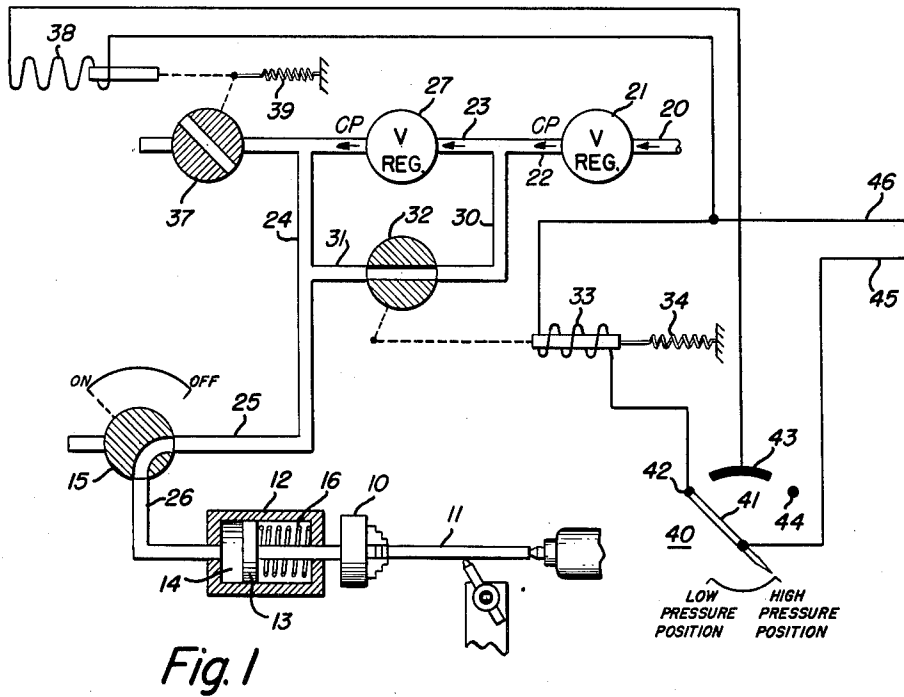
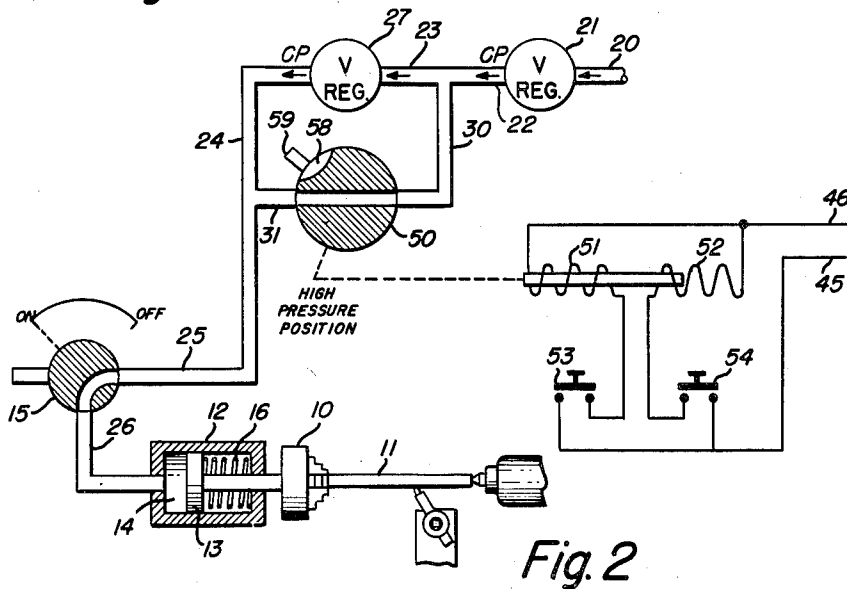
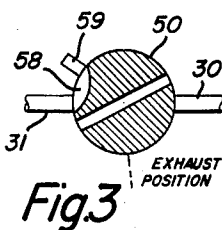
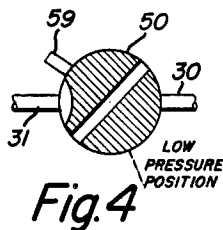


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FLUID SYSTEM HAVING SELECTABLE
FLUID OPERATING PRESSURES
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FLUID SYSTEM HAVING SELECTABLE FLUID OPERATING PRESSURES

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4 Claims. (Cl. 121—38)

My invention relates in general to control means and more particularly to control means for controlling the flow of fluid from a pressure source and selectively applying high and low pressure to a chamber, such, for example, as a piston chamber for actuating a chuck to hold a workpiece in a machine tool.

An object of my invention is the provision of applying selectively high and low pressure to a fluid actuating piston which controls the grip or force in which a fluid chuck engages a workpiece.

