This build up of pressure causes ball 24 to move against port 25 thereby blocking it. The piston 17 is beveled about its edge so that there is space for the pressurized fluid to enter the piston chamber even with the piston against the impact head. With port 25 blocked and passage 26 open, pressure builds up in the piston chamber and causes the piston to move in the piston chamber toward the valve. As the piston moves, it uncovers exhaust ports 19. The pressure in the piston chamber is relieved causing ball 24 in the valve to shift in a fashion similar to that described above, to a position as shown in Fig. 3, so that passage 26 is blocked

and port 25 is open. This causes the pressure to build up between the valve and piston so that the piston changes its direction of travel and moves toward the impact head.

The exhaust ports are located so that the piston will impact against the impact head when traveling toward it, but when traveling in the opposite direction, the piston will be stopped and its direction changed without impacting against the valve or any other part of the tool. Thus, impact is given to the tool in one direction only as the piston strikes the impact head.

The impact head is adapted to have a blade or other implement attached thereto. As illustrated, a blade 43 fits into a slot 44 in the impact head and is secured in place by a cap bolt 45. The blade shown is specifically adapted for removing gaskets from engine blocks or the like to which they often stick, and has a blade edge 46 defined by two surfaces 47 and 48, at least one of which is beveled from the respective opposite blade face 43a or 43b. As illustrated, both surfaces 47 and 48 are beveled at angles of about 30° from surfaces 43a and 43b respectively.

The tool is placed on an article such as engine block 49 (Fig. 1), from which a stuck gasket 50 is to be removed. With the tool operating, it is held against the gasket to be removed, and moved against such gasket. The gasket peels away from the engine block as illustrated. The beveled surface 48 allows the tool to be held at an angle to the block, as shown, yet still have a flat surface in contact with the block. In this way, the blade edge 46 and impact of the tool is directed to the engine block-gasket interface rather than to the block itself and does not cause damage to the block.

With the impact head secured to the tool so that it cannot move apart from the tool itself, the impact is imparted to the tool as a whole rather than to the blade individually. This limits the potential stroke of the tool and makes it very easy to manipulate and control. The impact can be very carefully directed, and the tool

will not jump around on the surface being worked on.

With the tool illustrated, the piston stroke is about 1.25 inches (0.5 cm.). The piston weighs about one ounce in relation to the tool's total weight of about 28 ounces (0.8 kg.). The tool is preferably operated with compressed air of 90 pounds per square inch (6.3 kg/sq.cm.) which causes the piston to complete about 4800 strokes per minute. The total impact produced by the tool is preferably between eight and twenty pounds (3.6 to 9 kg.) preferably about seventeen pounds (7.7 kg.). Below about eight pounds (6.3 kg.) of impact force the tool has no effective advantage over a normal hand chisel. Above about twenty pounds (9 kg.) of impact force the tool becomes difficult to control and may cause damage to the article being worked on.

The actual impact and frequency of the piston stroke may be varied by varying the amount and pressure of fluid to the tool. This may be adjusted by turning knob 40 which, as described above, controls the fluid flow to the valve. It will also vary with the pressure of the supply. Thus, if the pressure of the supply is less than the preferred 90 pounds per square inch (6.3 kg./sq.cm.), the frequency of the piston stroke will be less and the impact less. Wide variations in supply pressures are usable, however.

The dimensions of the tool will also affect its performance. If the weight of the piston is changed or the length of the stroke of the piston is changed, the impact produced and frequency of piston stroke at a given fluid pressure will be different. Thus, the tool can be designed to operate effectively on various input pressures. The total size and weight of the tool, of course, affects its maneuverability so must be considered in any changes made.

The embodiment has been described as having two sets of exhaust ports. This allows a tool with the proportions illustrated to operate as described. In some

circumstances, where the length of the piston chamber is greater in proportion to the length of the piston than that illustrated, only one set of exhaust ports is necessary. Further, while a set of exhaust ports has been described and illustrated, a single exhaust port where a set has been indicated is satisfactory. The two ports comprising a set is preferred because it provides greater exhaust capacity.

The tool has been illustrated and described with reference to an embodiment particularly adapted for use in removing gaskets. It will be understood, however, that the invention can be used in numerous other applications, some similar to removing gaskets, such as the separation of materials along an interface, or some dissimilar uses, such as carving wood. In certain applications, the implement attached to the tool will be different than the one shown. A wide variety of implements can be used with the tool depending upon the desired use.

