March 4, 1969 R. G. COSS 3,430,710

CONTROL MECHANISM FOR POWER HAND TOOLS OR INSTRUMENTS

Filed Oct. 27, 1967

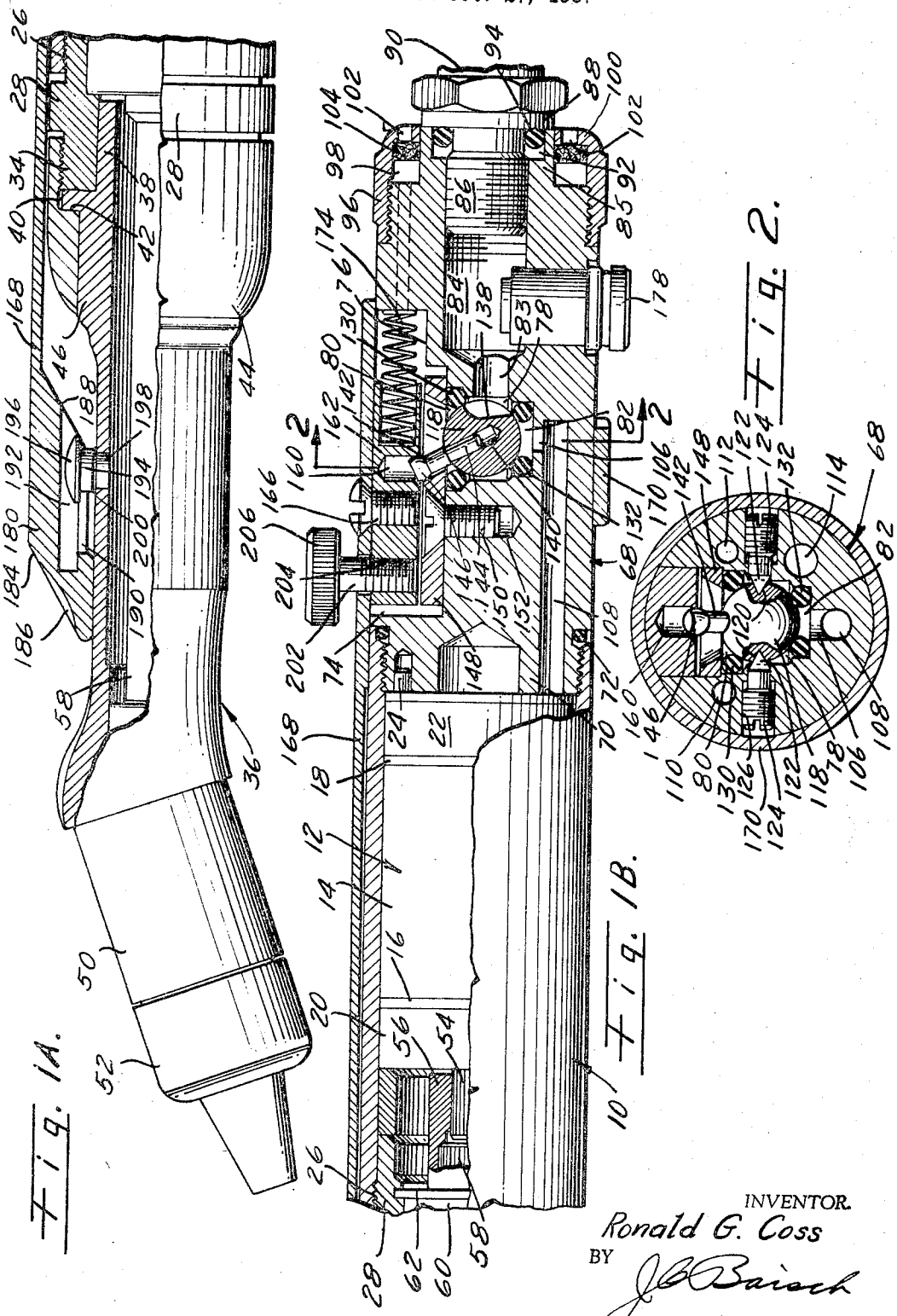

Fig. 1A.

Fig. 1B.

Fig. 2.

