This invention relates to new and useful improvements in a valve mechanism of the poppet type for directing air under pressure to two or more operating cylinders and for exhausting air from the cylinders.

An object of the invention is to provide a poppet valve mechanism of the above type in which a casing of few parts has a distributing chamber with connections to operating cylinders, a supply poppet valve for controlling the supply of air under pressure to said chamber, an exhaust poppet valve for controlling the discharge from said chamber, and means common to said poppet valves for operating the same.

A further object of the invention is to provide a poppet valve mechanism of the above type wherein the casing is made in two parts in one of which is located the inlet poppet stem and in the other the exhaust valve and its guiding stem and wherein the valve seat for the inlet poppet valve serves as a seal between the casing parts.

A further object of the invention is to provide a poppet valve mechanism of the above type wherein the poppet valves are so disposed that the air pressure operates to seal the poppet valves tightly against their respective seats when closed.

Still another object of the invention is to provide a rocker cam poppet valve operating mechanism which is so disposed as to open one of the poppet valves when oscillated in one direction and to open the other poppet valve when oscillated in the other direction.

A still further object of the invention is to provide a rocker cam mechanism of the above type which is so arranged that the inlet poppet valve is pushed off its seat by a force directed along its axis and the exhaust poppet valve is pulled off its seat by a force directed along its axis.

These and other objects will in part be obvious and will in part be hereinafter more fully disclosed.

In the drawings, which show by way of illustration one embodiment of the invention:

Figure 1 is a vertical sectional view through the valve casing and showing the inlet valve, the rocker cam and its operating mechanism with the inlet valve in closed position;

Figure 2 is a sectional view on a line 2—2 of Figure 1;

Figure 3 is a view similar to Figure 2 with the rocker cam oscillated so as to push open the inlet poppet valve; and

Figure 4 is a view similar to Figure 1 with the rocker cam oscillated so as to pull open the exhaust poppet valve.

The invention has to do with a poppet valve mechanism for directing air or other fluid under pressure to actuating cylinders, and for also exhausting the air from the actuating cylinders. The valve mechanism includes a valve casing formed in two parts, a lower or main part 1, and an upper part 2. The lower valve casing is provided with a chamber 3 and the upper part of the casing is provided with a chamber 4. There is an opening 5 through the upper wall of the lower casing and an opening 6 through the lower wall of the upper casing. When the upper casing is secured to the lower casing by the bolts 2′—2′, these openings are in alignment.

The upper valve casing has an inlet opening in one side thereof to which is attached a pipe 7 leading to the supply of air under pressure. Disposed between the upper and the lower casings is a valve seat 8. This valve seat 8 is preferably of a flexible elastic composition and it performs two functions. First, it seals the connection between the upper and lower parts of the casing, and second it serves as a seat for the inlet poppet valve 9.

This inlet poppet valve is provided with a poppet valve stem 10 which slides in a sleeve 11 formed integral with the upper portion of the valve casing. The sleeve is open at its upper end and the opening is closed by a cap 12 secured to the valve casing by the bolts 2′—2′. This cap is recessed and a gasket 13 located in the recess is clamped against the upper end of the valve housing 2 and this seals the opening leading to the sleeve 11.

The poppet valve sleeve 10 is counterbored as at the upper end thereof and a spring 15 extends into the counterbore and bears against the inner end thereof and at its upper end the spring is against the gasket 13. This spring serves to force the poppet valve 9 into contact with the valve seat 8. There is a drain opening extending from this counterbore down into the valve stem and a radial bore 16 which connects therewith. This provides a drain for any fluid accumulating in the upper part of the upper valve stem.

The chamber 3 in the lower part of the valve housing has an opening into which is threaded a pipe 17. This pipe leads to one of the actuating cylinders. On one of the sides of the valve casing there is an opening 18 which is closed by a cap 19. Between the cap and the end wall of the opening 18 is a gasket 20. Bolts 21, 21 serve to clamp the cap against the gasket and this provides a fluid tight seal between the cap and the lower portion of the casing. Threaded into the cap is a pipe 22 which leads to another actuating cylinder. As illustrated, this chamber 3 has these two outlets. One is the pipe 17 and the other is the pipe 22, which leads to two actuating cylinders.

At the lower side of the valve casing is an opening 23. A cap plate 24 with a similar opening is secured to the underside of the housing with the openings in alignment. An exhaust poppet valve 25 is adapted to engage the poppet valve seat 25. This poppet valve 28 has an integral lug 29 on its underside which contacts the valve seat. The poppet valve is cut away on one side thereof as indicated at 30. This cut-away extends slightly to one side of the center line of the poppet valve which is indicated at 31. At the upper side of the poppet valve there is an extension 32. A poppet valve stem 33 is rigidly attached to the upper end of the poppet valve 28. This poppet valve stem slides in a sleeve 34 which is formed integrally with the upper wall of the lower section of the valve casing. The poppet valve is counterbored with a chamber 35 which rests at its lower end against the bottom of the counterbore. The opening in the sleeve extends...
all the way through the upper wall and is closed by the upper section of the valve casing when the two sections are joined by the bolts 2, 2'. There is an opening 37 which leads from the counterbore to the extension on the valve so that any fluid accumulated in the counterbore will be carried away. The valve cam 38 provided with a head 39 at its lower end forming a flat integral surface.

