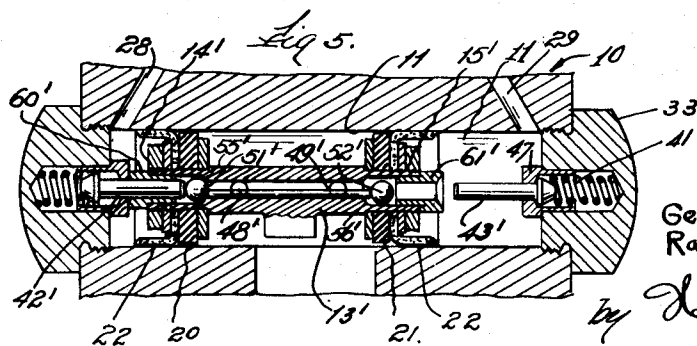
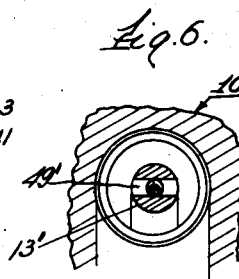
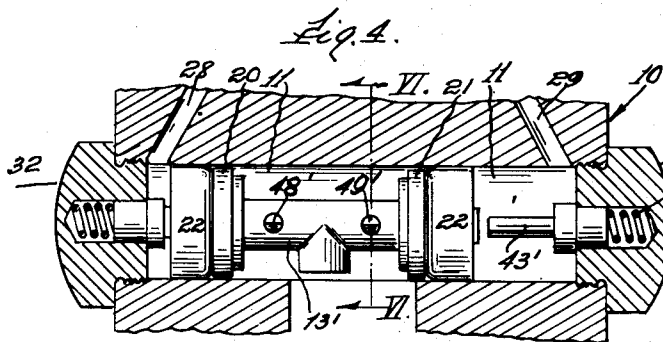
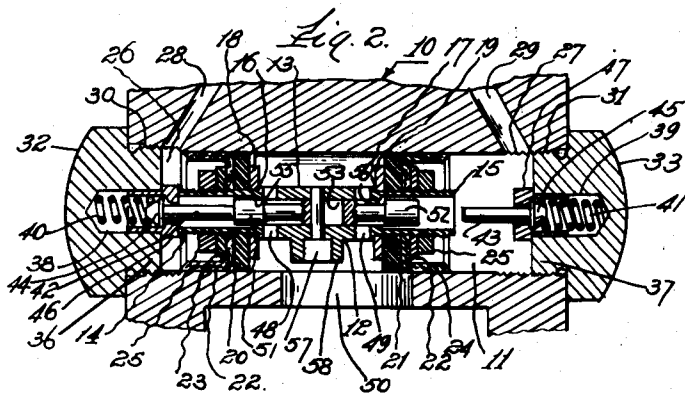
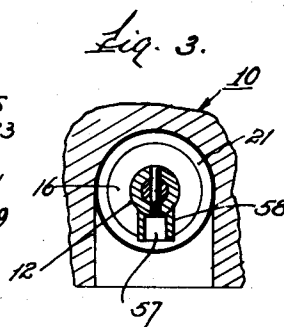
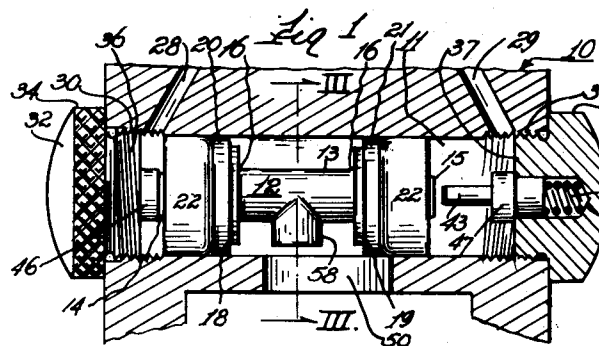


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G. M. WALRAVEN ET AL
AIR VALVE MECHANISM FOR CONTROLLING THE OPERATION
OF PNEUMATIC DEVICES AND THE LIKE
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AIR VALVE MECHANISM FOR CONTROLLING
THE OPERATION OF PNEUMATIC DEVICES
AND THE LIKEGeorge M. Walraven and Raymond G. Knudsen,
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5 Claims. (Cl. 121—123)

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This invention relates to valve mechanisms and more particularly to air valve mechanisms for valve lapping machines of the type illustrated in United States Letters Patent No. 2,212,993 although certain features thereof may be employed with equal advantage for other purposes.