INVENTOR.
Ronald G. Coss
BY
J. G. Baisch
Attorney

United States Patent Office

3,430,710

Patented Mar. 4, 1969



3,430,710

# CONTROL MECHANISM FOR POWER HAND TOOLS OR INSTRUMENTS

Ronald G. Coss, La Habra, Calif., assignor to Standard Pneumatic Motor Company, Whittier, Calif., a corporation of California

Filed Oct. 27, 1967, Ser. No. 678,609

U.S. Cl. 173—169 11 Claims

Int. Cl. B23b *45/04;* B27c *3/08;* A61c *1/10*

## ABSTRACT OF THE DISCLOSURE

Control mechanism for small size pneumatic hand tools or instruments having a valve with a pivoted ball shaped movable fluid control valve member with a relieved portion operated by a slidable, thumb tip or fingertip actuated lever.

### *Background of the invention*

#### *Field of the invention*

While the invention has particular utility in connection with surgical turbines, and is shown and described in such connection, it is to be understood that its utility is not confined thereto.

#### *Description of the prior art*

There have been various types of control mechanism for controlling the pressure fluid such as air to pneumatic motors of power operated tools. One type of such control mechanism comprises a trigger adjacent a hand grip. One type of trigger is pivoted as in the Connell Patent No. 1,954,620; another is a plunger type as shown in the Shaff Patent No. 2,818,893. Another type of control mechanism has a lever pivoted adjacent one end and extending along the body or barrel of the tool and normally inclined away from the body or barrel of the tool, the free end of the lever being yieldingly spring urged away from the body of the barrel but being adapted to be hand pressed toward said body or barrel to open the valve it controls. A typical arrangement of this type is shown in the Doeden Patent No. 2,830,560.

One of the problems of these prior art control mechanisms for pneumatically operated surgical tools or instruments is that it is very difficult to minutely regulate the supply of pressure air, and hence the speed of the pneumatic motor or turbine of the tool or instrument, especially in hand tools of the small size used in surgical and similar work. Also, these prior art tools with the trigger or pivoted lever control mechanism are very difficult to properly manipulate with the extreme accuracy required in surgical work.

The present invention solves these problems.

### *Brief summary of the invention*

The present invention comprises a control mechanism for the pneumatic motor or turbine of surgical instruments or tools which have a cylindrical housing or barrel in which the turbine is operably disposed or housed and which is held in the hand of the operator. Pressure air for operating the turbine is provided by a conduit connected to the rear of the housing and there is a collet arrangement at the forward end for operable reception of the shank of a cutting tool, burr, drill, or the like.

There is a rotatable ball or valve member having a relieved portion through which air passes when the valve is open. The control member for the ball valve comprises a lever slidably mounted on the body or barrel of the instrument and is yieldingly urged to a forward position whereat the valve is closed. The forward end of the control lever is adapted to be engaged with the tip of a finger



of the operator and moved rearwardly thereby. The control is easily actuated longitudinally to secure extremely small changes in the valve position so that the amount of pressure to the turbine can be minutely adjusted and regulated very accurately thereby controlling the speed of the turbine with the extreme care required in surgical work.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which represent one embodiment. After considering this example skilled persons will understand that many variations may be made without departing from the principles disclosed, and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

Referring to the drawings, which are for illustrative purposes only:

FIG. 1A is a side elevational view of the forward end portion of an instrument embodying the present invention, a portion being broken away and in section;

FIG. 1B is a side elevational view of the rear portion of the instrument, partially in section; and

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1B.

Referring more particularly to the drawings, there is shown a surgical instrument comprising a cylindrical housing **10** having therein a pneumatic turbine or motor, indicated generally at **12**, which may be of any suitable character. By way of example, a pneumatic motor or turbine such as disclosed in the Bent Patent No. 3,238,848 may be used.

Turbine **12** has a stator **14** with forward and rear end plates **16** and **18** respectively with forward and rear bearings **20** and **22** at the outer sides thereof. An alignment pin **24** keeps in alignment the parts at the rear of the turbine. A front alignment pin, not shown, serves the same purpose for the front part of the turbine.

The forward end of the housing **12** has an internally threaded portion for threadable reception of an externally threaded reduced diameter rear portion **26** of a tubular spindle housing **28**. Between the front bearing **20** and the rear end **30** of the spindle housing is a tubular spacer **32**. The spindle housing **28** has an externally threaded forwardly extending reduced diameter portion **34**.

A tubular angle housing, indicated generally at **36** has a rear end portion **38** slidably disposed within the forward end of the spindle housing, there being a radial flange **40** adjacent the rear end of said angle housing against which the forward end of the spindle housing abuts. Flange **40** is engaged by a shoulder **42** of a lock ring **44** disposed on the rear portion **46** of said angle housing. Lock ring **44** secures the angle housing to the spindle housing and hence to the housing **10** of the instrument.

