Aug. 26, 1930. H. C. GUSTAFSON 1,774,266

VARIABLE STROKE TOOL

Original Filed May 21, 1928 2 Sheets-Sheet 1

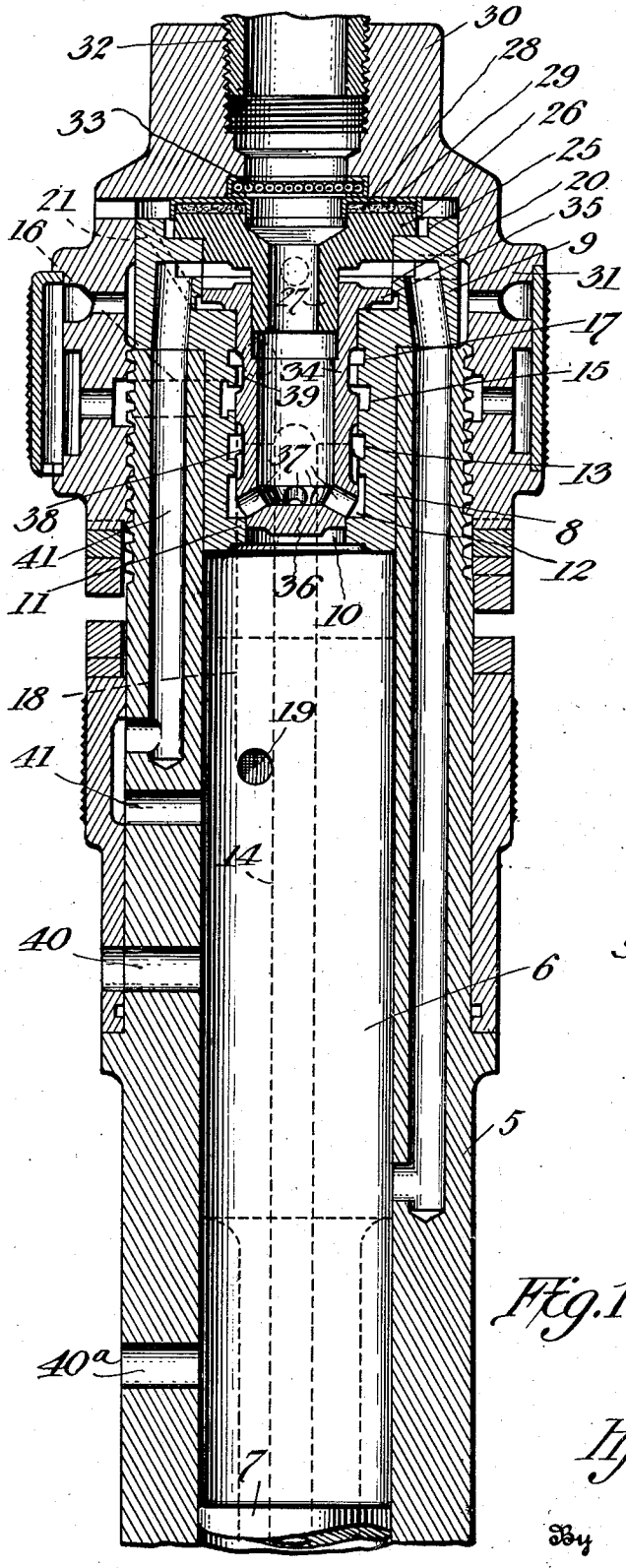


Fig. 1.

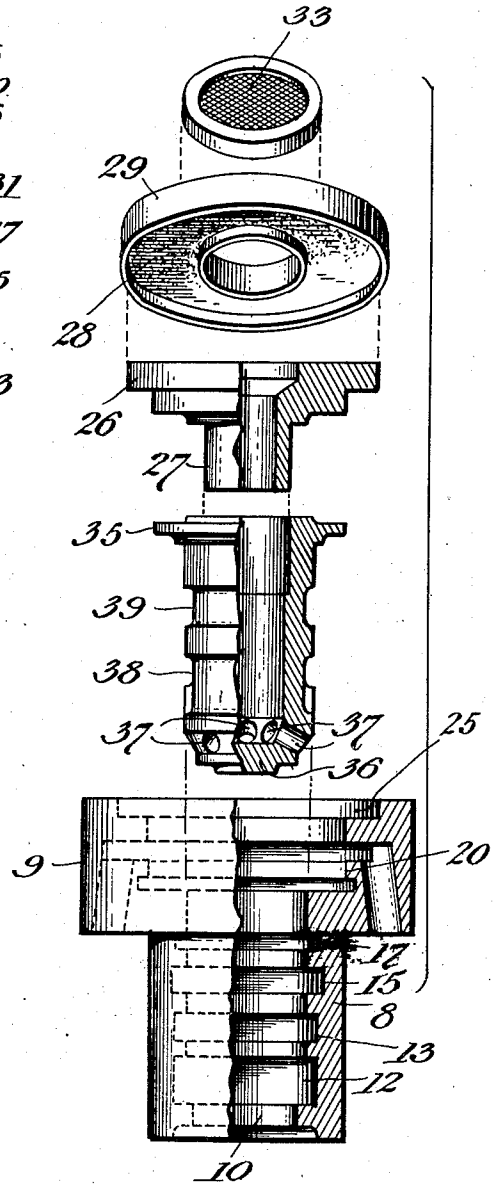


Fig. 3.

