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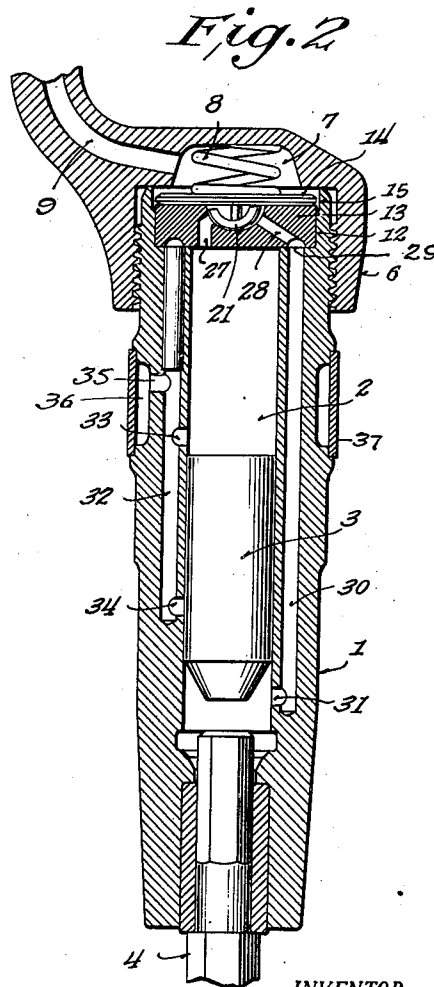
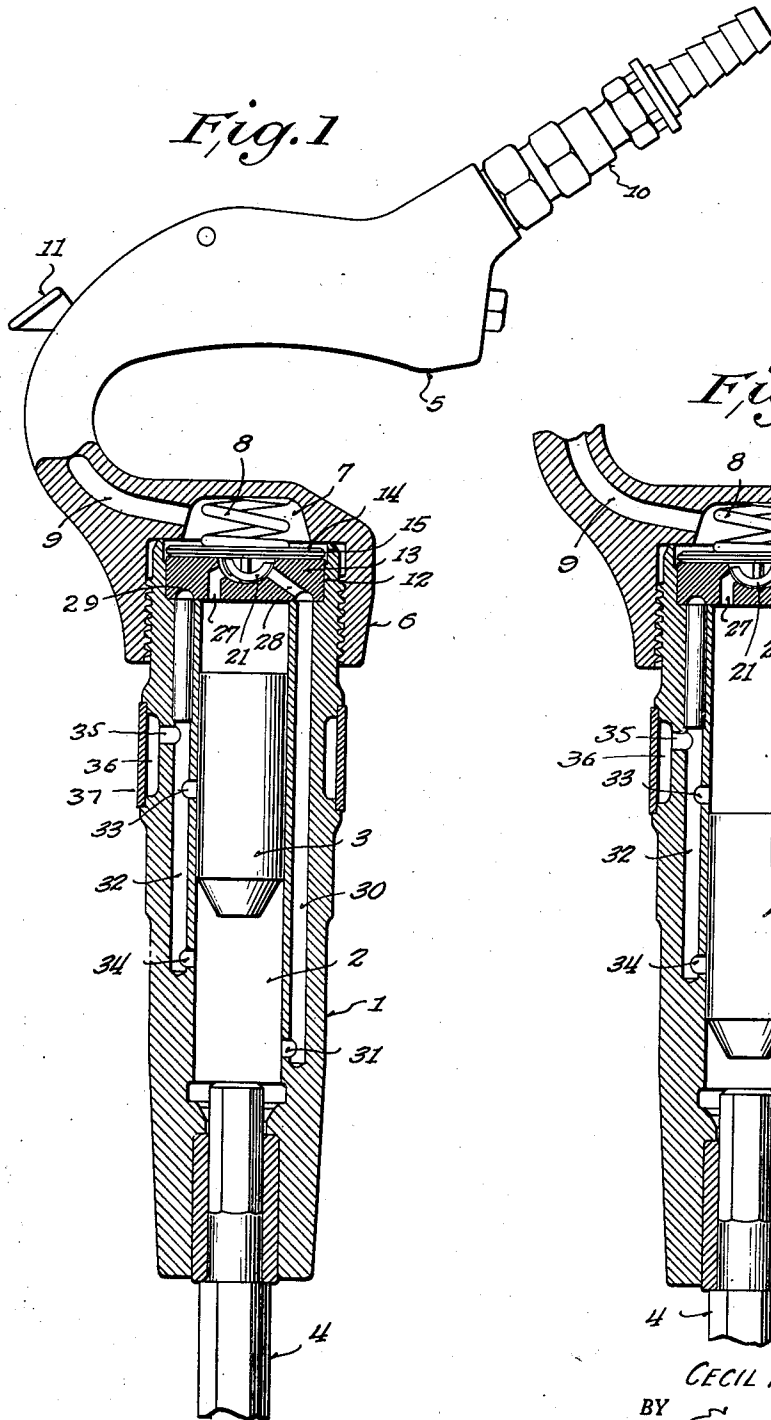
C. N. DOUGLASS