At the forward end of the angle housing **36** is an angular housing part **50** to the forward end of which is threadably attached an end cap **52**. In the housing part **50** is operably disposed the outpost spindle, not shown, and collet, also not shown, for operable releasable retention of burrs, drills or the like. These parts are not shown since they are of well known construction and operation.

The turbine has a drive shaft **54** operably connected with a driver **56** by a spline connection. There is a splined connection between the driver and the rear end of a spindle **58**. Within the spindle housing is a spindle bearing **60** releasably held in position by a removable retaining ring **62**.

The above described parts of the instrument are known so that there has been no greater details given.

To the rear end of the housing **10** is a head, indicated generally at **68**, which has a reduced diameter, externally

threaded forward end portion **70** screwed into the internally threaded rear end portion. An O-ring **72** provides a seal between the head and rear end of the housing **10**.

Head **68** has a longitudinally extending recess **74** in the top thereof, said recess having a reduced depth portion **76** at the rear. From the bottom of recess **74** downwardly extends a valve recess including an intermediate cylindrical part **78** the axis of which is vertical. At the upper end the valve recess has an enlarged diameter portion **80** and at the lower end it has a reduced diameter portion **82**. A bore **84** extends forwardly from the reduced diameter rear end portion **85** of the head, a rear portion of said bore **84** being internally threaded for reception of an externally threaded part **86** of a connector **88** whereby an air hose **90** is connected to the instrument for supplying operating or pressure air thereto. An enlarged diameter recess **92** is provided for a seal for the connector part **86**, the seal being an O-ring **94** although any other suitable seal may be used.

The head **68** has a reduced diameter externally threaded part **96** for threadable reception of an internally threaded muffler ring which defines, with the reduced diameter portion **85** of the head and the shoulder at the inner end of said portion **85**, a chamber **98**, said muffler ring having an outer end wall **100** with an axial opening therethrough for reception of the reduced diameter portion **85** and exhaust ports **102**. Within the chamber **98** is disposed a muffler **104** of porous material for muffling the sound of exhaust air from the turbine.

The inner end of the bore **84** is connected by a reduced diameter passage **83** with the valve recess **78** between the enlarged diameter portion **80** and the reduced diameter portion **82**. The reduced diameter portion **82** of the valve recess is connected by means of a short passage **106** with a passage **108** leading to the inlet of the turbine or pneumatic motor **12**. Expended air from the motor or turbine is exhausted through the passages **110**, **112** and **114** through the head **68**, said passages leading from the turbine exhaust ports to the chamber **98**. This exhaust air then passes through the muffler and to atmosphere through the exhaust ports **102**.

Pressure fluid or air to operate the turbine **12** is controlled by a ball shaped movable valve member **118** operably disposed in the valve recess. The ball shaped valve member **118** is rotatable on a horizontal axis through the apices of a pair aligned oppositely arranged conical recesses **120** in the valve member for reception of the conical inner ends **122** of pivot screws **124** screwed into oppositely arranged tapped bores **126** in the head **68**. At the inner ends of said tapped openings **126** are respective reduced diameter bores in which cylindrical, reduced diameter portions **128** of the screws are received, the conticap tips of said screws being at the free ends of said reduced diameter portions **128**. The screws **124** are fully within the bores **126**.

Upper and lower seals of any suitable character are provided for the valve member **118**, said seals being shown as O-rings **130** and **132** respectively. The upper seal **130** is disposed in the enlarged diameter portion **80** of the valve recess and the lower seal is disposed in the reduced diameter portion **82** of the valve recess. It is to be noted that these seals are disposed above and below the opening of the passage **83** into the valve recess to prevent the escape of pressure air between the walls of the valve recess and the valve member **118**.

Ball valve member **118** has a recess **138** facing the bore **83** and when the valve member **118** is in the closed position the O-ring seals **130** and **132** are above and below the respective upper and lower ends of said valve recess **138**.

There is a radially extending bore **140** in said ball valve member, said bore being inclined forwardly relative to the length of the instrument and there is a valve stem **142** having a reduced diameter end portion **144** press fitted in the bore **140** of the ball valve member to thereby secure said stem to said valve member. At its outer end the valve stem has an enlarged head **146** with the periphery rounded relative to the length of the stem.