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Fig. 2.

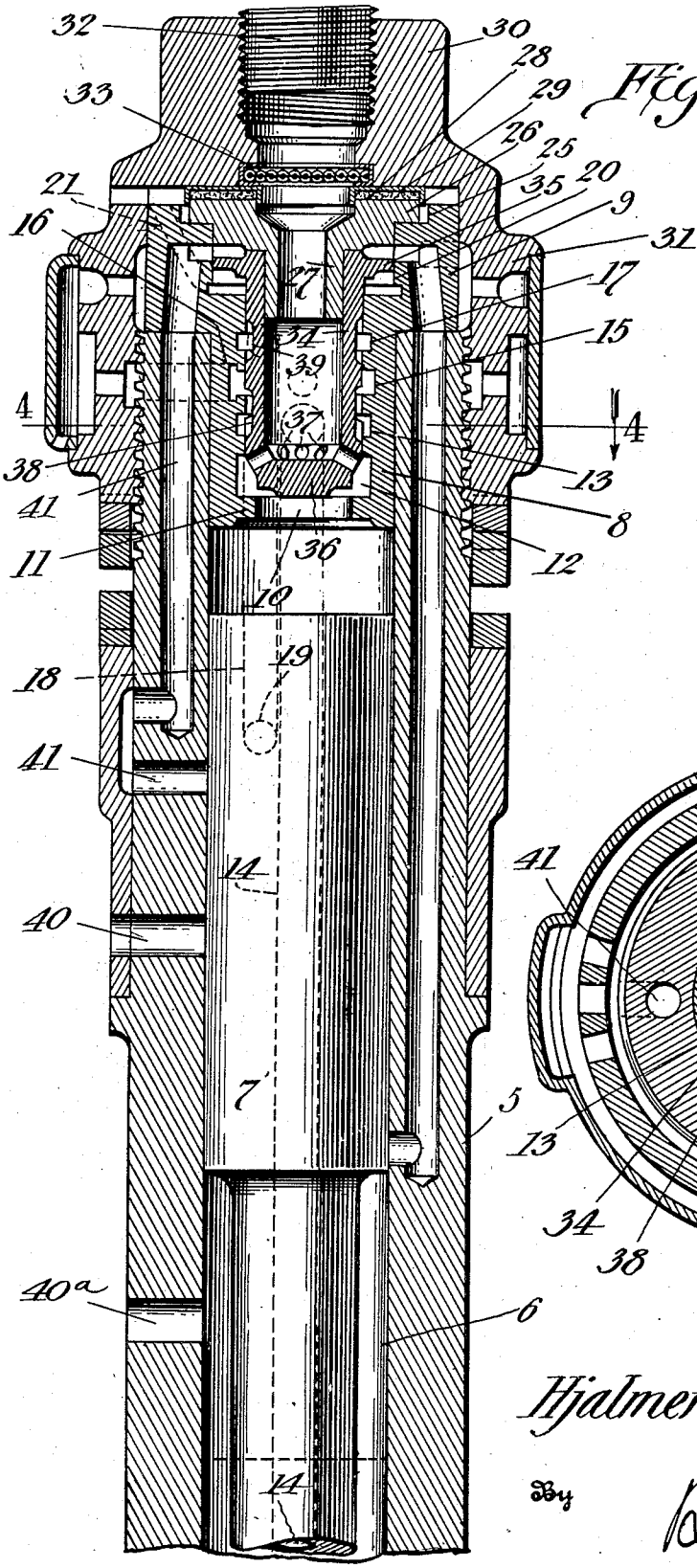
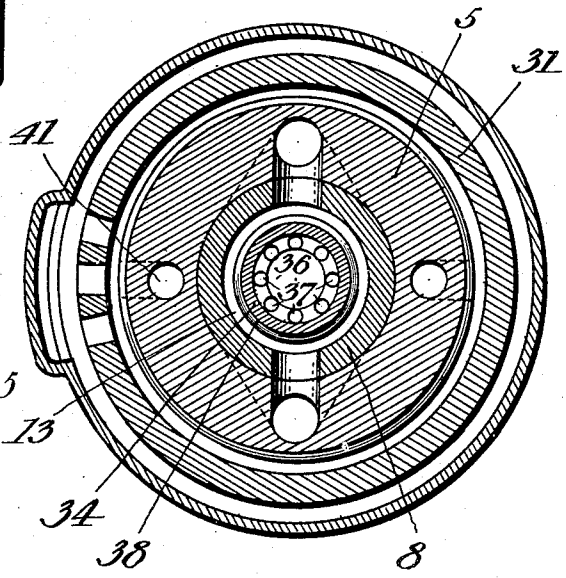


Fig. 4.



