

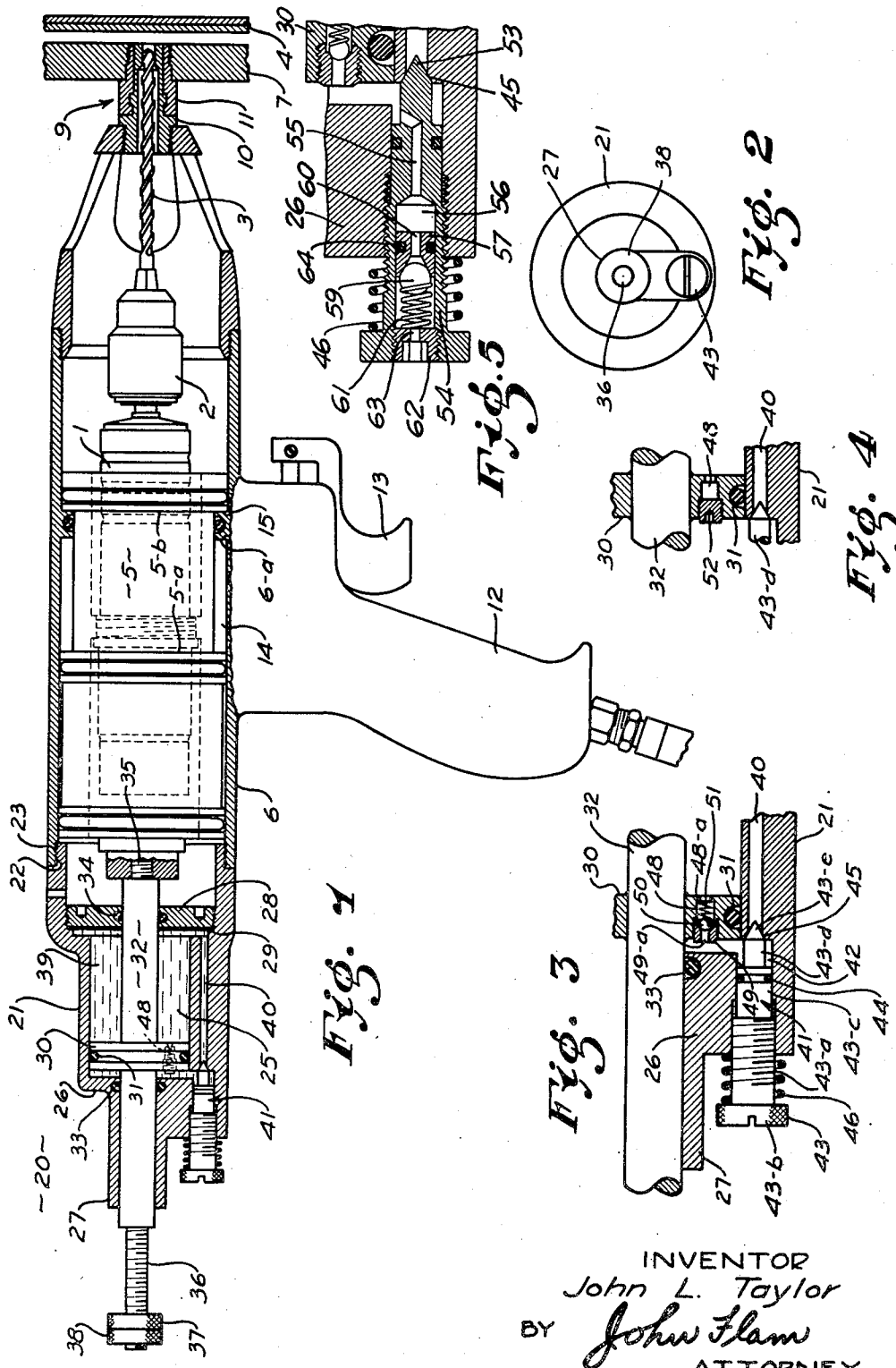
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J. L. TAYLOR

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DASH POT FOR PORTABLE TOOLS

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INVENTOR
John L. Taylor
BY *John Flam*
ATTORNEY

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DASHPOT FOR PORTABLE TOOLS

John L. Taylor, La Habra Heights, Calif., assignor
to Keller Tool Company, Grand Haven, Mich.

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2 Claims. (Cl. 188-97)

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This invention relates to a feed mechanism for power operated tools, such as portable drills, of the type in which the drill or other cutting tool is advanced toward the work and retracted therefrom by pressure fluid operated means. It is common in such a tool to control the feeding rate by means of a dashpot, including a cylinder and piston therein, and a valved by-pass for controlling the passage of oil or other liquid from one end of the cylinder to the other so as to govern the rate of advance of the tool.

The primary object of the present invention is to provide in a feed mechanism of the character stated means of a simple and effectual character for maintaining under pressure the oil or other liquid in the entire space on opposite sides of the piston and in the by-pass so as to insure that such space shall be completely filled with oil or other liquid.