CLAIMS:

1. A method of removing a stuck gasket from an engine block or the like, characterized by the steps of: holding a power impact tool that produces between about 8 and 20 pounds of impact force (3.6 to 9 kg.) and that has a blade (43) attached thereto wherein at least one blade-edge (46) defines a surface (48) which is beveled and rests flat on the engine block surface (49) and which blade (43) is not movable apart from the tool itself, so that the blade edge (46) is against the gasket (50) at its interface with the engine block (49); and impacting the tool against the gasket (50) for controlled removal of the gasket without damage to the associated surface (49).

2. A pneumatic impact tool for removing a stuck gasket from an engine block or the like, comprising a housing (10-11) which is adapted to have an implement (43) attached to its outward end, characterized by an impact head (12) secured in and extending from one end of the housing (10-11); valve means (15) secured within said housing but spaced from said impact head defining a piston chamber (16) within said housing, said valve means having an inlet port means (33) adapted to be connected to a source of pressurized fluid and two outlet ports (25,26) for the alternate release, respectively, of pressurized fluid, only one of said outlet ports (25), opening directly into said piston chamber; a piston (17) freely slidably mounted within said piston chamber; passage means (29) connecting the other outlet port (26) with the piston chamber (16) immediately adjacent to the impact head (12), at least one exhaust port (18-19) through said housing (10) for exhausting pressurized fluid from said piston chamber when the piston reaches the end of its travel in each direction of its stroke; and means (37) for connecting a source of pressurized fluid to said housing to supply pressurized fluid to the valve inlet port means (33).

3. The tool of Claim 2, characterized in that the valve means (15) includes a valve chamber with an

outlet port (25,26) extending from each end thereof, a ball (24) within said valve chamber adapted to seat against one or the other of the outlet ports, and two inlet ports (31,32), each one entering the valve chamber radially, but adjacent to opposite ends of the valve chamber so that when the valve ball is seated against one end of the chamber compressed fluid can pass through an inlet port at the opposite end of the chamber and through the outlet port at that end.

4. The tool of Claim 2, characterized in that two longitudinally spaced exhaust ports (18,19) are provided in said housing (10) so that one exhaust port opens into the portion of the piston chamber (16) not occupied by the piston (17) when the piston is at one end of its stroke and so that the other exhaust port opens into the portion of the piston chamber not occupied by the piston when the piston is at the opposite end of its stroke.

5. The tool of Claim 4, characterized in that the passage means (29) is a longitudinal passage in an inner tubular housing (10) which connects said other port (26) and a second port to said chamber (16).

6. The tool of Claim 4, characterized in that there are two pairs of said longitudinally spaced exhaust ports, each port of a pair being aligned longitudinally but extending radially from opposite sides of the housing (10), the passage means (29) connecting said at least one exhaust port to the atmosphere being a groove or flattened groove area along the outer surface of each of the opposite sides of the inner tubular housing, each groove or flattened area connecting one of the exhaust ports of each pair and the edge of the inner tubular housing, so that a passage is formed between the inner and outer tubular housings from the exhaust ports to the atmosphere.

7. The tool of Claim 2, characterized in that the valve means (15) includes means (40) for regulating the flow of pressurized fluid.

