United States Patent

Walter

[15] 3,645,500

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[54] THROTTLE SLEEVE FOR FLUID-POWERED DEVICE

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[73] Assignee: The Black and Decker Manufacturing Company, Towson, Md.

[22] Filed: Aug. 21, 1970

[21] Appl. No.: 65,951

[52] U.S. Cl. 251/340

[51] Int. Cl. F16k 31/528

[58] Field of Search 251/340, 341, 347, 342, 345, 251/352, 251

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Attorney—Leonard Bloom, Joseph R. Slotnik and Edward D. Murphy

[57] ABSTRACT

A portable pneumatic device including an elongated housing having a rotary pneumatic motor therein. Pressurized air is delivered to the rear end of the housing to drive the motor and rotate a tool disposed at the front of the housing. Airflow to the motor is controlled by a throttle valve actuated by a rotatable cam sleeve or collar disposed on the housing. The sleeve is constructed to maximize ease of control of the tool and minimize the possibility of inadvertent or accidental tool operation.

7 Claims, 9 Drawing Figures

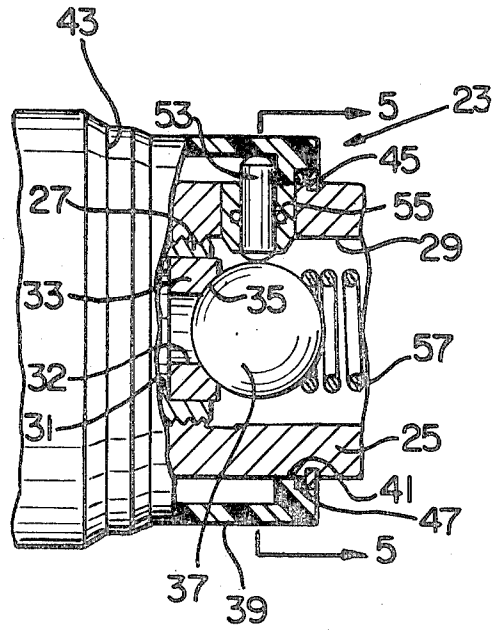


FIG. 1

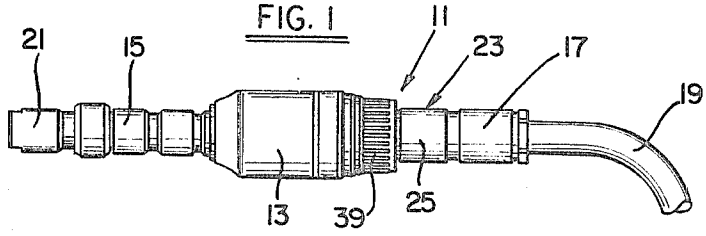


FIG. 2

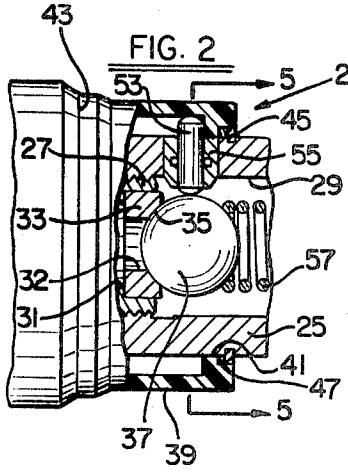


FIG. 3

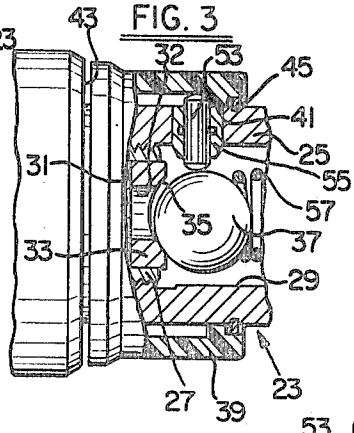


FIG. 4

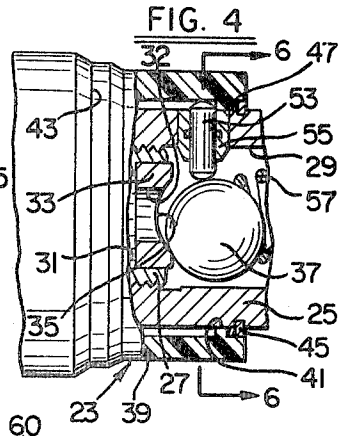


FIG. 5

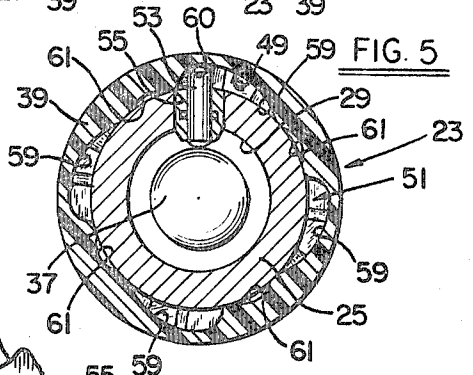


FIG. 6

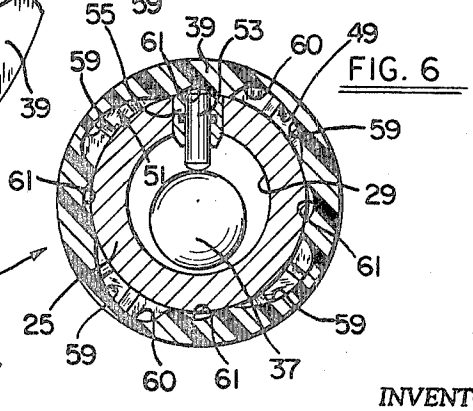


FIG. 7

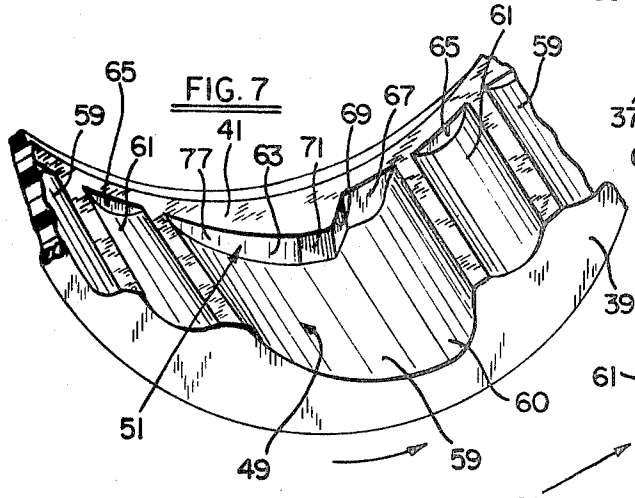


FIG. 8

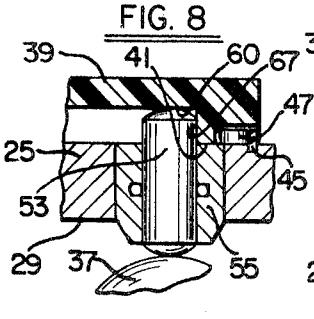
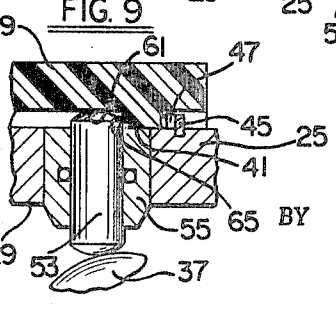


FIG. 9



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THROTTLE SLEEVE FOR FLUID-POWERED DEVICE

SUMMARY OF THE INVENTION

The present invention is directed to a control sleeve for a throttle valve, which sleeve is rotatable to turn the valve on or off. Detent means is provided to hold the sleeve in position with the valve "on" and, regardless of the direction the sleeve is turned, to return and stop the sleeve in position with the valve "off." In addition, the sleeve is closely disposed to a housing surrounding the valve and provides no protruding levers or buttons that can catch and/or be depressed accidentally.

