CONTROL VALVE FOR FLUID OPERATED TOOL


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ABSTRACT

A flow control valve for a fluid operated power tool including a valve closure member fitted in a transverse bore in the tool handle portion and being normally locked against movement to the open position by a digitally actuated rodlike plunger. The plunger includes a push button disposed on the opposite side of the tool handle portion from a valve operating lever. The plunger also includes a grooved portion which is registerable with a plurality of ball members held captive in a stem surrounding the plunger and which are movable into the grooved portion of the plunger to permit movement of the closure member to an open position only upon actuation of the plunger itself.

6 Claims, 4 Drawing Figures
CONTROL VALVE FOR FLUID OPERATED TOOL

BACKGROUND OF THE INVENTION

Many types of power tools present certain hazards if allowed to be accidently energized or started while lying unattended in the work area. Certain types of hand-held pressure fluid operated power tools of the so-called straight handle configuration do not have the inherent protection against accidental or unwanted energization that pistol grip type tool configurations possess because of the location of the operating lever or button. Accordingly, in order to minimize the accidental or unwanted startup of these types of power tools it is desirable to provide means which provide for locking the tool operation control valve in the closed position and which may be deliberately actuated to unlock the control valve and its operating member prior to movement thereof to energize the tool. Moreover, it is further desirable that fluid operated power tools be provided with control valve locking means which automatically lock the tool operation control valve in the off or deenergized position when the valve operating member is released and moved to the off position.

SUMMARY OF THE INVENTION

The present invention provides means for locking the operating control valve of a hand-held power tool in the deenergized or off position so as to minimize the accidental or unwanted starting of the tool motor. In particular the present invention provides an improved control valve arrangement for a fluid operated power tool which includes locking means which may be digitally actuated to release the control valve and the valve operating member whereby the operating member may be actuated to open the valve for admitting pressure fluid to the tool motor.

The improved control valve of the present invention includes locking means which is further characterized in that when the control valve operating member is fully released by the tool operating person the control valve is automatically locked in the closed position and remains so until the locking means is again actuated. The control valve locking means of the present invention is also adapted to facilitate one-handed operation to unlock the control valve and to actuate the control valve operating member, and upon unlocking the control valve the locking means itself may be released and is not required to be continually actuated by the tool operating person while the tool is in use.

The improved control valve arrangement of the present invention is particularly useful for so-called straight handle type fluid operated power tools but may be utilized on other tool configurations as will be recognized by those skilled in the art.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal view of a fluid operated power tool including the control valve arrangement of the present invention;

FIG. 2 is a partial longitudinal section of the tool of FIG. 1 illustrating the control valve in the closed and locked position;

FIG. 3 is a view similar to FIG. 2 illustrating the control valve in the unlocked and open position; and,

FIG. 4 is a section view taken along line 4--4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing the present invention is embodied in a fluid operated tool generally designated by the numeral 10. The tool 10 includes a housing 14 having an elongated straight handle portion 12. The housing 14 has disposed therein a fluid operated motor 16. The motor 16 is suitably connected to a work implement such as a rotary grinding wheel 18. The handle 12 includes an internal passage 20 which is adapted to be in communication with a pressure fluid supply conduit 22 connected to the handle. The passage 20 opens into a passage 24 which is in communication with the motor 16 for conducting pressure fluid thereto.

The tool 10 also includes an improved pressure fluid control valve generally designated by the numeral 26 and which is disposed in a transverse bore 28 extending through the handle 12 and intersecting the passage 26. A bearing sleeve 30 is disposed in the bore 28 and supports a control valve closure member 32 for reciprocal sliding movement therein. The control valve closure member 32 is characterized as a generally cylindrical spool having a deep circumferential groove 34, and a reduced diameter head 36 on one end of the spool. The head 36 projects from one end of the bore 28 and is engageable by a valve operating control member or lever 38 which is mounted on the tool by means of a pivot pin 40. The closure member 32 is retained in the sleeve 30 by an inwardly projecting shoulder 42. The closure member 32 also includes a recess 44 opening to the end opposite the head 36.

The end of the bore 28 opposite the side of the handle portion on which the lever 38 is mounted is partially threaded to receive a complementary threaded plug 46. The plug 46 is characterized by a stem 48 which projects into the recess 44 and partially supports a coil spring 50, the latter comprising means for biasing the closure member 32 in the position shown in FIG. 2. The stem 48 has a bore 52 which is intersected by transverse openings 54 in which are disposed a pair of hard metal spherical balls 56. The balls 56 are slightly larger in diameter than the radial wall thickness of the stem 48 and are retained from outward radial displacement from the openings by forming the openings to be slightly smaller than the ball diameter at their outward edge.

The control valve 26 further includes a plunger or rod 58 closely fitted in the bore 52. The rod 58 includes a reduced diameter portion forming a circumferential groove 60 which is registerable with the openings 54 to permit the balls 56 to move radially inward so that the closure member 32 may be moved over the stem 48 from the position shown in FIG. 2 to the position shown in FIG. 3. The rod 58 includes an integral head or button 62 which is disposed in a recess 64 formed in the plug 46. The recess 64 is formed by an axially projecting skirt 66 on the plug 46. The rod 58 is biased into the position shown in FIG. 2 by a coil spring 68 disposed around the rod and engaged with the plug 46 and the button 62. A retaining ring 70 prevents the rod 58 from being displaced from the plug 46.

When the rod 58 and the closure member 32 are biased into the positions shown in FIG. 2 the balls 56 are forced radially outwardly to project beyond the circumference of the stem 48 and prevent the movement of the valve closure member. However, when the butt-
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3. The invention set forth in claim 2 wherein: said means comprises ball means disposed in opening means in said plug and engageable with said closure member, and said rod includes a groove registerable with said opening means in response to movement of said rod to said second position for receiving said ball means to unlock said closure member.

4. The invention set forth in claim 2 wherein: said plug includes a recess formed by an axially projecting skirt portion of said plug and said rod includes an operating button disposed in said recess and actuable at will for moving said rod from said first position to said second position.

5. The invention set forth in claim 4 wherein: said operating member and said button are opposed to each other on opposite sides of said handle.

6. In a fluid operated tool:
a housing;
a fluid operated motor disposed in said housing;
a passage in said housing for conducting pressure fluid to said motor;
a fluid flow control valve interposed in said passage including a closure member movable between open and closed positions and a valve operating member for manually actuating said closure member to the open position and biasing means for urging said closure member to the closed position; and,
locking means cooperate with said closure member for preventing the movement of said closure member to said open position, said locking means including a movable rod actuable at will for unlocking said closure member for movement to the open position in response to the actuation of said operating member, and means engageable with said rod and releasably engageable with said closure member for locking said closure member in a closed position when said rod is in a first position, said means being operable in response to the movement of said rod to a second position to unlock said closure member.

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