Another object of my invention is the provision of applying low pressure to a piston chamber and then when it becomes desirable to apply high pressure, the fluid is admitted to the piston chamber through a by-pass conduit which is in parallel with the pressure relief valve which admits low pressure to the piston chamber.

Another object of my invention is the provision of momentarily exhausting the fluid from the piston chamber as the control valve which admits high pressure to the chamber is actuated from open to closed position.

Another object of my invention is the provision of exhausting the high pressure fluid from the piston chamber momentarily as the pressure admitted to the piston chamber is transferred from a high pressure to a low pressure.

Another object of my invention is the provision of controlling the fluid actuating valves by electrical means.

Another object of my invention is the provision of providing in the high pressure control valve an exhaust valve means which momentarily exhausts the high pressure within the piston chamber as the control valve is moved from open to closed position.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

Figure 1 shows a diagrammatic illustration of a fluid control means embodying the features of my invention; Figure 2 is a modified form of the invention;

Figure 3 is a view of the control valve shown in Figure 2, but illustrated in an intermediate position; and

Figure 4 is another view of the control valve shown in Figure 2, being shown in the closed position.

With reference to Figure 1 of the drawing, I illustrate a fluid operated chuck 10 adapted to hold a workpiece 11. The fluid operated chuck 10 may be of any conventional design as embodied in modern machine tools. As illustrated, the fluid operated chuck 10 is actuated by a piston 13 mounted in a cylinder 12 so that as fluid is admitted to the piston chamber 14 the chuck 10 is actuated to a closed position; and as fluid is exhausted from the piston chamber 12, the spring 16 actuates the chuck to open position.

The admission of fluid to the piston chamber 14 and the exhaust of the fluid therefrom is controlled by a chuck control valve 15.

The conduit 20 represents the fluid supply source and the pressure to which it is regulated is governed by a

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constant pressure regulating valve 21, whereby the fluid within the conduit 22 is of a constant pressure source depending upon the setting of the regulating valve 21. Fluid from the constant pressure source 22 flows through a conduit 23, a pressure reducing valve 27, and conduits 24 and 25 to the chuck control valve 15 and then through a conduit 26 to the fluid piston chamber 14. The fluid conduits 23 and 24 may be regarded as first conduit means. Connected in parallel with the first conduit means is a by-pass conduit means comprising the conduits 30 and 31. Mounted in the conduit 31 is a control valve 32 which is actuated to open and closed positions by means of a solenoid 33 and a spring 34. When the solenoid 33 is energized the control valve 32 is actuated to open position, and when the solenoid is de-energized the spring 34 actuates the control valve to closed position.

An exhaust valve 37 is connected in communication with the conduit 24, whereby when the exhaust valve is actuated to open position the fluid within the piston chamber 14 is exhausted to atmosphere. The exhaust valve 37 may be actuated to closed position by means of a spring 39 actuated to open position by a solenoid 38. An electrical switch 40 is adapted to control the operation of the solenoids 33 and 38. The switch 40 comprises a control arm 41 which is adapted to make contact with the contacts 42 and 43. Means 44 designates a position.

In operation, when the control arm 41 is making contact with the contact 42, current flows from the supply conductor 45 through the control arm 41, the contact 42 and the winding of the solenoid 33 to the other supply conductor 46. The circuit energizes the solenoid 33 and actuates the control valve 32 to its open position for admitting fluid under high pressure to the piston chamber 14. In the event that the operator desires to reduce the pressure of the chuck force upon the workpiece 11, he actuates the control arm 41 to the contact 44. As the arm 41 swings to the right in Figure 1, it makes intermediate contact with the sliding contact 43 for energizing the solenoid 38 which momentarily actuates the exhaust valve 37 to its open position for exhausting air from the piston chamber 14 to atmosphere. The amount that the pressure is reduced in the piston chamber 14 is equal to a value comparable to the low pressure effected by the pressure reducing valve 27. As the control arm leaves the slide contact 43 and is moved to the contact 44, the solenoid 38 is de-energized and the spring 39 closes the exhaust valve 37, after which the pressure within the piston chamber 14 is maintained at a low value determined by the setting of the pressure reducing valve 27. The length of the sliding contact 43 is such that enough time elapses to permit the exhaust valve 37 to drain the fluid from the piston chamber 14 to reduce the pressure to a low value.

Accordingly, I have disclosed in Figure 1 a control means for controlling the flow of fluid from a pressure source 22 and selectively applying high and low pressure to the piston chamber 14 determined by the setting of the regulator 21 and the pressure reducing valve 27.

In Figure 2 I show a modified form of the invention, in that the complete control is effected by a control valve 50 which is actuated from open to closed position by means of a solenoid 51 and from closed to open position by a solenoid 52 governed, respectively, by the push buttons 53 and 54. In Figure 2 the control valve is illustrated in open position and high pressure is admitted to the piston chamber 14.