In the bottom of the recess **74** there is a retainer plate **148** having a countersunk recess to accommodate the correspondingly shaped head of a screw **150** screwed into a tapped bore **152** extending downwardly or inwardly in the head from the bottom of the recess **74**, screw **150** securing the retainer plate **148** in the recess.

Retainer plate **148** is provided with an opening or hole therethrough to accommodate the valve stem, said opening flaring outwardly as shown in FIG. 1A with the head **146** of the valve stem projecting outwardly of the opening so that it extends into the inner open end of a bore **160** in a valve actuator **162** slidable in the upper portion of the recess **74** and the portion **76** thereof.

Valve actuator **162** has a tapped bore for reception of a screw **166** projecting through an opening provided therefor in a valve control lever **168** which extends longitudinally of the head **68**, instrument housing **10** and the rear portion of the angle housing **36**. Adjacent the rear end said lever has an annular or cylindrical part **170** encircling the head **68** and slidable thereon, the part **170** retaining the lever on the head. Screw **166** secures the valve actuator **162** to the lever, it being noted that the lever also provides a cover for the recess **74** and its reduced depth part **76** to keep out dust or other foreign matter or particles.

A spring **174** has a forward portion disposed in a bore **176** which extends forwardly from the rear end of the valve actuator and said spring reacts against the inner end of the bore **176** and the rear end of the recess **74** to yieldingly urge the actuator **162** forwardly and thereby position the valve member **118** in the valve closed position when said actuator **162** is at its position whereat it is limited by the forward end wall of the recess **74**.

The forward end of the lever is thickened at **180** toward the reduced diameter part of the angle housing **36** and at the forward end of the part **180** of the lever said part **180** is inclined forwardly and inwardly at **184** and this part has a shallow recess **186** for reception of the operator's thumb tip or a fingertip for actuating the lever rearwardly against the force of spring **174** to move the valve in the opening direction.

The rear end **188** of the thickened part **180** of the lever is spaced from the adjacent enlarged part of the angle housing and the locking ring **44** when the lever is in the valve closed position, the space between said rear end **188** of the part **180** and the enlarged part of the angle housing and the lock ring **44** permits the rearward, valve opening movement of the lever **168**.

From the rear wall **188** of the thickened part **180** of the lever **168** there is a forwardly extending slot **190** and a forwardly extending slot **192** of greater depth, width and length, the slot **190** having its upper part communicating with the slot **192**. The slot **190** slidably receives a lever pin **194** which has an enlarged head **196** slidably disposed in the slot **192**. Lever pin **194** has a reduced diameter part **198**, opposite the head, disposed in an opening provided therefor in the adjacent part of the wall of the angle housing, said lever pin being secured in position by any suitable means, said pin being shown as secured by brazing or welding at **200**.

Thus the forward end of the lever is operably held in position and it is to be noted that the under side of the part **180** slides on the adjacent outer surface of the angle housing.

A locking screw **202** extends through a hole provided therefor in the lever **168** adjacent the screw **166**, said screw **202** being threadably received in a tapped bore **204** extending through the valve actuator **162**. Screw **202** has an enlarged head **206** and is adapted to be screwed in said tapped bore **204** so as to cause the free end of said screw to engage the outer surface of the retainer plate **148** to lock the lever against movement.

When the locking screw is in a release position the lever

168 may be moved rearwardly by thumb tip or fingertip pressure against the forward end thereof. Rearward movement of the lever will cause the actuator 162 to move rearwardly and pivotally actuate the ball valve member 118 in the clockwise direction as viewed in FIG. 1B against the force of spring 174. This movement of the valve member 118 will cause the recess 138 of the valve member to rotate or move clockwise so that the lower end of said recess will pass the O-ring 132 thereby establishing communication between the bore 83 and the lower part 82 of the valve recess and hence the passage 106 and 108 so that pressure fluid flows into the turbine and operates same.

Expended fluid then passes from the turbine through the passages 110, 112 and 114 to the chamber 98, through the muffler 104 and out the exhaust ports 102.

Spring 174 will actuate the lever 168 forwardly and effect closing of the valve when thumb or finger pressure is released from the forward end of said lever.

In order to provide means for lubricating the valve parts and the turbine an oil fitting 178 is provided which supplies oil to the air passing through the bore 84.

The invention and its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts of the invention without departing from the spirit and scope thereof or sacrificing its material advantages, the arrangement hereinbefore described being merely by way of example, and I do not wish to be restricted to the specific form shown or uses mentioned except as defined in the accompanying claims.