The valves are operated by a cam rocker 40. The cam rocker is carried by a shaft 41 (see Figure 1). The shaft is mounted in ball bearings 42. At the inner side of the ball bearings is a seal 43 and at the outer side of the ball bearings is a seal 44. These are retainer seals of the usual character and they keep the air from leaking around the shaft and also prevent dirt from working into the bearings. A lubrication supply 45 is provided so that the bearings and seals may be kept lubricated. On the inner end of the shaft 41 is a rocker cam 46. This rocker cam has its outer surface curved about the center of the shaft and the inner surface is flat. At one end is a flat section 47 and at the other end of the cam rocker is a flat section 48. When the rocker cam is in the position shown in Figures 1 and 2 the cam 46 is out of contact with either of the valves. If this shaft is turned in a clockwise direction as viewed in Figure 2, the flat end 48 will contact with the head 39 at the lower end of the inlet poppet valve extension. This contact is at the center line of the valve and the reciprocating motion of the rocker cam after contact therewith will lift the inlet poppet valve from its seat as shown in Figure 3. At this time the exhaust poppet valve is free from contact with the rocker and the spring 36 holds the valve closed. When this inlet poppet valve is raised then air under pressure passes through the opening in the upper and lower in the upper and lower chambers and through the lower chamber out through the two outlet pipes to the actuating cylinders. The air pressure on the chamber 3 will bear on the upper face of the exhaust poppet valve 28 and hold the same tightly sealed.

When the operating shaft 41 for the rocker cam is oscillated in a counterclockwise direction it will first release the inlet poppet valve and then it will contact with the exhaust poppet valve at the center line of the valve and lift the valve from its seat as shown in Figure 4. This will connect the outlet pipes to the exhaust and permit the air in the actuating cylinders to be exhausted through the valve casing and the exhaust pipe connected thereto. It is noted that when the inlet poppet valve is released the spring 15 will close the valve. Furthermore, the air pressure on the upper chamber will bear on the valve and hold it tightly sealed.

The shaft 41 has an outer sleeve 49 keyed thereto and secured to this sleeve by welding or otherwise is a plate 50. A nut 51 on the end of the shaft forces the sleeve 49 into engagement with the ball bearings 42 and thus the ball bearings are held in place. A cap plate 52 carrying the lubrication device 45 is secured to the lower part of the casing by bolts 53, 53. There is an associated plate 54 between the cap plate 52 and the heads of the bolts which serve to hold in place the seals 44. Connected to the plate 50 is a plate 55 to which a hollow shaft 56 is attached by welding. There are spacer sleeves 57 between the plate 55 and the plate 56 which are preferably welded to the plate 50. Bolts 58, 59 pass through these spacer sleeves and clamp the outer plate 55 to the inner plate 50. When the hollow shaft is turned this will turn the plate 50 and the plate 50 through the sleeve 49 will turn the shaft 41. This hollow sleeve 56 forming the actuating shaft for the rocker cam shaft may be extended to any suitable place where it is accessible for turning. The upper part of the valve casing is substantially rectangular in cross section and this portion of the casing is so symmetrical that it may be placed so as to position the inlet pipe 27 on any one of the four sides of the valve casing. The opening 18 closed by the cap plate 19 is similar to the opening at the other side of the casing which receives the ball bearings, inner retainer and the shaft so that the actuating shaft and its associated parts can be attached at this opening 18 and the cap plate 19 with its associated outlet pipe transmitter to the other side of the casing in place of the shaft location. This makes the valve mechanism very flexible as to its mounting and connection to pipes leading to the actuating cylinders and the source of supply of actuating fluid. It is noted that the inlet poppet stem is enclosed in the upper valve casing and the exhaust poppet valve is enclosed in the lower valve casing. Hence, no stuffing packing around the poppet valve stems is necessary and there is no chance for leakage of air around the poppet stems.

It is also noted that the rocker cam pushes the inlet poppet valve off its seat and pulls the exhaust poppet valve off its seat. In both cases the rocker cam exerts a direct force along the axis of each poppet valve. The cam contacting surfaces on the inlet poppet valve and the exhaust poppet valve are in substantially the same plane as the rotating axis of the rocker cam. Hence there is no side thrust on the poppet valve at the time the poppet valve is lifted off its seat.

