March 31, 1964 W. C. KESSELRING 3,126,795

MULTIPLE PURPOSE SPEED CONTROL VALVE CONSTRUCTION

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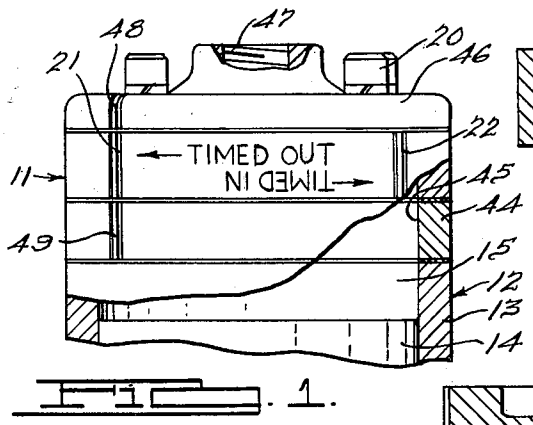



FIG. 1.

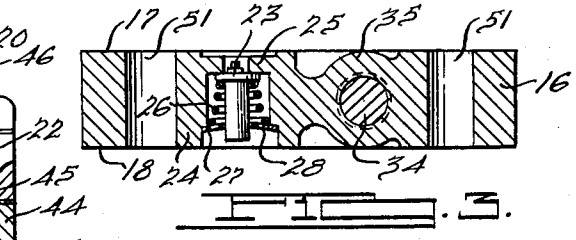


FIG. 3.

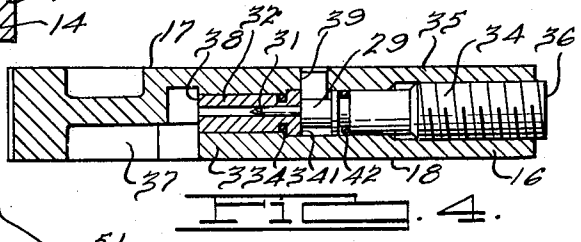


FIG. 4.

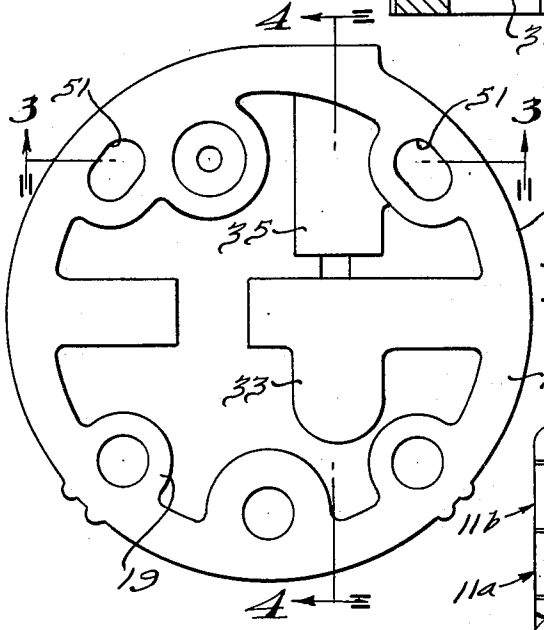


FIG. 2.

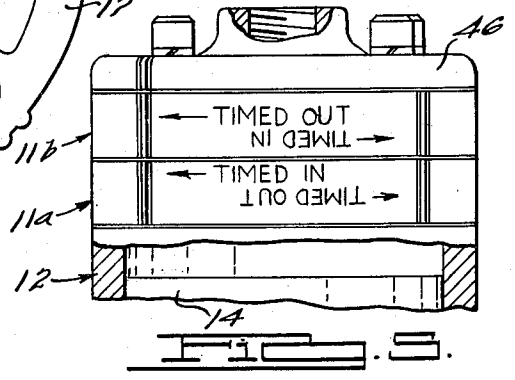



FIG. 5.

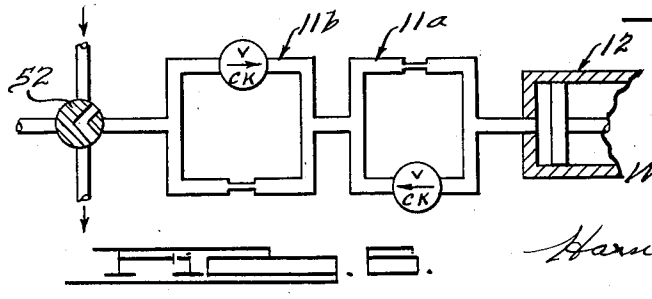


FIG. 6.