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UNITED STATES PATENT OFFICE

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VARIABLE-STROKE TOOL

Original application filed May 21, 1928, Serial No. 279,370. Divided and this application filed June 19, 1929. Serial No. 372,025.

The present invention relates to automatic distributing valves for fluid operated tools. This application is a required division of my application, Serial No. 279,370.

The object is to provide a novel form of structure that is effective and quick in operation.

In the accompanying drawings:

Figure 1 is a vertical sectional view through a portion of a pneumatic tool equipped with the preferred embodiment of the said valve mechanism.

Figure 2 is a view similar to Figure 1, but showing the valve shifted.

Figure 3 is a detail view of the parts of the valve mechanism separated.

Figure 4 is a cross sectional view on the line 4—4 of Figure 2.

In the embodiment illustrated, a cylinder is employed in the form of a barrel 5 having a piston chamber 6 in which is a reciprocatory hammer piston 7.

The piston chamber 6 opens through the rear end of the cylinder 5, and detachably fitted into said rear end is valve casing 8 having a flange 9 abutting the rear end of the cylinder. The front end of the valve casing has an opening 10 therethrough, affording communication between the interior of the casing and the rear end of the piston chamber 6, this opening being surrounded by a circular end wall 11. In rear of said opening 10 there is formed an internal annular motive fluid supply groove 12 and in rear of said groove there is formed an annular internal distributing groove 13. This distributing groove is in communication by a passageway 14 with the front end of the piston chamber 6. Behind the distributing groove 13 is formed an internal annular exhaust groove 15, from which an exhaust port 16 opens through the cylinder wall, and behind the exhaust groove 15 is another groove 17 into which opens a passageway 18 that also opens at 19 into the interior of the piston chamber 6. Behind the groove 17 and in the rear end of the valve casing 8 is formed an internal annular trip groove 20 of larger diameter than the above mentioned grooves. From the front portion of said groove 20, a bleed port, shown in dotted lines at 21, in Figure 2, opens to atmosphere.

The rear end of the valve casing 8 is furthermore provided with a recessed seat 25, in which is fitted the flange 26 of a bushing 27 that extends into the rear end of the valve casing 8 in spaced relation to the walls thereof. This bushing is engaged by a packing gasket 28 preferably held in a cupped washer 29 and the latter being abutted against by a rear head 30, the skirt 31 of which is threaded on to the rear end of the cylinder 5. To the rear head is connected a suitable member 32, constituting a conduit for supplying motive fluid, as air, to the bushing 27. A screen 33 is preferably interposed between the packing cup 29 and the rear head 30 and extends across the passageway for the fluid.

In the valve casing 8 is a reciprocatory tubular distributing valve, designated 34. This valve slidably fits within the valve casing and has its rear end slidably fitting on the bushing 27. Obviously therefore motive fluid is supplied to the interior of this valve through said bushing. The rear end of the valve is provided with a trip flange 35, operating in the trip groove 20. The valve is provided with a closed front end 36 that is movable to and from a position to plug the opening 10 that affords communication between the supply groove 12 and the rear end of the piston chamber 6. It is further provided in its front end portion and directly in rear of the plug with lateral supply ports 37 opening into the supply groove 12. Behind these ports the exterior of the valve is reduced as shown at 38 to afford communication between the supply groove 12 and the distributing groove 13 when the valve is in its foremost position, or as shown in Figure 1. When, however, the valve is in its rear position, and the opening 10 is uncovered, then communication between the supply groove 12 and the distributing groove 13 is cut off, as shown in Figure 2, while the supply groove 12 is in communication with the rear end of the piston chamber 6 through the opening 10. The valve further is provided behind the reduced portion 38 with another reduced portion 39 that establishes and cuts

off communication between the exhaust groove 15 and the groove 17, accordingly as the valve is in one or the other position, illustrated in Figures 1 and 2.

The cylinder is provided with an exhaust port 40 covered and uncovered by the piston during its reciprocation. Leading from the piston chamber 6 at a point in rear of the exhaust port 40 is a trip passageway 41 that opens into the trip groove 20 behind the valve flange 35.