2,201,431

DISTRIBUTING VALVE FOR PNEUMATIC HAMMERS

Filed Oct. 21, 1938

2 Sheets-Sheet 1



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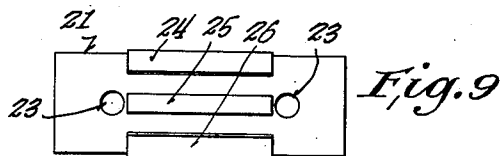
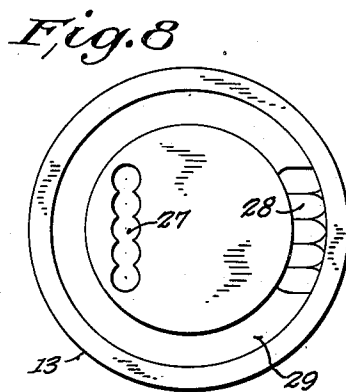
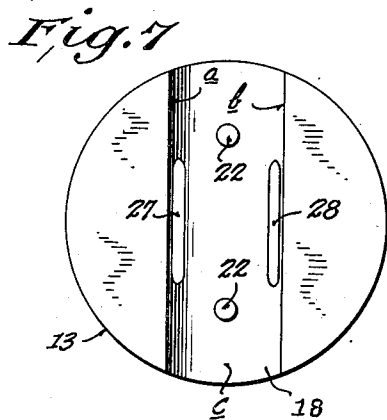
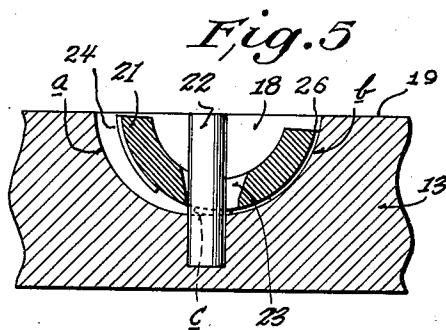
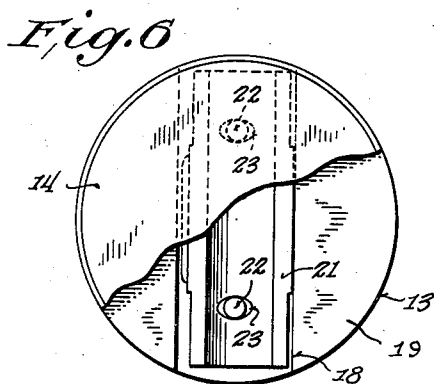
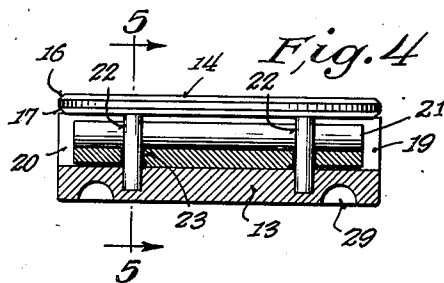
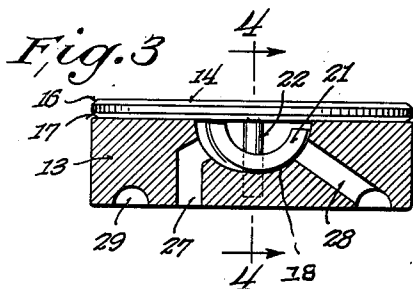
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DISTRIBUTING VALVE FOR PNEUMATIC HAMMERS

Filed Oct. 21, 1938

2 Sheets-Sheet 2



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2,201,431

DISTRIBUTING VALVE FOR PNEUMATIC HAMMERS

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Application October 21, 1938, Serial No. 236,181

7 Claims. (Cl. 121—22)

This invention relates to chipping hammers and other pneumatic tools and more particularly to the distributing valves for such tools.

The principal object and purpose of my invention is to provide a distributing valve which opens and closes the ports controlled thereby with a rolling action to eliminate the impact closing of said ports and the wear which is common to valves of the plate, spool and sleeve types heretofore employed.