I claim:

1. Control mechanism for power hand instruments, comprising:

(A) a housing adapted to be held in the hand of an operator;

(B) an instrument part carried by said housing;

(C) a fluid control valve in said part, said fluid control valve including a movable valve member;

(D) and a longitudinally slidable valve control lever extending alongside said housing and operably connected to said movable valve member for actuating said valve member upon appropriate longitudinal movement of said lever, said lever being engageable by digit of the operator's hand for moving said lever longitudinally.

2. The invention defined by claim 1, including a spring yieldingly urging the mechanism to the valve closed position; and stop means for limiting movement of the valve member between predetermined closed and open positions.

3. The invention defined by claim 1, wherein the lever includes an annular part slidably encircling parts of the instrument for slidable retention of the lever on the instrument.

4. The invention defined by claim 1, wherein the lever has a free end inclined forwardly and toward the housing, said free end having a shallow recess therein for comfortable reception of the tip of a digit of the operator.

5. The invention defined by claim 4, wherein the free end of said lever has a thickened portion with a slot at the under side, said slot being T-shaped in cross section; and there is a pin secured to the adjacent portion of the housing, said pin being slidably disposed in the vertical portion of said slot and having an enlarged head slidably disposed in the horizontal portion of said slot.

6. The invention defined by claim 1, wherein the part carried by the housing has a valve member receiving recess with a fluid inlet port and a fluid outlet port; and there is a ball shaped movable valve member disposed in said recess, means for supporting said ball shaped valve member for rotation on an axis, said ball shaped valve member having an external recess at one side of its axis, said recess being positioned with respect to the ports so that when the valve member is in one position said recess is out of communication with one of said ports but provides communication between said ports when said ball valve member is rotated on its axis to another position.



7. The invention defined by claim 6, wherein said recess is cylindrical, one of said ports being at one side of said recess while the other port is at one end of said recess; and there is a seal at each end of the recess engaging an adjacent portion of the ball valve member and effecting a seal between said ball member and adjacent portions of the recess, the port at the side of the recess communicating with said valve member receiving recess between said seals, the recess in the valve member, when the valve is closed, being disposed between said seals, movement of the valve member on its axis moving said recess beyond one of the seals for effecting fluid communication between said ports.

8. The invention defined by claim 7, wherein there is a retainer plate for retaining the seals and ball valve in position in the recess, said retainer plate having an opening therethrough; a valve stem for said valve member, said valve stem extending through said opening in the retainer plate; and a valve actuator connected to the control lever and slidable therewith, said actuator having a recess therein for reception of an outer end portion of the valve stem to provide an operable connection therebetween.

9. A fluid control valve, comprising:

(A) a part having a cylindrical recess open at one end and closed at the other end, there being a fluid port in one side and a second fluid port in the closed end of said recess said port also having axially aligned tapped bores at opposite sides of said recess and opening thereinto;

(B) a ball valve member in said recess, said ball valve member having opposed and axially aligned conical recesses therein in alignment with respective tapped bores;

(C) a screw in each of said bores, said screws having conical free inner ends received in respective conical recesses in said ball valve member whereby said member is rotatable on the axis through said conical recesses and said screws, said ball valve member having a recess therein out of communication with one of said ports when the valve is in the closed position but adapted to be moved to a position providing fluid communication between said ports when the valve member is rotated on its axis;

(D) and a valve stem for said valve whereby said valve may be rotated on its axis.

10. The invention defined by claim 9, wherein the valve recess has an enlarged diameter part at the open end and a reduced diameter part at the closed end; there is a seal in the enlarged diameter part and a seal in the reduced diameter part, said seals effecting a seal between the ball valve member and the wall of the valve recess; the seal in the reduced diameter part providing a seal between the ports when the valve is in the closed position, the recess in the ball valve member passing said seal when the ball valve member is rotated on its axis to an open position whereat one end of the recess in the ball valve passes said seal; and a retainer for retaining the ball valve and said seals in the valve recess.

11. The invention defined by claim 10, wherein the seals are O-rings.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,664,632 | 1/1954 | Norlen | 32—26 |
| 3,011,287 | 12/1961 | Goldfarb | 32—27 |
| 3,128,079 | 4/1964 | De Groff | 32—26 X |
| 3,210,847 | 10/1965 | Prufer | 32—27 |
| 3,210,848 | 10/1965 | Bizzigotti | 32—27 |
| 3,373,824 | 3/1968 | Whitehouse | 173—169 X |



NILE C. BYERS, JR., *Primary Examiner.*

U.S. Cl. X.R.

32—27