A further object is to facilitate the filling of the dashpot spaces with oil or other liquid.

A portable power operated drilling apparatus is described and claimed in an application filed in the name of John L. Taylor on March 15, 1946, under Serial No. 654,533, and entitled "Pneumatic drill guide." By way of example, the control mechanism of the invention is shown and described in connection with this apparatus in the accompanying drawings and specification. This showing will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this description is not to be taken in a limiting sense, since the mechanism may be used with other forms of such apparatus, the scope of the invention being best defined by the appended claims.

In the drawings:

Figure 1 is an elevation, partly in section, showing the feed mechanism of the invention;

Fig. 2 is an end elevation, as seen from the left in Fig. 1;

Fig. 3 is a detail section showing the control valves;

Fig. 4 is a detail section showing a modified valve arrangement; and

Fig. 5 is a detail section showing a further modification.

Referring to Fig. 1, a conventional motor for operating a drill, or the like, is generally indicated by the numeral 1, and is shown as having a chuck 2 mounting a twist drill 3. The work to be drilled is indicated at 4. The motor 1 is secured in a carriage 5 movable axially in the cylindrical guide or housing 6. A drill jig 7 is provided for locating the drill 3 with respect to the

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work 4, together with a coupling means generally designated 9 for restraining the guide 6 against movement due to the reaction of the motor 1 during the drilling operation. This coupling means constitutes the subject matter of my co-pending application Serial No. 602,592. Briefly, it comprises a member 10 secured to the guide 6 and a member 11 secured to the jig 7, is provided for detachably connecting the guide 6 to the jig 7. Appropriate angular and lateral movement between the members 10 and 11 causes inter-engaging surfaces formed on the members to lock the members together, opposite movement releasing the members.

The guide 6 is provided with a hand grip 12 and a control member 13 for manipulating and controlling the operation of the drill. The member 13 is so arranged that, with the member in one position, the motor 1 is de-energized, and air under pressure is admitted to the annular chamber 14 between the internal flange 6-a on the guide and the external flange 5-2 on the carriage. This urges the drill to the retracted position shown.

Movement of the member 13 to the left by the operator will cause energization of the motor 1 and admission of air under pressure to the space 15 between the internal flange 6-a and the external flange 5-b on the carriage 5, the chamber 14 being vented. Thus the drill 3, or other tool, such as a reamer or a tap, will be rotated by the motor 1, and advanced by axial movement of the carriage 5. When the tool 3 has advanced to the desired depth, the member 13 is permitted to return to its original position de-energizing the motor 1, readmitting air pressure to the chamber 14, and venting chamber 15, causing the carriage 5 to move to the left and retract the cutter 1. This mechanism is described in detail in the said prior application.

The feed control mechanism for controlling the rate of axial movement of the carriage 5 is generally indicated by the numeral 20, and comprises a member 21 having an exteriorly threaded end portion 22 cooperating with a threaded portion 23, formed on the guide 6, to secure the mechanism 20 to the guide.

The member 21 provides a cylinder 25 closed at one end by an integral wall 26 having an elongated boss 27 thereon, and at the opposite end by a head 28 threaded into the member 21 and sealed against a shoulder 29 therein.

A piston 30 is provided in the cylinder 25, being sealed against the cylinder wall, as by a conventional O ring packing 31. The piston 30 is

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fixed on a piston rod 32 which extends in opposite directions through the closures 26 and 28 of the cylinder 25 in a fluid-tight manner, O ring packings 33 and 34 being provided about the rod 32 in the closures 26 and 28 respectively. The rod 32 is secured to the carriage 5, as by a threaded extension 35, thus connecting the piston 30 for movement with the carriage 5.

The opposite end of the rod 32 also has a reduced threaded extension 36 carrying a pair of knurled nuts 37 and 38. The nut 37 serves, by contacting the end of the boss 27 to limit the movement to the right of the piston rod 32 and connected parts, thus serving to restrict the advance or penetration of the drill or other tool 3 to a desired depth. The nut 38 serves to lock the nut 37 in adjusted position.

The cylinder 25 is filled with a suitable liquid 39, such, for example, as that commonly used with hydraulic brakes on automotive vehicles. A by-pass port 40 serves to connect the cylinder space on opposite sides of the piston 30 to permit liquid flow therebetween in response to movement of the piston.

A needle valve structure 41 is provided for controlling the rate of such flow. Thus, the port 40 (Fig. 3) is provided with an enlarged open-ended extension 42, the outer-end portion of which is threaded for accommodating the valve member 43 which has a correspondingly threaded intermediate body portion 43-a. The valve member 43 has a knurled head 43-b and a cylindrical body extension 43-c which closely fits the unthreaded portion of the port extension 42, and is shown as provided with a resilient packing ring 44 to prevent escape of the liquid 39. The valve member 43 also has a reduced body extension 43-d with a tapered end 43-e engageable with a correspondingly tapered seat 45 provided in port 40. A light compression spring 46, confined under the head 43-b, serves to retain the valve member 43 in adjusted position.