A further object of my invention is to provide for this rolling action by rockably mounting the valve in its seat and providing the seat and the valve with complementary or mating radial surfaces which close a port by a gradually diminishing arc and open a port by a gradually increasing arc in the operation of the valve, thereby producing an easy-handling tool in that the explosive action common to plate and like valves is eliminated.

A further object of my invention is to provide a valve structure which is simple to manufacture and also which provides for the direct flow of air to the cylinder from the underside of the valve, thus avoiding the indirect method over the top of the valve as heretofore.

The invention consists further on the features hereinafter described and claimed.

In the accompanying drawings—

Fig. 1 is a longitudinal sectional view with parts in elevation of a chipping hammer embodying my improved distributing valve, the latter being shown in a position for supplying live air to the rear end of the cylinder;

Fig. 2 is a similar view with the handle member broken away and showing the valve in its position for supplying live air to the front end of the cylinder;

Fig. 3 is a detail of the valve assembly, the block being in section;

Fig. 4 is a sectional view with parts in elevation taken on line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary sectional view taken on line 5—5 of Fig. 4;

Fig. 6 is a top plan view of the valve assembly, the cover plate being broken away to show the rocker valve;

Fig. 7 is a top view of the valve block;

Fig. 8 is a bottom view of said block; and

Fig. 9 is a similar view of the rocker valve.

In the drawings, 1 indicates the barrel of the tool containing a cylinder 2 in which reciprocates a hammering piston 3 as in devices of this general character. A chisel 4 extends into the cylinder 2 at the front end of the barrel to receive the blows of the piston 3 and a handle member 5 is at the opposite end of the barrel to close the rear end of the cylinder and supply compressed or live air thereto.

The handle member 5 screws on the rear end

of the barrel 1, having an internally threaded annular extension 6 as shown in Fig. 1. This extension is preferably cast integral with the body of the handle member so that the latter when screwed on the barrel provides a closure for the open rear end of the cylinder 2. The handle body over the rear end of the cylinder contains a recess or cavity 7 for a spring element 8 to be presently referred to and to connect with a live air passage 9 in the handle member. This passage extends to a fitting 10 at the rear end of the handle, whereby an air supply hose (not shown) may be connected to the tool. The flow of live air to the cylinder 2 through the handle member is controlled by a throttle valve mounted in the handle. The only part of the throttle valve shown in the drawings (Fig. 1) is its actuating lever 11 which is depressible by the thumb of the operator's hand grasping the handle.

The distributing valve of my invention is located at the rear end of the cylinder 2 in a recess 12 provided therefor in the barrel 1 as shown in Figs. 1 and 2. This valve comprises a valve block 13 which seats against the barrel at the bottom of the recess 12. The block and the recess are annular, the block having an easy fit in the recess against its side wall and extending over the open rear end of the cylinder as shown.

The block 13 terminates short of the rear end of the barrel leaving a space to receive a disc-like cover plate 14 which lies on the top surface of the block as shown. The disc 14 is circular having a diameter substantially equal to that of the block, but having its outer peripheral edge out of contact with the adjacent wall of the recess 12 by slightly enlarging the recess about the edge of the disc as indicated at 15. This allows the live air pressure to pass around the edge of the disc to the block, such edge being beveled on both sides for this purpose as shown at 16, 17 in Figs. 3 and 4. The spring element 8 holds the disc against the block 13 and the latter against the barrel 1 at the bottom of the recess 12. The joint here is a ground fit to prevent leakage of air between the barrel and the lower surface of the block.

The block 13 is provided with a valve seat in the form of a groove 18 extending diametrically across the block and opening through its top surface 19 against which the disc 14 seats. The groove 18 also opens at its opposite ends through the peripheral edge of the block, as indicated at 19, 20 in Figs. 4, 6 and 7.

Located in the groove 18 and extending substantially the full length thereof is a valve element 21. Pins 22, 22 extend into the valve 21 from the block 13 at the base of the groove 18 to balance the valve and also hold it against axial displacement of the groove. The pins 22 extend into the valve 21 through holes 23 therein, which

holes, as shown in Fig. 5, are enlarged and tapered to permit axial rocking of the valve in the groove 18. The disc 14 closes the top side of the groove and retains the valve in the groove on said pins 22.