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MULTIPLE PURPOSE SPEED CONTROL VALVE CONSTRUCTION

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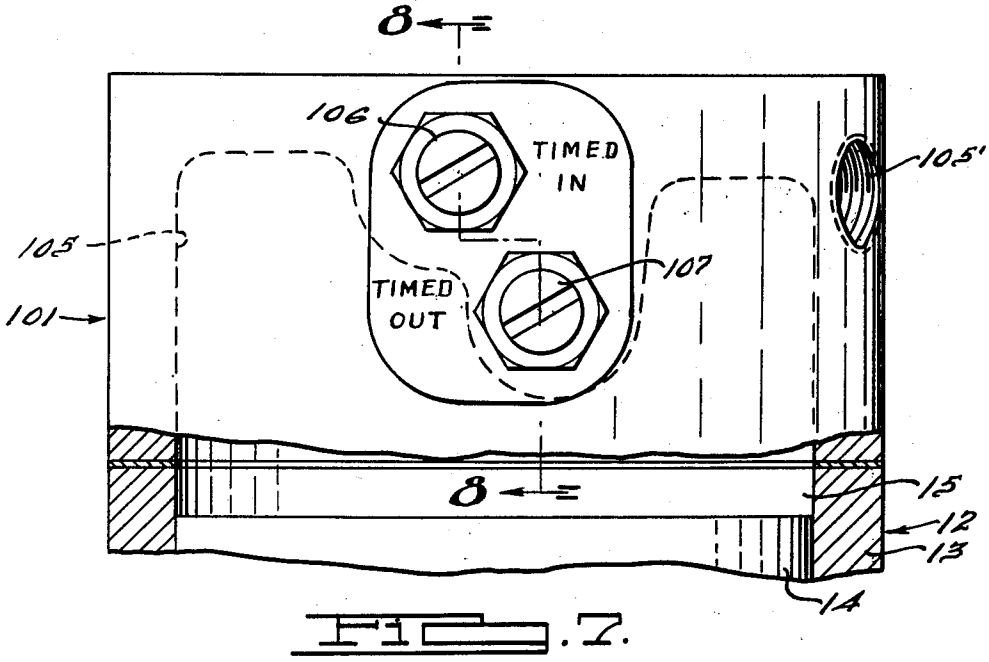



FIG. 7.

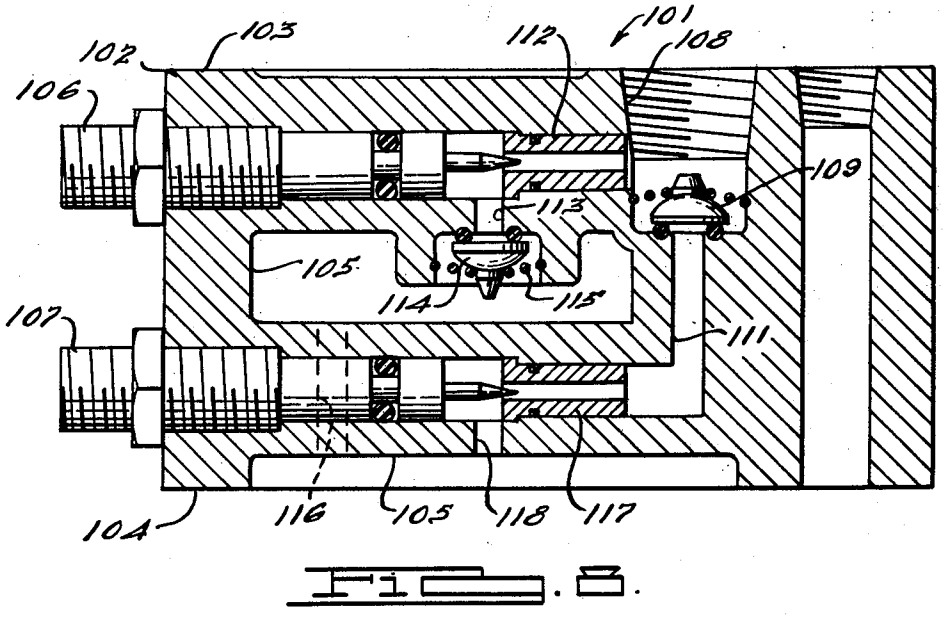



FIG. 8.