Main objects of the invention, therefore, are to provide a novel throttle valve control sleeve which is rotatable to turn a valve "on" or "off" which incorporates detent means to releasably hold the sleeve in the "off" and in the "on" position, and which may be turned in either direction from the "on" to the "off" position.

Further important objects are to provide a novel control sleeve of the above character which presents relatively smooth, nonprotruding surfaces which cannot catch on clothing or the like, and which requires deliberate action to turn it "on."

Additional important objects are to provide a novel control sleeve of the above character which is relatively inexpensive to manufacture, rugged in construction, and reliable in use.

Other objects and advantages of this invention will become more apparent from a consideration of the detailed description to follow taken in conjunction with the drawings annexed hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view illustrating a pneumatic tool embodying the present invention;

FIG. 2 is an enlarged fragmentary sectional view illustrating the valve and the control sleeve of the present invention and shown with the valve "off";

FIG. 3 is a view similar to FIG. 2 and showing the sleeve partly turned and the valve partly "on";

FIG. 4 is a view similar to FIGs. 2 and 3 and showing the valve fully "on";

FIG. 5 is a sectional view of FIG. 2 taken along the line 5—5 thereof;

FIG. 6 is a sectional view of FIG. 4 taken along the line 6—6 thereof;

FIG. 7 is a partial perspective view of the control sleeve of the present invention;

FIG. 8 is an enlarged view of a portion of FIG. 2; and

FIG. 9 is an enlarged view of a portion of FIG. 4.