It is obvious that many changes in details of construction may be made without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A valve mechanism comprising a casing having upper and lower chambers, said casing being formed in two sections, said upper section having upper, lower and side walls forming the upper chamber, said side wall having an inlet opening, said lower section having an upper wall, a lower wall and side walls forming said lower chamber, the side wall of said lower chamber having an outlet opening and the lower wall of said lower chamber having an exhaust opening, the lower wall of the upper section contacting the upper wall of the lower section, a port extending through the contacting walls and connecting said chambers, a valve seat of flexible composition surrounding said port, said seat being extended so as to form a seat between the upper and lower sections of the casing, means for firmly clamping the upper section into sealed engagement with the lower section, a spring closed poppet valve mounted in said upper chamber and connecting said valve seat for closing the port, said valve having a depending portion axially thereof projecting through said port into said lower chamber, a spring closed poppet valve located in said lower chamber for closing the exhaust opening, and means located in said lower chamber for opening the valves in sequence.

2. A valve mechanism comprising a casing having upper and lower chambers, said casing being formed in two sections, said upper section having upper, lower and side walls forming the upper chamber, said side wall having an inlet opening, said lower section having an upper wall, a lower wall and side walls forming said lower chamber, the side wall of said lower chamber having an outlet opening and the lower wall of said lower chamber having an exhaust opening, the lower wall of the upper section contacting the upper wall of the lower section, a port extending through the contacting walls and connecting said chambers, a valve seat of flexible composition surrounding said port, said seat being extended so as to form a seal between the upper and lower sections of the casing, means for firmly clamping the upper section into sealed engagement with the lower section, a spring closed poppet valve mounted in said upper chamber and connecting said valve seat for closing the port, said valve having a depending portion axially thereof projecting through said port into said lower chamber, a spring closed poppet valve mounted in said upper chamber and connecting said valve seat for closing the port, and a valve carried thereby and adapted to engage said valve seat, said valve stem having a counterbore, a spring disposed in the counterbore and adapted to move the valve to closed position, the upper wall of the lower casing having a depending sleeve, a valve stem slidable in said sleeve, a valve carried thereby and adapted to close the
exhaust opening, said stem being counterbored, a spring within said counterbore for moving the exhaust valve to closed position, said exhaust valve being cut away at one side thereof between its upper and lower ends, an oscillating rocker cam disposed in said lower chamber and contacting the first-named valve axially thereof for opening the valve when rocked in one direction and contacting said exhaust valve axially thereof for opening the same when rocked in the opposite direction, and a manually operated shaft extending through one wall in the lower section of the casing and carrying said rocker cam.

3. A valve mechanism comprising a casing having upper and lower chambers, said casing being formed in two sections, said upper section having upper, lower and side walls forming the upper chamber, said side wall having an inlet opening, said lower section having an upper wall, a lower wall and side walls forming said lower chamber, the side wall of said lower chamber having an outlet opening and the lower wall of said lower chamber having an exhaust opening, the lower wall of the upper section contacting the upper wall of the lower section, a port extending through the contacting walls and connecting said chambers, a valve seat of flexible composition surrounding said port, said seat being extended so as to form a seal between the upper and lower sections of the casing, means for firmly clamping the upper section into sealed engagement with the lower section, a spring closed poppet valve mounted in said upper chamber and contacting said valve seat for closing the port, said valve having a depending portion axially thereof projecting through said port into said lower chamber, an exhaust valve seat of flexible composition surrounding the exhaust opening, a spring closed poppet valve located in said lower chamber for contacting said exhaust valve seat, an oscillating rocker cam disposed in said lower chamber and movable into contact with said port controlling valve axially thereof when rocked in one direction, and movable into contact with said exhaust valve axially thereof when rocked in the opposite direction.

4. A valve mechanism comprising a casing having upper and lower chambers, said casing being formed in two sections, said upper section having upper, lower and side walls forming the upper chamber, said side wall having an inlet opening, said lower section having an upper wall, a lower wall and side walls forming said lower chamber, the side wall of said lower chamber having an outlet opening and the lower wall of said lower chamber having an exhaust opening, the lower wall of the upper section contacting the upper wall of the lower section, a port extending through the contacting walls and connecting said chambers, a valve seat of flexible composition surrounding said port, said seat being extended so as to form a seal between the upper and lower sections of the casing, means for firmly clamping the upper section into sealed engagement with the lower section, a spring closed poppet valve mounted in said upper chamber and contacting said valve seat for closing the port, said valve having a depending portion axially thereof projecting through said port into said lower chamber, an exhaust valve seat of flexible composition surrounding the exhaust opening, a spring closed poppet valve located in said lower chamber for contacting said exhaust valve seat, an oscillating rocker cam disposed in said lower chamber and movable into contact with said port controlling valve axially thereof when rocked in one direction, and movable into contact with said exhaust valve axially thereof when rocked in the opposite direction, said contacting surfaces on the valves and the axis of oscillation of the rocker cam being substantially in a single plane when the valves are in contact with their respective valve seats whereby side thrust on the poppet valves is avoided when the valves are lifted from their respective seats by the rocker cam.

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