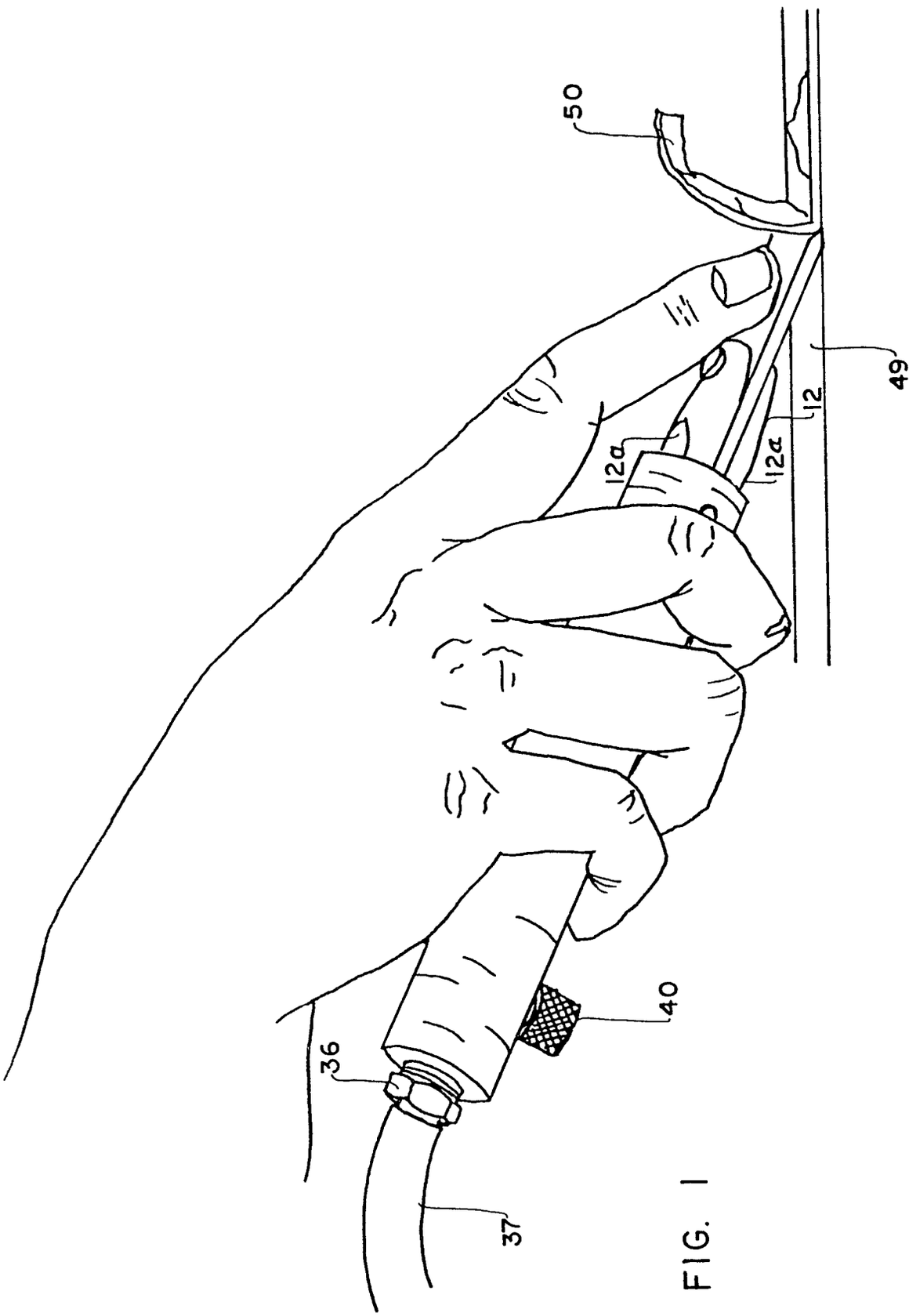

FIG. 1

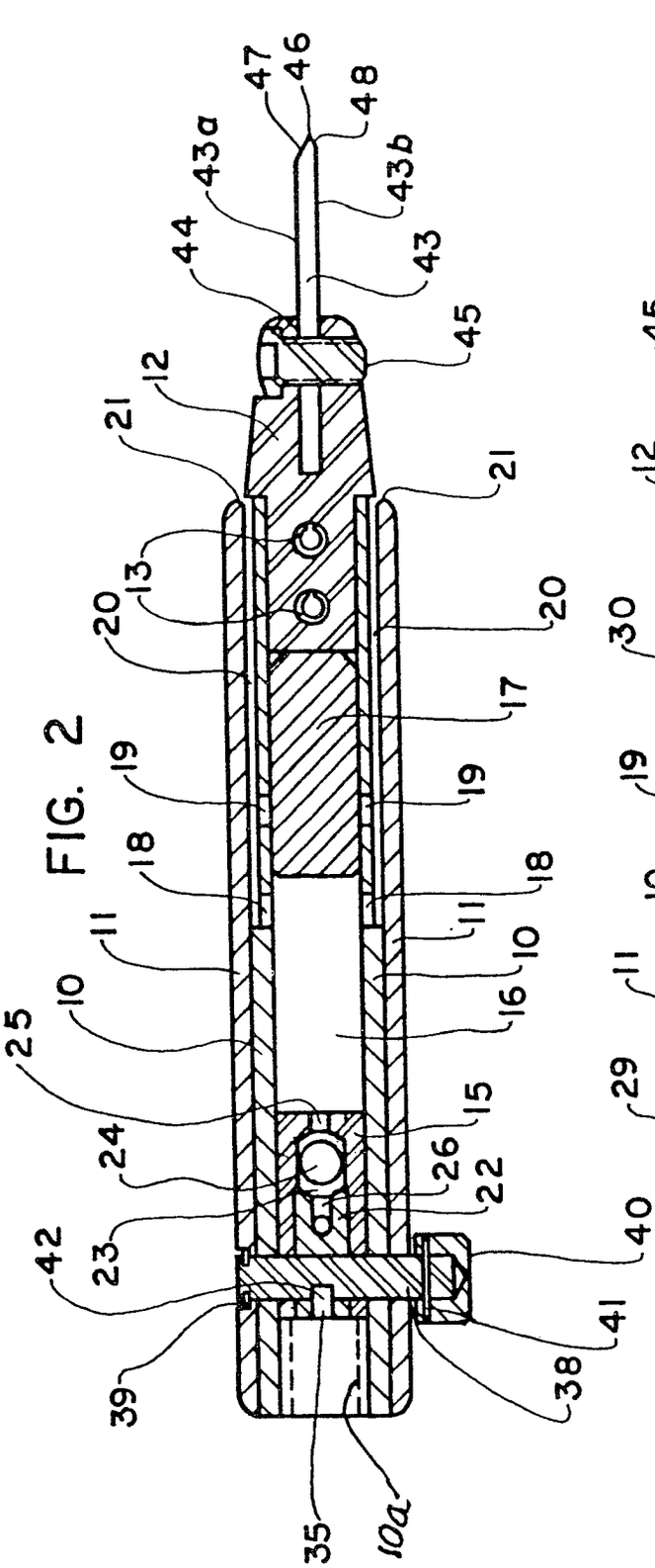
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FIG. 2