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# MULTIPLE PURPOSE SPEED CONTROL VALVE CONSTRUCTION

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2 Claims. (Cl. 91—443)

This invention relates to industrial control valves, and more particularly to speed control valve units in which the rate of flow of a fluid to and/or from a fluid motor may be timed.

It is a general object of the invention to provide a novel and improved multiple purpose speed control valve construction usable to time the fluid flow rate in either one or both directions with respect to a fluid motor.

It is another object to provide an improved multiple purpose speed control valve unit of this nature which is capable of use in conjunction with an additional element intended to form a chamber of substantial volume between the fluid motor and the metering valve element, thus contributing to the reliability of the metering valve setting.

It is also an object, in one form of the invention, to provide a novel and improved reversible speed control valve unit which may be utilized to time the fluid flow rate in one direction with respect to a fluid motor, permitting the flow in the other direction to be unrestricted, the valve being capable of assembly with other portions of the fluid system and being easily reversible between timed-in and timed-out positions.

It is a further object, in this form of the invention, to provide an improved speed control valve unit having the above characteristics, in which two such valve units may be used in stacked relation to provide both a timed-in and a timed-out fluid flow condition, the flow rate in each direction being independently adjustable.

It is another object to provide an improved speed control valve unit of this nature which is inexpensive to construct and requires little maintenance.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a side elevational view, partly in cross section, showing the exterior of one form of the unit as part of an assembly which also includes a fluid motor, a volume element and a signal port element;

FIGURE 2 is a top plan view of the body of the valve unit, parts being removed;

FIGURE 3 is a cross-sectional view taken along the line 3—3 of FIGURE 2 and showing the unit with the check valve in the body;

FIGURE 4 is a cross-sectional view taken along the line 4—4 of FIGURE 2 and showing the metering valve in the body;

FIGURE 5 is a partly sectioned side elevational view of another assembly variation, utilizing two speed control valve units constructed in accordance with the invention and in stacked relation so as to provide both timed-in and timed-out flow with respect to the fluid motor;

FIGURE 6 is a schematic flow diagram of the assembly of FIGURE 5;

FIGURE 7 is an exterior view in elevation of another form of the invention which combines the structures of the two units of FIGURE 5 and a volume element into a single integral unit; and

FIGURE 8 is a schematic cross-sectional view in elevation taken along the line 8—8 of FIGURE 7 but with the relative positions of the parts shifted for clarity and showing the internal construction.



In general terms, the first illustrated embodiment of the invention comprises a body having flat upper and lower surfaces and adapted to be mounted directly on a fluid motor such as a piston and cylinder which operates a main valve, or a nested relation between said fluid motor and a pilot valve. The body has an apertured portion extending between its flat surfaces in which is mounted a check valve permitting unrestricted flow in one direction between the surfaces but preventing flow in the opposite direction. A metering valve is also carried by the body, in the form of a screw-adjustable needle valve mounted in an apertured portion of the body extending parallel to and between the flat surfaces, with passages connecting the opposite ends of the needle valve to the surfaces. The unit may be mounted with either flat surface facing the fluid motor, thus providing either timed-in or timed-out fluid flow.

Because of its novel configuration, the unit may be used in conjunction with a volume element of like size and having flat surfaces, the volume element being placed in nested relation between the speed control unit and the fluid motor. This volume makes possible increased accuracy for the metering valve setting. Two units constructed in accordance with the principles of this embodiment of the invention may be stacked in reverse positions on the fluid motor, thus providing both timed-in and timed-out fluid flow with the timing in each direction being independently adjustable.

In another form of the invention, an integral unit is provided combining the elements of two stacked units constructed in accordance with the principles of the first embodiment of the invention, and also incorporating a volume element in the integral construction.

Referring more particularly to the drawings, the speed control unit of the first embodiment is generally indicated at 11 and is shown in FIGURE 1 as being mounted on a fluid motor generally indicated at 12. The fluid motor comprises a cylinder 13 and a piston 14, the piston being urged upwardly by means (not shown) and being capable of downward movement under the influence of pressure in chamber 15 which is opened toward the flat cylinder top.