BROAD STATEMENT OF THE INVENTION

Broadly described, the present invention relates to a fluid device of the type including a housing, a throttle valve in said housing, said valve including longitudinal passage means, means defining an annular seat around said passage means, a ball normally biased into engagement with said seat and movable laterally thereof to open said valve, manual means for moving said ball, said manual means including a collar rotatable on said housing and operatively engageable with said ball through cam means, whereby rotation of said collar controls said valve, said operative engagement including a detent pin slidable radially of said housing and having one end engageable with said ball and its other end engageable with the surface on said collar, said surface having spaced detent recesses adapted to receive said other pin end, whereby to retain said collar in selected rotated positions.

DETAILED DESCRIPTION

Referring now more specifically to the drawings, a portable pneumatic tool embodying the present invention is illustrated generally at 11 in FIG. 1 and is seen to include a motor housing 13 having a spindle assembly 15 extending forwardly and a pneumatic coupling assembly 17 extending rearwardly thereof. A rotary pneumatic motor (not shown) is disposed in the motor housing 13 and is powered by compressed air delivered thereto through a conduit 19 and drives a tool member 21 which may be a chuck, a grinding wheel, or the like.

Delivery of compressed air to the motor is past a throttle valve generally indicated at 23. This valve 23 includes a cylindrical housing 25 threaded onto a coupling 27 at the entrance to the motor housing 13. The housing 25 and coupling 27 are hollow and define aligned cylindrical passages 29, 31, respectively, and are communicated by a through opening 32 in a hollow bushing 33. A spherical seat 35 is located at the entry side of the bushing 33 and around the opening 32 and is adapted to have a valve ball 37 seated thereagainst. When positioned as shown in FIG. 2, the ball 37 closes the valve 23 and prevents the flow of pressurized fluid to the motor. In FIG. 3, the ball 37 is slightly away from the seat 35 and the valve 23 is partially open, whereas in FIG. 4, the ball 37 is more fully withdrawn from the seat 35 and the valve 23 is fully open.

The valve 23 is actuated by means of a sleeve 39. As shown in FIGS. 2–4, the sleeve 39 includes an annular flange 41 slidably engaging the housing 25 (and supporting the sleeve 39) and is disposed between a shoulder 43 on the motor housing 13 and a retaining ring 45 on the valve housing 25. A spring washer 47 is disposed between the flange 41 and the retaining ring 45 and normally maintains the sleeve 39 against the shoulder 43, as shown in FIG. 2, while allowing the sleeve 39 to move toward the right and away from the shoulder 43, as shown in FIGS. 3 and 4.

The sleeve 39 is formed with two sets of cam surfaces 49, 51 each of which is repeated at four equidistant locations therearound. The set of cam surfaces 49 faces radially of the sleeve 39 and is adapted to bear endwise on a pin 53 slidably disposed in a bushing 55 fixed to a housing 25. The inner end of the pin 53 engages the ball 37 so that when the pin 53 is pushed radially inwardly, the ball 37 is pushed laterally off the seat 35. When the pushing force on the pin 53 is released, a compression spring 57 pushes the ball 37 back into engagement with the seat 35 and the pin 53 radially outwardly.

As shown in FIGS. 5–7, the set of cam surfaces 49 includes a relatively long surface 59 and a short surface 61. The long surface 59 has a relatively deep portion 60 at one end which, when aligned with the pin 53 (as shown in FIGS. 2, 5 and 8) allows it to move outwardly and the ball 37 to fit into seat 35. When the sleeve 39 is turned in a counterclockwise direction, as seen in FIG. 5, the pin 53 is gradually cammed radially inwardly thereby moving the ball 37 away from seat 35 and opening the valve 23. Continued movement of the sleeve 39 in this direction moves the cam surface 59 past the pin 53 and brings the shallow cam surface 61 into alignment therewith. In this position, shown in FIGS. 4, 6 and 9, the ball 37 remains spaced from the seat 35 and the valve 23 "open." In addition, the spring 57 acting on the ball 37 holds the pin 53 in the sleeve groove 61 in detent fashion so that the valve 23 remains "open." When it is desired to close the valve 23, the sleeve can be turned in either direction to reposition the parts as shown in FIGS. 2, 5 and 8 with the pin 53 in the deep part 60 of the cam surface 59 and the ball 37 against the seat 35.

The sets of cam surfaces 51 each includes a relatively long surface 63 coincident with each surface 59, and a relatively short cam surface 65 coincident with each surface 61. The surfaces 63, 65 are adapted to engage the side of the pin 53 during the time the surfaces 59, 61 engage the end of the pin 53. The long surface 63 includes a relatively deep portion 67 which coincides with the deep portion 60 of the cam surface 59. Adjacent the deep portion 67 of the surface 63 is a sharply tapered surface 69, a flat 71, and a gently tapered surface 77. The surface 65 is flat and lies substantially in the same plane as the surface 67.