It contemplates more especially the provision of an improved air valve mechanism of increased efficiency and speed of operation to more effectively actuate valve lapping tools and similar devices.

Air valve mechanisms of numerous types have heretofore been proposed, but these are comparatively sluggish and undependable for operating high speed mechanisms such as valve lapping tools. Valve lapping tools require high speed operation and in consequence thereof the air valve instrumentalities must be simple, speedy in operation, and dependable to impart high speed and uniform strokes to the lapping mechanism.

One object of the present invention is to simplify the construction and improve the operation of devices of the character mentioned.

Another object is to provide an improved air valve mechanism that is dependable under high speed operation, to control the strokes of valve lapping devices and the like.

Still another object is to provide an improved reciprocal air valve mechanism which will impart improved stroke characteristics to valve lapping devices and the like.

A further object is to provide a compound valve of the reciprocal type which is simple, compact, and dependable under high speed operation.

A still further object is to provide an improved dual air valve of the reciprocal type which is efficient at high speed to control the operation of valve lapping tools and the like.

Still a further object is to provide an improved air valve mechanism which is simple in construction and dependable in operation for actuating valve lappers and similar devices at high speed.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

In the drawings:

Figure 1 is a sectional view in elevation through a housing showing the internal structure of an air valve mechanism embodying features of the present invention.

Figure 2 is a sectional view in elevation similar to Figure 1 and showing the compound valve mechanism in section.

Figure 3 is a fragmentary sectional view taken substantially along line III—III on Figure 1.

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Figure 4 is a sectional view in elevation of a modified air valve mechanism similar to the showing in Figure 1.

Figure 5 is a sectional view in elevation similar to Figure 4 and showing the valve mechanism in section to clarify the illustration.

Figure 6 is a fragmentary sectional view in elevation taken substantially along the line VI—VI on Figure 4.

The structure selected for illustration is not intended to serve as a limitation upon the scope or teachings of the invention, but is merely illustrative thereof. There may be considerable variations and adaptations of all or part of the teachings depending upon the dictates of commercial practice.

The present embodiment comprises a valve housing 10 cast or otherwise shaped to provide a cylinder 11 that extends entirely therethrough to receive a valve piston 12 therein. The valve piston 12 comprises, in this instance, a cylindrical shank 13 of comparatively small diameter having reduced tubular ends 14—15 to present peripheral shoulders 16—17. Circular discs 18—19 are disposed over the reduced ends 14—15 of the piston 12 to receive collars 20—21 of somewhat lesser diameter than the cylinder bore 11 to abut against the discs 18—19. The discs 18—19 support flexible cup-shaped valves 22 which are preferably stamped or otherwise shaped from any suitable flexible material such as leather, synthetic rubber and the like.

The flexible valves 22 are retained on the piston ends or extensions 14—15 by means of axially apertured discs 23—24. The discs 23—24 are retained against the valves 22 through the medium of threaded fasteners such as nuts 25 that engage the internally threaded piston ends or extensions 14—15. It should be noted that the cup shaped valves 22 are disposed oppositely of each other to frictionally embrace the internal wall of the cylinder bore 11 in that the air pressure serves to impart a spreading urge to the cup-shaped valves 22.