Unit 11 comprises a body 16 of generally circular shape and having an annular flat upper surface 17 and an annular flat lower surface 18, the diameter of body 16 being substantially the same as that of the fluid motor on which it is to be mounted. A plurality of apertured bosses 19 are provided around the periphery of body 16 for the reception of assembly bolts 20. As seen in FIGURE 1, the exterior surface of body 16 may be provided with the legend "timed-out" with an arrow pointing toward a mark 21 connecting surfaces 17 and 18, and another legend, "timed-in" having an arrow pointing to another mark 22, the two legends being inverted with respect to each other and marks 21 and 22 being in circumerentially spaced relation by about 90°.

A check valve 23 is carried by body 16 within an apertured portion 24 thereof which extends between surfaces 17 and 18. Valve 23 is engageable with a valve seat 25 at the end of apertured portion 24 adjacent surface 17, being urged against this seat by a helical spring 26, the other end of this spring being supported by a retaining member 27 having apertures 28 for the passage of fluid. Valve 23 will thus permit unrestricted fluid flow from surface 17 to surface 18, but will not permit fluid flow in the opposite direction.

A metering valve 29 is also mounted in body 16, this valve having a needle stem 31 disposed within an elongated hollow insert 32 carried by a portion 33 of body 16. Metering valve 29 extends in parallel relation between surfaces 17 and 18, and has a threaded outer end 34 mounted within a threaded portion 35 of body 16, the

outer end 36 of portion 34 being accessible from the outside of the unit for adjustment purposes. A space or passage 37 is formed in body 16 between surface 18 and the outer end 38 of insert 32. A passage 39 extends from the outer end 41 of insert 32 to surface 17. A first seal 42 is carried by valve 29 between passage 39 and threaded portion 34, and a second seal 43 is carried by insert 32. By adjusting the position of tapered needle 31 within insert 32 by means of rotation of valve 29, the rate of flow of fluid between passages 37 and 39 may be adjusted.

FIGURE 1 shows unit 11 mounted in conjunction with a volume element 44, the latter comprising a circular body of the same diameter as body 16 having flat end surfaces with a chamber 45 extending therebetween. The purpose of element 44 is to insure that a substantial volume of fluid connected to chamber 15 must pass through metering valve 29, whether the valve is in the timed-in or timed-out position. Valve 29 may thus be adjusted with greater accuracy. The reason the substantial volume must be connected on the side adjacent motor 14, rather than on the other side of unit 11, is because it is the movement of motor 14 which is to be time-controlled. By providing a separate element 44 as the volume element, the overall thickness of unit 11 may be made relatively small, and the volume will always be in the proper position regardless of the position of unit 11.

FIGURE 1 also shows a cap 46 mounted on unit 11 and having a signal port 47 connected to a three-way valve (not shown). Alternatively, a three-way pilot valve, whether power or manually actuated, could be mounted directly on unit 11 in place of cap 46.

In operation, with the unit in its timed-out position as shown in FIGURE 1, application of fluid pressure to port 47 will cause the fluid to shift check valve 23 downwardly away from its seat 25, the fluid flowing immediately through apertures 28 in retaining member 27 and into chamber 15 of motor 12 through volume element 44. Piston 14 will thus be shifted rapidly to its downward position.

Upon connection of part 47 to exhaust, fluid will flow from chamber 15 through volume element 44, passage 37, insert 32 (past needle 31) and passage 39 to port 47. The fluid flow will thus be controlled by the position of metering valve 29 and the upward movement of piston 14 timed accordingly. The fluid pressure will hold check valve 23 in its closed position.

When it is desired to have piston 14 move downwardly in a time-controlled manner but move upwardly at a rapid rate, unit 11 may be reversed so that surface 18 is above and surface 17 below, the legend "timed-in" being in upright position with mark 22 being aligned with marks 48 and 49 on cap 46 and volume element 44 respectively. The purpose of providing these marks is to insure that the elongated bolt receiving apertures 51, seen in FIGURE 2, will be properly positioned regardless of the inversion of unit 11.

The operation of unit 11 in its inverted position may be envisioned by considering FIGURES 3 and 4 as being inverted. Application of fluid pressure to signal port 47 will cause fluid to pass through passage 37, through insert 32, past needle 31 and through passage 39 to volume element 44 and chamber 15. This will cause downward movement of piston 14 at a rate dependent upon the setting of metering valve 29, check valve 23 remaining closed.

The connection of port 47 to exhaust will permit rapid upward movement of piston 14, the fluid pressure being released directly through check valve 23.