In use, when the parts are positioned as shown in FIGS. 2, 5 and 8, the pin 53 is disposed in deep portions or pockets 60, 67 of surfaces 59, 63 and the sleeve 39 is retained in detentlike

fashion against turning. The sleeve 39 cannot be turned in a clockwise direction, as seen in FIG. 5, from this position because of the sharply sloped wall presented by the pocket 60. The sleeve 39 can, however, be turned in a counterclockwise direction from this position. When this is done, the pin 53 rides up the wall 69 of surface 63 and slides the sleeve 39 toward the right, as seen in FIGS. 2–4, 8 and 9, against the force of the spring washer 47. At the same time, the surface 59 begins to cam the pin 53 radially inwardly and opens the valve 23. Continued turning movement of the sleeve 39 in this direction allows it to slide back toward the left, as seen in FIGS. 2–4, 8 and 9, as the pin 53 rides along tapered wall 73. Ultimately, the pin 53 comes into groove 61, as shown in FIGS. 4, 6 and 9, (where the valve 23 is fully open) and is retained there in detentlike fashion.

To then close the valve 23, the sleeve 39 is turned in either direction from the FIGS. 4, 6 and 9 position. If turned counterclockwise, as seen in FIG. 6, the pin 53 immediately moves into pockets 60, 67. If turned clockwise, the pin 53 is positioned initially against the tapered wall 73 and the shallow part of surface 59. In this position, there is little resistance to continued turning action of the sleeve 39 and the latter can continue turning until, ultimately, the pin 53 is again positioned in deep portions or pockets 60, 67.

It will be appreciated that the sleeve 39 closely surrounds the valve housing 25 and that no latches, levers, buttons or the like are exposed which might catch on clothing or the like, or otherwise be accidentally actuated. Furthermore, the valve 23 requires a positive act to open and close it, and is retained in detent fashion in either an open or closed position. In addition, by providing the sets of cam surfaces 49, 51 around the sleeve 39, the valve 23 is actuated by relatively little arcuate movement of the sleeve 39.

By the foregoing, there has been disclosed a novel throttle sleeve for a fluid valve calculated to fulfill the inventive objects set forth above, and while a preferred form of the invention has been illustrated and described in detail, various additions, substitutions, modifications and omissions may be made thereto without departing from the spirit of the invention.

I claim:

1. A fluid device of the type including a housing, a throttle valve in said housing, said valve including longitudinal passage means, means defining an annular seat around said passage means, means defining an annular seat around said passage means, a ball normally biased into engagement with said seat and movable laterally thereof to open said valve, manual means for moving said ball, said manual means including a collar rotatable on said housing and operatively engageable with said ball through cam means, whereby rotation of said collar controls said valve, said operative engagement including a detent pin slidable radially of said housing and having one end engageable with said ball and its other end engageable with a surface on said collar, said surface having spaced detent recesses adapted to receive said other pin end, whereby to retain said collar is selected rotated positions.

2. A device as defined in claim 1 wherein said pin bears generally radially of said collar against said surface, said collar including another surface engageable with said pin in a direction axially of said collar, resilient means normally biasing said collar axially against said pin, said another surface having spaced recesses therein spaced arcuately from the detent recesses in said first-mentioned surface, whereby to retain said collar in other selected rotated positions.

3. A device as defined in claim 2 wherein said first-mentioned surface has relatively deep portions aligned with the recesses in said another surface, said detent recesses being relatively shallow.

4. A construction as defined in claim 1 wherein said cam means includes a first surface on the interior of said collar engageable with said detent pin a second interior surface on said sleeve engageable with said detent pin, and resilient means normally biasing said collar in a direction to engage said second surface and said detent pin.

5. A construction as defined in claim 4 wherein said pin is mounted on said housing for movement in one plane only, said first and second surfaces intersecting one another, said second surface being biased against said pin in a direction transverse to its direction movement.

6. A construction as defined in claim 5 wherein said engaging first surface and pin retains said collar in said first position and said engaging second surface and said pin retains said collar in said second position.

7. A construction as defined in claim 1 wherein said cam means includes first and second intersecting annular surfaces formed internally of said sleeve, said detent pin being movable transversely of said passage means by engagement with said first surface during rotation of said sleeve, means biasing said sleeve axially of said passage means whereby to engage said pin and said second surface.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,645,500 Dated FEBRUARY 29, 1972

Inventor(s) HARVEY J. WALTER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN COLUMN 3, LINE 44, "MEANS, MEANS DEFINING AN ANNULAR SEAT AROUND SAID PASSAGE" SHOULD BE OMITTED. IN COLUMN 4, LINE 10, "IS" SHOULD READ --- IN ---.

Signed and sealed this 13th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334