The oppositely disposed flexible piston valves 22 are spaced from each other for a lesser distance than the spacing between intake ports 26—27 provided in the cylinder body or housing 10 to communicate with upwardly convergent air intake passages 28—29 to which compressed air is admitted from a suitable source such as an air reservoir that is maintained full under pressure by an air compressor (not shown). It should be noted that the air pressure is alternated in the intakes 28—29 by the position of the valve piston 12 through an auxiliary control mechanism (not

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shown) that is well known in the art of piston-type actuators of the double piston reciprocatory steam chest, air chest, and fluid chest variety. The control mechanism is directly and operatively connected to the piston shank 13 or exhaust valves 51—52 so that the operation thereof will be synchronized with and rendered responsive to each reciprocation of the piston shank 13 and/or the exhaust valves 51—52, thereby cutting off the air pressure to the intake 28 when the valve piston 12 is at its extreme right position and similarly cutting off the air pressure to the intake 29 when the valve piston 12 arrives at its extreme left position. In these extreme positions of valve piston displacement, the opposite air inlets 28—29 are subjected to air pressure so that the valve piston 12 will be reciprocated at high speed and with maximum efficiency. The cylinder bore 11 is provided with internally threaded ends 30—31 to receive closure caps 32—33 that are preferably though not essentially knurled around their peripheral rims 34—35 to provide for the threaded engagement or disengagement of their reduced axial threaded shanks 36—37. The reduced threaded shanks 36—37 of the closure caps 32—33 threadedly engage the internally threaded ends 30—31 of the cylinder bore 11.

The end cap enclosures 32—33 are provided with upwardly disposed axial recesses 38—39 which confined compression springs 40—41 against which valve stop pins 42—43 are disposed. To this end, the valve stop pins 42—43 are provided with conical heads 44—45 to engage the ends of the springs 40—41 for assembled connection therewith through the medium of retainer bushings 46—47. These axially disposed valve stop pins 42—43 are resiliently supported in the path of the valve piston 12 so that the tubular ends or extensions 14—15 thereon will ride thereover. The valve piston 12 is provided with diametrically disposed exhaust ports 48—49 which open into the cylinder bore 11 that communicates with an enlarged exhaust opening 50 provided in the bottom of the cylinder housing 10.

Exhaust valves 51—52 are disposed within the bore 53 of the valved piston 12 to cooperate with exhaust ports 48—49 for the purpose of controlling the discharge of the air therefrom after the valve piston 12 has been moved to the left or right depending upon the direction of traverse and the reversal thereof as the exhaust valves 51—52 abut against the valve stop pins 42—43. With this arrangement, the air under pressure is alternately admitted through the ports 26—28 and 27—29 for discharge through the exhaust ports 48—49 as the valved piston 12 reciprocates to the right and then the left at high speed to actuate any suitable mechanism such as a valve lapping tool.

This cycle of operation is controlled by the exhaust valves 51—52 that momentarily effect alternate contact with the peripheral valve seats 55—56. The momentary alternate cooperation between the exhaust valves 51—52 which are precision fitted relative to the valve seats 55—56, precludes the escape of air from the exhaust ports 43—49 until after the piston 12 has been displaced for its extreme stroke. Thereupon, the exhaust valves 51—52 will alternately recede for a slight distance from the valve seats 55—56 to permit the escape of the expended air pressure whereupon the reversal of movement is instantaneously effected to repeat the reciprocatory displacements in one direction and then

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another. The valve piston 12 has a transverse recess 57 provided in a boss 58 to accommodate a suitable rod or link which transmits the motion of the piston 12 to the instrumentalities that are to be actuated therewith.

In the modified embodiment shown in Figures 4—5, the structure is similar, except for the exhaust valves 51—52 in this embodiment are substituted by spherical exhaust valves 51'—52' which cooperate with valve seats 55'—56' to accomplish the same operational control and purpose. The spherical exhaust valves 51'—52' are displaced by the valve stop pins 42'—43' as the piston 12' is displaced in one direction and then the other to control the exhaust ports 43'—49'. The tubular reduced extensions 14'—15' of the valve piston 12' are provided with guide bushings 60'—61' to retain the exhaust valve stop pins 42'—43' in position and to yield, to a limited extent, upon contact with the spherical exhaust valves 51'—52'. From the foregoing description, it will be apparent that an air valve mechanism has been provided to control the operation of valve lapping and other similar air actuated tools in an efficient manner.