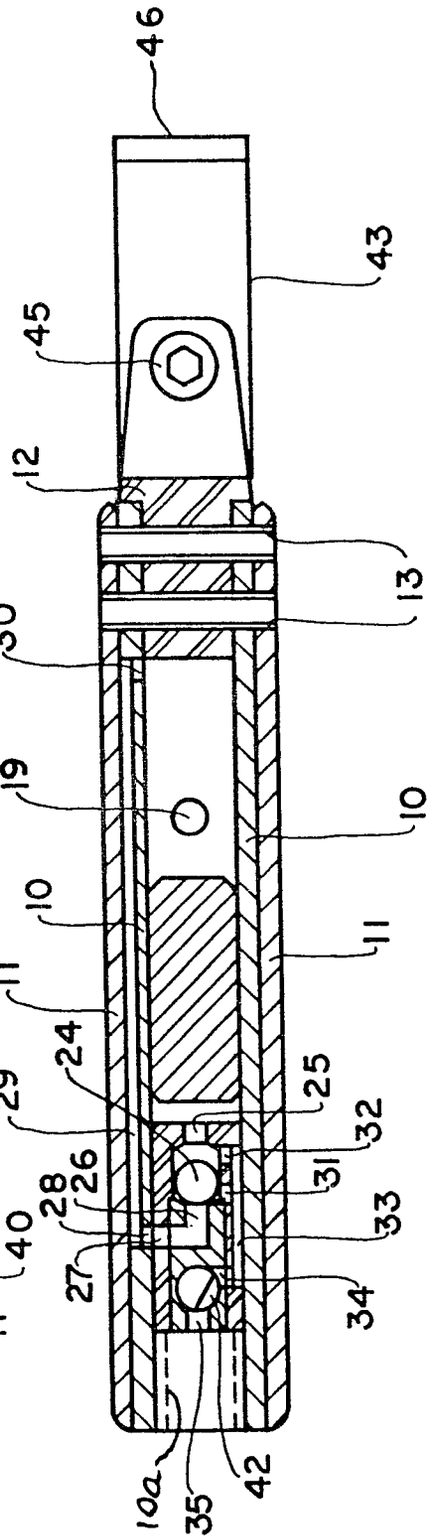
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FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 80 30 2693.9

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 4 080 734 (D.R. BARBOUR) * claims 1 to 9; fig. 4, 6, 8 *	1
	US - A - 3 279 060 (D.L.G. YOUNG) * claims 1 to 8; fig. 1 to 14 *	1
	US - A - 2 334 403 (F.P. FORSS) * page 3, right column, line 22 to page 4, right column, line 22; fig. 1, 2, 7 *	2,4,5, 7
	DE - C - 481 431 (FLOTTMANN AG) * page 2, lines 36 to 57; fig. 1 *	3
	US - A - 1 636 813 (G. ELSTER) * page 1, lines 39 to 94; fig. 1, 5 *	3

CLASSIFICATION OF THE APPLICATION (Int. Cl.3)

B 25 D 17/02
B 25 D 9/16

TECHNICAL FIELDS SEARCHED (Int.Cl.3)

B 25 D 9/00
B 25 D 17/02

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
Berlin	21-11-1980	HOFFMANN