It will be apparent that force urging the piston 30 to move axially in cylinder 25 will create a pressure on the liquid 39 ahead of the piston 30, and that movement of the piston will depend on the amount of liquid permitted to pass through the port 40 to the space behind the piston. Accordingly, adjustment of the needle valve 41 serves to control the rate of movement of the piston 30, the carriage 5, and the drill 3 carried thereby.

In general it is the rate of feed or advance of the drill 3, or other cutting tool which must be closely controlled in accordance with the size and function of the cutting tool, as well as with the character of the material being worked; the retraction or withdrawal of the tool can be accomplished at a much faster rate which may be substantially constant. Accordingly, an auxiliary by-pass port 48 (see Fig. 3) is provided through the piston 30 controlled so as to pass liquid only when the piston 30 moves in a direction to withdraw the drill 3.

Referring to Fig. 3, the port 48 has a reduced portion forming a shoulder 48-a, the opposite end portion being threaded for receiving a seat member 49. This member has a port 49-a adapted to be closed by a closure member 50, such as a steel ball, which is urged to seat by a small spring 51 confined between the ball 50 and the shoulder 48-a.

When the piston 30 is urged to the right, as by air pressure acting in chamber 15, the speed of advance of the piston 30, the carriage 5, and

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the drill 3 is controlled by the rate of liquid flow past the valve 41, the pressure of the liquid maintaining the valve member 50 seated and the port 48 closed. When the piston 30 is urged to the left by air pressure acting on the carriage 5 in chamber 14 to retract the tool 3, the liquid pressure on the left side of the piston 30 unseats the valve member 50 so that port 48 supplements the port 40. Thus, the return movement is much faster.

In case the tool 3 is a thread-forming tool, such, for example, as a tap, it is preferable that the retraction occur at substantially the same rate as the advance. Furthermore, the motor 1 must be of a type capable of operation in either direction at the same speed, so as to back the tool from the work after forming the threads.

For this purpose the auxiliary by-pass 48 is optionally rendered inoperative. This may be done conveniently by replacing the ported seat member 49 with a solid plug 52 (see Fig. 4.) In this way, the movement of the piston 30 in either direction is controlled by the setting of the needle valve 41.

The needle valve 41 is shown in fully closed position in Figs. 1 and 2. It is to be understood, however, that the valve may be opened to any desired extent by adjustment of valve member 43.

It is desirable to maintain spaces through which fluid 39 circulates completely full at all times. One manner in which this is assured is illustrated in Fig. 5.

The needle valve, as before, is formed between seat 45 and the tapered end 53 of a screw member 54 threaded into the end wall 26 of cylinder 25. The member 54 is hollow, having a port 55 that establishes communication between the space to the left of piston 30, and the space 56 within screw 54. This space serves as a reservoir for liquid, which is automatically adjusted by a piston 57 slidable in space 56.

To facilitate filling the cylinder spaces with liquid after the screw 54 is installed, a ball check valve 59 cooperating with a port 60 through piston 57, is utilized. This ball is urged toward seated position by a compression spring 61, the left-hand end of which is confined by a headless screw 62 that is vented at 63 and threaded into the head of screw 54. An O packing ring 64 may be provided for the piston 57.

Spring 61 is quite stiff and keeps the ball 59 normally seated, and also keeps piston 57 in a position to maintain all of the liquid spaces filled.

To fill the device, the screw 54 is first turned in part way, leaving the needle valve entirely open. The ball 59 and spring 61 are not yet in place, nor is set screw 62. Now the device is filled, through port 55, with oil or other liquid until all spaces are filled. Then ball 59 and spring 61 are dropped in place, and the headless screw 62 is installed. Then screw 54 is turned in to the desired position. The piston 57 moves enough in screw 54 to equal the reduction in volume due to the turning in of the screw 54. Loss of liquid in the system is taken up by movement of piston 57; and expansion of the liquid is also compensated by movement of the piston in the other direction.

The inventor claims:

1. In a device of the character described: means forming a chamber; a movable wall in the chamber; means forming a port connecting the spaces on opposite sides of the wall; and an ad-

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justable valve in said port to control the rate of liquid flow from one side of the wall to the other; and means in said valve forming an adjustable space in communication with said port, and including a plunger mounted for movement in said space, means forming an abutment at the end of the space, and a spring interposed between said plunger and said abutment means and urging said plunger in a direction to reduce said adjustable space.

2. In a device of the character described: means forming a chamber; a movable wall in the chamber; means forming a port connecting the spaces on opposite sides of the wall; means forming a valve seat in the port; a screw having an end cooperating with the seat to control the port opening; said screw being hollow and having a

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passage communicating with the interior of the screw and the port; and a movable wall in the screw and resiliently urged in a direction to reduce the volume of the space.

JOHN L. TAYLOR.

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