5 The valve element 21 is substantially semi-cylindrical in cross-section and is provided on its outer side with curved surfaces 24, 25 and 26 all on the same radius. These surfaces extend axially of the valve member to substantially the same extent between the holes 23 and are arranged with the surface 25 centrally disposed between the side surfaces 24 and 26 as clearly shown in Fig. 9. The surface 25 seats against the bottom of the groove 18 and with the groove laterally wider than the valve element the latter is rockably mounted in the groove to alternately open and close inlet ports 27, 28 at the opposite sides of the groove. These ports connect with the opposite ends of the cylinder 2 as will presently appear.

10 The side portions *a*, *b* of the groove 18 are curved on the same radius, but with the centers offset to provide a sufficiently wide tangent section *c* at the bottom of the groove to rockably mount the valve 21. The sections *a*, *b* are constructed on the same radius as the valve 21 so that the side surfaces 24, 26 of the valve in opening and closing the ports 27, 28 will have a rolling action against the sides of the groove to open a port by a gradually increasing arc and close the port by a gradually decreasing arc.

15 The port 27 directly connects the groove 18 with the rear end of the cylinder 2, while the port 28 connects the groove with a channel 29 in the underside of the block 13. The channel 29 is adjacent to the periphery of the block, being in the portion of the block which seats against the barrel at the bottom of the recess 12. The channel 29 connects with a passage 30 in the barrel leading to the front end of the tool where said passage is connected by a port 31 with the front end of the cylinder 2. The channel 29 is circular so that it will connect with the passage 30 in any rotative position of the block 13 in the recess 12. Hence, centering of the block 13 in the recess 12 is not required. The groove 18 and the valve surfaces 24, 25 and 26 are ground or lapped to provide a close fit between them and thus preclude air leakage when closing the ports 27, 28. The valve surfaces may be separated as shown to save expense in constructing the valve element.

20 The valve element 21 operates as follows. When the throttle valve is opened, live air pressure is supplied to the barrel 1 through the handle member 5. This air pressure enters the groove 18 at its opposite ends about the edges of the disc 14 and flows into the space between the valve and the disc by reason of the concave form given to the inner surface of the valve as shown. With the parts in the positions shown in Fig. 1, the fluid under pressure on the concave surface of the valve 21 rocks the valve to close the port 28 and shuts-off the front end of the cylinder 2 to the live air pressure. The front end of the cylinder is at this time open to the exhaust through the passage 32 in the barrel and hence there is a reduced pressure on the valve area 26 permitting the live air pressure to rock the valve to close the port 28. This opens the port 27 and supplies live air pressure to the rear end of the cylinder 2 to force the piston 3 on its forward or power stroke.

25 When the rear end of the piston 3 passes a port 33 which connects the rear end of the cylinder 2 with the exhaust passage 32, the rear

end of the cylinder is open to the exhaust, and the live air pressure on the inner curved surface of the valve 21 rocks the valve to the position in Fig. 2. This closes the port 27 and opens the port 28. Live air pressure is now admitted to the front end of the cylinder 2 through the port 31 and the piston 3 is driven rearwardly on its return stroke.

30 The piston 3 on its return stroke first closes the port 33 to shut-off the rear end of the cylinder 2 to the exhaust 32 before uncovering a port 34 which connects the exhaust passage 32 with the front end of the cylinder. When port 34 is uncovered, the front end of the cylinder is opened to the exhaust, reducing the pressure on the valve 21 opposite the port 28. A pressure is built up behind the piston at the rear end of the cylinder by compression of the entrapped air and the live air pressure on the valve rocks it to close the port 28 and open the port 27. This connects the rear end of the cylinder to the live air pressure and the piston is driven forwardly on its power stroke as before. These operations repeat as the valve rocks, the ports being automatically opened and closed in alternation to reciprocate the piston in the cylinder to impart blows on the tool element 4 at the front end of the barrel.

35 The advantages of the rocker valve 21 are as follows. It will be noted that the valve opens and closes its ports 27, 28 by a rolling action. This eliminates the impact closing of ports and the resultant wear which is common to valves of the plate, spool and sleeve types, whose motion is controlled by a direct stop on a shoulder or seat. This rolling action shuts-off the live air to the ports by a gradually diminishing arc and opens the ports in the same way. This produces an easy-handling tool in that the rolling action of the valve eliminates the sudden opening and the sudden closing of the valve with an explosive action which occurs with the plate and other types of valves which operate with a direct thrust. The valve 21 is balanced on the two pins 22 in such a position that starting of the tool is assured with the minimum amount of live air and eliminates the possibility of the valve becoming locked in the block. Also, the rocker valve allows simplicity in manufacture and mainly, direct air pressure for the power and the return strokes of the piston. As will be observed from the drawings, the air is delivered to the cylinder at all times from the under-side of the valve block and does not have to loop over the top. The radial surfaces which are equal to each other cause the valve 21 to be self-seating, that is, wear is equally distributed providing a long life valve.