With the structure as thus described, if air or motive fluid is supplied to the distributing valve 34, assuming the valve in its rearmost position, as shown in Figure 2 and the piston at the rear end of its stroke, the air will pass through the interior of the valve, out of the ports 37, through the supply groove 12 and opening 10 into the piston chamber 6 behind the piston 7, thereby driving the piston forwardly. The exhaust in advance of the piston takes place through an exhaust port 40^a until said port is covered. When the piston uncovers the trip passageway 41, motive fluid is thereby admitted from behind the piston through said passageway 41 and behind the flange 35 of the valve 34. The area of said flange being great enough to overcome the pressure against the front end of the valve, the valve is shifted to its forward position, or the position shown in Figure 1. When this position is taken, the front end of the valve plugs the opening 10 and cuts off further supply of motive fluid to the rear end of the piston chamber 6. At the same time communication is opened between the supply groove 12 and the distributing groove 13. The motive fluid therefore finds its way through the passageway 14 to the front end of the piston chamber 6 and operating against the front end of the piston 7, drives it rearwardly. The exhaust now takes place through the port 40 until said port is closed and thereafter through the passageway 19, groove 17, reduced portion 39 of the distributing valve, groove 15 and port 16 to atmosphere. When the port 19 is passed by the piston fluid pressure will be built up behind the said piston until its force on the front end 36 of the valve 34 is sufficient to force said valve rearwardly. The ports are now in the position first described.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In a variable stroke fluid operated tool, the combination with a cylinder having a piston chamber, of a piston that operates in the chamber, a valve casing having an open end in communication with one end of the piston chamber, a tubular valve in the valve casing having a closed end movable to and from a position to plug the open end of the valve chamber, and means for supplying motive fluid to the interior of the valve, said valve having ports that permit the escape of the motive fluid to the exterior of the valve, said ports being in communication with the open end of the valve casing when the closed end of the valve is withdrawn therefrom to open said end.

2. In a variable stroke fluid operated tool, the combination with a cylinder having a piston chamber, of a piston that operates in the chamber, a valve casing having an open end in communication with one end of the chamber and also having an internal supply groove adjacent the open end, a tubular valve in the valve casing having a closed end movable to and from a position to plug the open end of the valve chamber, and means for supplying motive fluid to the interior of the valve, said valve having ports that permit the escape of the motive fluid to the internal supply groove and said groove being in communication with the open end of the valve casing when the closed end of the valve is withdrawn therefrom to open said end.

3. In a variable stroke fluid operated tool, the combination with a cylinder having a piston chamber, of a piston that operates in the chamber, a valve casing having an open end in communication with one end of the piston chamber, and also having an internal supply groove adjacent the open end, and a second distributing groove alongside the supply groove, a tubular valve in the valve casing having a closed end movable to and from a position to plug the open end of the valve chamber, and means for supplying motive fluid to the interior of the valve, said valve having ports that permit the escape of the motive fluid to the internal supply groove and said groove being in communication with the open end of the valve casing when the closed end of the valve is withdrawn to open said end, and said valve having means for establishing communication between the supply groove and the distributing groove when the closed end of the valve plugs the open end of the valve casing.

4. In a variable stroke fluid operated tool, the combination with a cylinder having a piston chamber, of a piston that operates in the piston chamber, a valve casing, passageways from the valve casing communicating with the end portions of the piston chamber, a tubular reciprocatory valve in the piston chamber having external means for controlling the passage of fluid to the passageways, a bushing fitting the interior of the valve and said valve being slidable thereon, and

means for supplying motive fluid to the bushing and thence to the interior of the valve, said valve having supply ports leading to its exterior.

5. In a variable stroke fluid operated tool, the combination with a cylinder having a piston chamber, of a piston that operates in the piston chamber, a rear head for the cylinder, a valve casing fitted into the rear end of the cylinder and having a flange interposed between the cylinder and rear head, a bushing extending into the valve casing and having a flange interposed between the cylinder and rear head, a tubular distributing valve slidably mounted in the casing and on the bushing, means for supplying motive fluid through the bushing into the interior of the valve, and means controlled by the valve for distributing the motive fluid to the piston chamber and piston to operate the latter.

6. In a variable stroke fluid operated tool, the combination with a cylinder having a piston chamber, of a piston that operates in the piston chamber, a rear head for the cylinder, an open ended valve casing fitted into the rear end of the cylinder and having a flange interposed between the cylinder and rear head, said valve casing having an internal supply groove behind its front open end and a distributing groove in rear of the supply groove, a bushing extending into the valve casing and having a flange interposed between the cylinder and rear head, a tubular distributing valve slidably mounted in the casing and on the bushing and having a closed front end that plugs and opens the front end of the valve casing, said valve having outlet ports opening into the supply groove of said valve casing, and also having a reduced portion that affords and cuts off communication between the supply groove and distributing groove, and means for supplying motive fluid through the bushing into the interior of the valve.

In testimony whereof, I affix my signature.

HJALMER C. GUSTAFSON.