While we have illustrated and described a preferred embodiment of this invention, it must be understood that the invention is capable of considerable variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

We claim:

1. In an air valve mechanism, the combination with a cylinder, of a reciprocable shank in said cylinder, spaced pistons on said shank in said cylinder, flexible liners on said pistons in air seal engagement with said cylinder, there being spaced air intake ports in said cylinder, said intake ports communicating with said cylinder proximate to the ends thereof to provide for greater spacing distance than the spacing of said pistons, there being spaced exhaust ports in said piston shank, end closures detachably associated with said cylinder, slidable piston-type reciprocable valves in said shank to control said exhaust ports, yieldably mounted elongated axial bumper means in the end closures of said cylinder to reverse the reciprocation of said pistons and simultaneously actuate said exhaust port valves, there being an opening in said cylinder between said pistons, and means on said piston shank for connection of an actuated member to project through said last named opening in said cylinder.

2. In an air valve mechanism, the combination with a cylinder, of a reciprocable shank in said cylinder, spaced pistons on said shank in said cylinder, flexible liners on said pistons in air seal engagement with said cylinder, there being spaced air intake ports in said cylinder, said intake ports communicating with said cylinder proximate to the ends thereof to provide for greater spacing distance than the spacing of said pistons, there being spaced exhaust ports in said piston shank, valves in said shank to control said exhaust ports, yieldably mounted valve stop bumper means extending axially inwardly from the ends of said cylinder to reverse the reciprocation of said pistons and simultaneously actuate said exhaust port valves, there being an opening in said cylinder between said pistons and

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means on said piston shank for connection of an actuated member to project through said last named opening in said cylinder.

3. In an air valve mechanism, the combination with a cylinder, of a reciprocable shank in said cylinder, spaced pistons on said shank in said cylinder, flexible liners on said pistons in air seal engagement with said cylinder, there being spaced air intake ports in said cylinder, said intake ports communicating with said cylinder proximate to the ends thereof to provide for greater spacing distance than the spacing of said pistons, there being spaced exhaust ports in said piston shank, end closures detachably associated with said cylinder, piston type valves in said shank to control said exhaust ports, yieldably mounted elongated axial bumper means extending inwardly from the end closures of said cylinder to reverse the reciprocation of said pistons and simultaneously actuate said exhaust port valves, there being an opening in said cylinder between said pistons, and means on said piston shank for connection of an actuated member to project through said last named opening in said cylinder.

4. In an air valve mechanism, the combination with a cylinder, of a reciprocable shank in said cylinder, spaced pistons on said shank in said cylinder, flexible liners on said pistons in air seal engagement with said cylinder, there being spaced air intake ports in said cylinder, said intake ports communicating with said cylinder proximate to the ends thereof to provide for greater spacing distance than the spacing of said pistons, there being spaced exhaust ports in said piston shank, end closures detachably associated with said cylinder, axially disposed piston type valves in said shank to control said exhaust ports, yieldably mounted elongated axial bumper means extending inwardly from the end closures of said cylinder to reverse the reciprocation of said pis-

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tons and simultaneously actuate said exhaust port valves, there being an opening in said cylinder between said pistons, and means on said piston shank for connection of an actuated member to project through said last named opening in said cylinder.

5. In an air valve mechanism, the combination with a cylinder, of a reciprocable shank in said cylinder, spaced pistons on said shank in said cylinder, flexible liners on said pistons in air seal engagement with said cylinder, there being spaced air intake ports in said cylinder, said intake ports communicating with said cylinder proximate to the ends thereof to provide for greater spacing distance than the spacing of said pistons, there being spaced exhaust ports in said piston shank, end closures detachably associated with said cylinder, axially disposed piston type valves in said shank to control said exhaust ports, yieldably mounted valve stop pins axially mounted in the end closures of said cylinder to extend inwardly therein to reverse the reciprocation of said pistons and simultaneously actuate said exhaust port valves, there being an opening in said cylinder between said pistons, and means on said piston shank for connection of an actuated member to project through said last named opening in said cylinder.

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