40 With the rolling action, the tool may be started easily and enable the working tool or chisel to take hold before being subject to the maximum power of the piston. This is especially advantageous in chipping hammers. In the tool shown, the passage 32 connects with the atmosphere through a port 35 and a groove 36 in the exterior of the barrel behind an exhaust ring deflector 37.

45 The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. A pneumatic tool, comprising a cylinder, a hammering piston reciprocable within said cylinder, means providing a concave groove at one end of the cylinder and having ports for con-

necting the opposite sides of the groove with the opposite ends of the cylinder, and a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with said mid-portion in rolling contact with the bottom wall of the groove between said ports and said side portions opposite said ports to alternately open and close the same in the rolling action of the valve on its mid-portion transversely of the groove.

2. A pneumatic tool, comprising a cylinder, a hammering piston reciprocable within said cylinder, means providing a groove at one end of the cylinder and having ports for connecting the opposite sides of the groove with the opposite ends of the cylinder, and a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with said mid-portion in rolling contact with the bottom wall of the groove between the ports and said side portions opposite said ports, said groove being wider than the valve and having a substantially flat seat for the valve between the side portions of the groove which side portions have substantially the same radius as the adjacent side portions of the valve to alternately open and close the ports in the rolling action of the valve on its mid-portion transversely of the groove.

3. A pneumatic tool, comprising a cylinder, a hammering piston reciprocable within said cylinder, a block closing one end of the cylinder and having a concave groove therein opening through the outer surface of the block, said block having ports for connecting the opposite sides of the groove with the opposite ends of the cylinder, a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with said mid-portion in rolling contact with the bottom wall of the groove between said ports and said side portions opposite the ports to alternately open and close the same in the rolling action of the valve on its mid-portion transversely of the groove, and a cover plate on the block over the groove to retain the valve therein, said groove opening through the peripheral portion of the block adjacent the outer edge of the plate.

4. A pneumatic tool, comprising a barrel containing a cylinder, a hammering piston reciprocable within said cylinder, a block closing one end of the cylinder and having a concave groove therein opening through the outer surface of the block, said block having ports for connecting the opposite sides of the groove with the opposite ends of the cylinder, a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with said mid portion in rolling contact with the bottom wall of the groove between said ports and said side portions opposite the ports to alternately open and close the same in the rolling action of the valve on its mid-portion transversely of the

groove, and a cover plate on the block over the groove to retain the valve therein, said barrel having a recess to receive the block and the plate with the portion of the recess about the edge of the plate larger in diameter than the plate.

5. A pneumatic tool, comprising a cylinder, a hammering piston reciprocable within said cylinder, means providing a concave groove for the cylinder and having ports for connecting the opposite sides of the groove with the opposite ends of the cylinder, a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with said mid-portion in rolling contact with the bottom wall of the groove between said ports and said side portions opposite the ports to alternately open and close the same in the rolling action of the valve on its mid-portion transversely of the groove, and means providing a balanced symmetrical mounting for the valve within the groove.

6. A pneumatic tool, comprising a cylinder, a hammering piston reciprocable within said cylinder, means providing a concave groove at one end of the cylinder and having ports for connecting the opposite sides of the groove with the opposite ends of the cylinder, and a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with said mid-portion in rolling contact with the bottom wall of the groove between the ports and said side portions opposite said ports to alternately open and close the same in the rolling action of the valve on its mid-portion transversely of the groove, said groove having its side portions containing the ports on substantially the same radius as the arcuate side portions of the valve and on laterally offset centers to make the groove wider than the valve and provide a substantially flat seating surface for the valve at the bottom of the groove.

7. In a pneumatic tool, a barrel containing a cylinder, a hammering piston reciprocably mounted within said cylinder, a block fitted in a recess in the barrel at the rear end of the cylinder and closing the same, a handle member secured to the barrel over the block, said block having a groove and inlet ports for connecting the opposite sides of the groove to the opposite ends of the cylinder, a substantially semi-tubular fluid actuated distributing valve located within said groove, said valve having arcuate mid and side portions on its undersurface on substantially the same radius and being mounted within the groove with its mid-portion in rolling contact with the bottom wall of the groove between said ports and its side portions opposite the ports to alternately open and close the same in the rolling action of the valve on its mid-portion transversely of the groove, a plate on the block over the groove to retain the valve therein, and a spring element between and engaging the plate and the handle member to hold the plate against the block and the block against the barrel at the base of said recess.

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