In Figure 3 I show the control valve 50 in an intermediate exhaust position, being the position in which the piston chamber 14 is in fluid communication with an exhaust conduit 59 through an exhaust valve cavity 58. Accordingly, in Figure 3 the control valve is illus-

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trated in the exhaust position. As the control valve 50 is further actuated in a counterclockwise direction to the low pressure position shown in Figure 4, the exhaust valve cavity 58 is moved out of communication with the exhaust conduit 59 whereby the fluid can no longer be exhausted and whereby the pressure applied to the piston chamber 14 is controlled by the setting of the pressure reducing valve 27. Accordingly, in Figure 2 I illustrate a fluid control valve for controlling the flow of fluid from a pressure source 22 and selectively applying high and low pressure to the piston chamber 14 whereby the pressure grip of the chucks of the jaw 10 on the workpiece may be varied from a high to a low value to accommodate the workpiece.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. Control means for controlling flow of fluid from a pressure source and selectively applying high and low pressure to a chamber, said control means comprising first conduit means connecting said pressure source to said chamber, said first conduit means comprising a fixed fluid path and a manually operated on-and-off valve in said fixed fluid path, a pressure reducing valve in said first conduit means to admit fluid of a pressure lower than said pressure source to said chamber through said first conduit means, by-pass conduit means connected in parallel with said pressure reducing valve, a control valve in said by-pass conduit means, electrical control means to actuate said control valve to open and closed positions, said control valve in said open position admitting fluid to said chamber of a pressure higher than that admitted to said chamber by said pressure reducing valve, exhaust means under control of said electrical control means and communicating with said chamber to momentarily exhaust fluid therefrom to reduce the pressure therein as said control valve is being actuated by said electrical control means from open to closed position, and said electrical control means comprising separately energized circuits to insure that said exhaust means is open at a time when said control means is closed, and manually operable contact means to separately energize said circuits.

2. Control means for controlling flow of fluid from a pressure source and selectively applying high and low pressure to a chamber, said control means comprising first conduit means connecting said pressure source to said chamber, said first conduit means comprising a fixed fluid path and a manually operated on-and-off valve in said fixed fluid path, a pressure reducing valve in said first conduit means to admit fluid of a pressure lower than said pressure source to said chamber through said first conduit means, by-pass conduit means connected in parallel with said pressure reducing valve, a control valve in said by-pass conduit means, electrical control means to actuate said control valve to open and closed positions, said control valve in said open position admitting fluid to said chamber of a pressure higher than that admitted to said chamber by said pressure reducing valve, exhaust valve means communicating with said chamber, means under control of said electrical control means to momentarily operate said exhaust valve means

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to open position in said chamber to reduce the pressure as said control valve is being actuated by said control means from open to closed position, and said electrical control means comprising separately energized circuits to insure that said exhaust means is open at a time when said control means is closed, and manually operable contact means to separately energize said circuits.

3. Control means for controlling flow of fluid from a pressure source and selectively applying high and low pressure to a chamber, said control means comprising first conduit means connecting said pressure source to said chamber, said first conduit means comprising a fixed fluid path and a manually operated on-and-off valve in said fixed fluid path, a pressure reducing valve in said first conduit means to admit fluid of a pressure lower than said pressure source to said chamber through said first conduit means, by-pass means connected in parallel with said pressure reducing valve, a control valve in said by-pass conduit means, electrical means to actuate said control valve to open and closed positions, said control valve in said open position admitting fluid to said chamber of a pressure higher than that admitted to said chamber by said pressure reducing valve, exhaust valve means communicating with said chamber, second electrical means to momentarily operate said exhaust valve means to open position in said chamber to reduce the pressure as said control valve is being actuated from open to closed position, and first and second manually operable contact means for respectively controlling said electrical means and said second electrical means.

4. Control means for controlling flow of fluid from a pressure source and selectively applying high and low pressure to a cylinder having a piston defining a fluid chamber for actuating a chuck to hold a workpiece, said control means comprising first conduit means connecting said pressure source to said chamber, said first conduit means comprising a fixed fluid path and a manually operated on-and-off valve in said fixed fluid path, a pressure reducing valve in said first conduit means to admit fluid of a pressure lower than said pressure source to said chamber through said first conduit means, by-pass conduit means connected in parallel with said pressure reducing valve, a control valve in said by-pass conduit means, electrical control means to actuate said control valve to open and closed positions, said control valve in said open position admitting fluid to said chamber of a pressure higher than that admitted to said chamber by said pressure reducing valve, exhaust means under control of said electrical control means and communicating with said chamber to momentarily exhaust fluid therefrom to reduce the pressure therein as said control valve is being actuated by said electrical control means from open to closed position, and said electrical control means comprising separately energized circuits to insure that said exhaust means is open at a time when said control means is closed, and manually operable contact means to separately energize said circuits.

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