FIGURE 5 shows two units 11*a* and 11*b* in stacked relation between a motor 12 and a cap 46. Unit 11*a* is in its timed-in position, whereas unit 11*b* is in its timed-out position. In this manner, piston 14 may be time-controlled when moving in both directions, the time required for the two movements being independently adjustable. Proper means for fluid flow between units 11*a*, 11*b* may of course be provided, either by gasket passages or by recesses within surfaces 17 and 18 such as those seen in FIGURE 2. A volume element 44 could be disposed between unit 11*a* and motor 12, and a pilot valve could be mounted on unit 11*b* in place of cap 46.

FIGURE 6 illustrates in schematic fashion the fluid flow relationship of the assembly of FIGURE 5. The three-way signal valve is indicated at 52 in this figure.

FIGURES 7 and 8 illustrate another embodiment of the invention in which the elements of the two units 11*a* and 11*b* in FIGURE 5 are combined in an integral unit, the equivalent of a volume element 44 also being combined in the integral construction. The unit is generally indicated at 101 and comprises a body 102 having a flat upper surface 103 and a flat undersurface 104. A recess indicated at 105 extends upwardly from undersurface 104, thus forming a volume equivalent to that of volume element 44 in the previous embodiment. A port 105′ extends outwardly from recess 105 and is connectable to a larger volume (not shown) in cases where volume 105 is insufficient to achieve the required time delay. A "timed-in" needle 106 and a "timed-out" needle 107 are threadably mounted in body 102, the needles being in spaced parallel relation and parallel to the upper and lower surfaces of the body.

A signal port 108 extends downwardly from surface 103, a check valve 109 being mounted at the lower end of port 108, the check valve being disposed so as to permit fluid flow only from a passage 111 below port 108 to port 108, but prohibiting fluid flow from port 108 to passage 111.

The inner end of needle 106 is disposed within one end of a hollow insert 112, the other end of this insert being connected to port 108. A passage 113 leads from the end of insert 112 surrounding needle 106 to a check valve 114, this check valve being so disposed as to permit fluid flow from insert 112 to volume recess 105, but prohibiting fluid flow from volume 105 to insert 112. Spiral wire springs 115 are provided for retaining check valves 109 and 114 in position and urging them against their respective seats. Chamber 105 is of course connectable to chamber 15 of fluid motor 12 mounted beneath unit 101. Schematic passage 116 in FIGURE 8 indicates the fact that recess 105 extends to the bottom of housing 102.

The inner end of needle 107 is disposed within one end of an insert 117 within body 102, the other end of this insert being connected to passage 111. The end of insert 117 which receives needle 107 has a passage 118 connecting it with chamber 105.

The operation of the embodiment of FIGURES 7 and 8 will be similar to that of units 11*a* and 11*b* in FIGURE 5. When signal pressure is applied to port 108, assuming that needle 106 is set in a restricted position, fluid will flow through insert 112, past needle 106, through passage 113, check valve 114, and chamber 105 to chamber 15. When signal port 108 is connected to exhaust, fluid will flow through passageway 118, past needle 107, through insert 117, passage 111 and check valve 109 to port 108. Of course, either or both needles 106 and 107 may be set in an unrestricted position, so that the flow will not be timed by such needle.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a speed control valve unit for use in conjunction with a fluid motor piston having a cylinder of predetermined outside end diameter, a body of substantially the same outside diameter as the cylinder outside end diameter and having oppositely disposed flat parallel surfaces, a passage connecting said surfaces, a check valve

mounted in said passage and permitting unrestricted fluid flow in one direction while preventing fluid flow in the opposite direction, a metering valve comprising a stem adjustably mounted in said body and extending parallel to and between said surfaces, and passages connecting opposite sides of said metering valve to said opposite surfaces.

2. In a speed control valve unit for use in conjunction with a fluid motor piston having a cylinder of predetermined outside end diameter, a body of substantially the same outside diameter as the cylinder outside end diameter and having oppositely disposed flat parallel surfaces, a passage connecting said surfaces, a check valve mounted in said passage and permitting unrestricted fluid flow in one direction while preventing fluid flow in the opposite direction, a metering valve comprising a stem adjustably mounted in said body and extending parallel to and between said surfaces, passages connecting opposite sides of said metering valve to said opposite surfaces, and a volume element comprising a body having substantially the same outside diameter as said cylinder and unit and oppositely disposed parallel surfaces with a chamber connecting said surfaces, said volume element and unit being disposable in stacked relation on said cylinder.



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