March 11, 1941. I. SICARD 2,234,322

CONTROL VALVE MECHANISM FOR SNOW REMOVING MACHINES

Filed Dec. 1, 1939 2 Sheets-Sheet 1

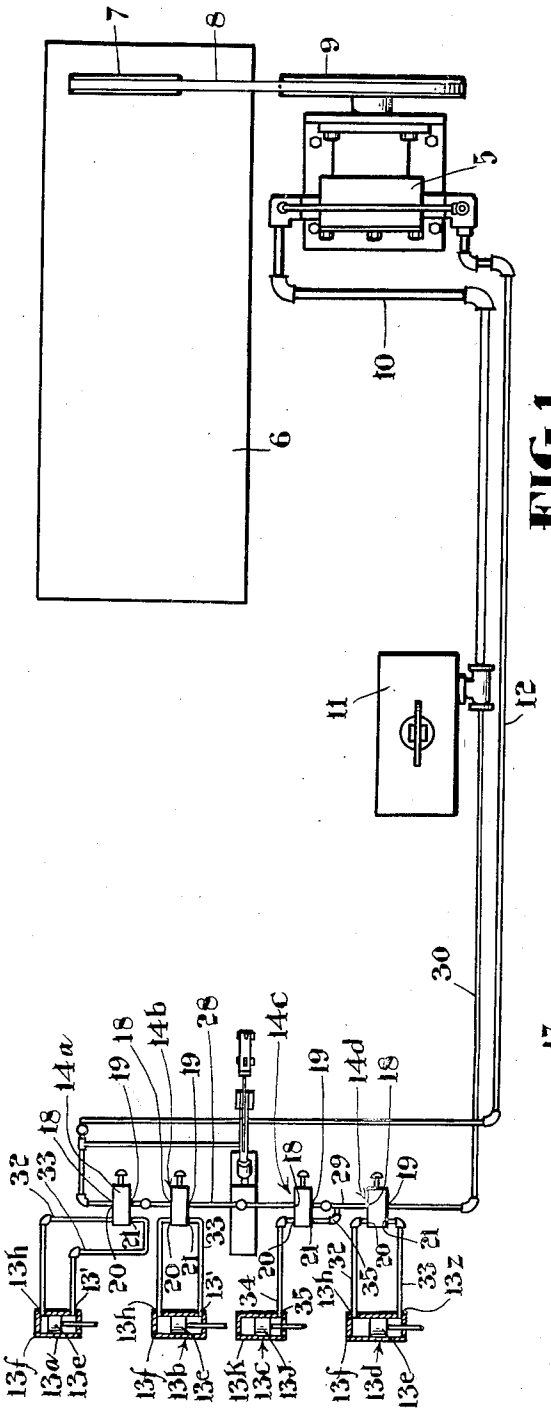


FIG.1

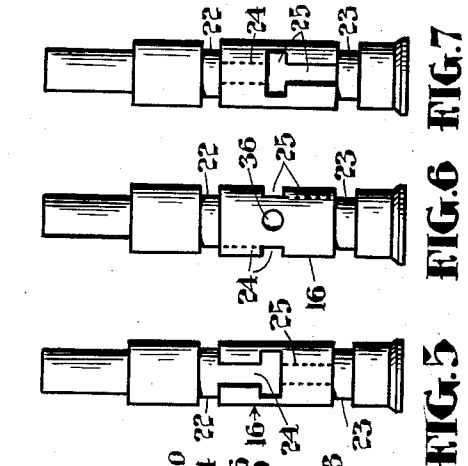


FIG.7 FIG.6 FIG.5 FIG.4 FIG.3 FIG.2

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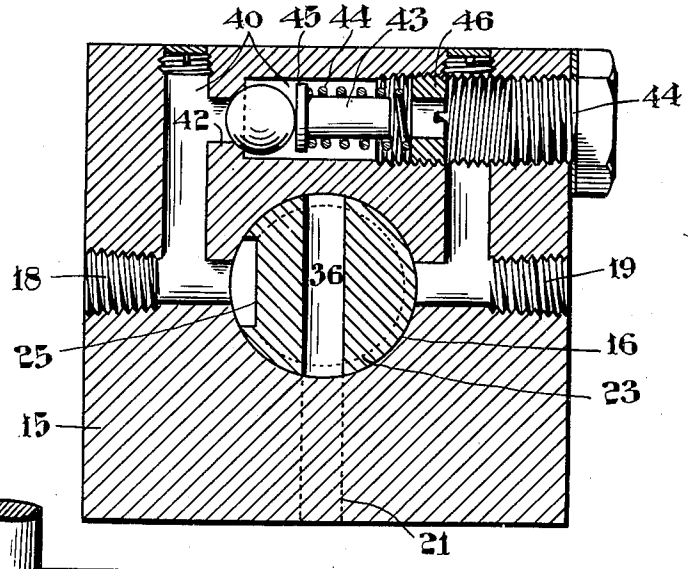


FIG. 9

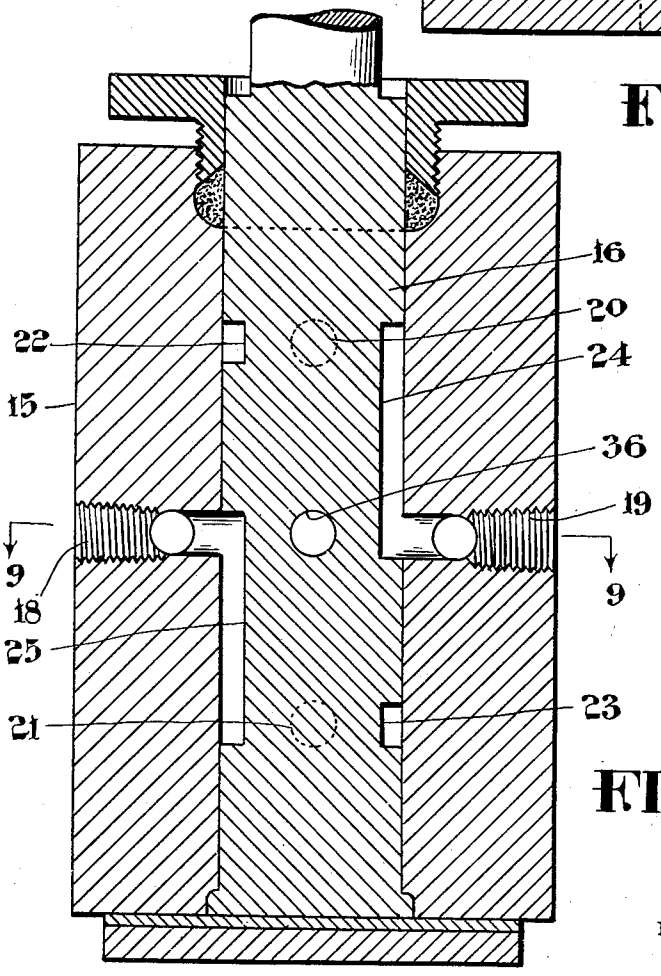


FIG. 8

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UNITED STATES PATENT OFFICE

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CONTROL VALVE MECHANISM FOR SNOW REMOVING MACHINES

Ireneé Sicard, Montreal, Quebec, Canada

Application December 1, 1939, Serial No. 307,162
In Canada October 24, 1939

2 Claims. (Cl. 277—53)

This invention relates to control apparatus for selectively controlling the operation of a plurality of fluid motors. Such apparatus, while intended for general application, is especially useful in connection with snow removing machines of the type disclosed in United States Patent 2,092,536, granted Sept. 7, 1937.

The machine disclosed in the above patent comprises the following elements which are susceptible of operation by the motors embodied in the aforesaid control apparatus: (1) a rotatably mounted blower housing adapted to be turned so that its discharge opening may be directed upwardly or toward either side of the roadway; (2) an elbow-shaped discharge spout which is adapted to be turned about a vertical axis and is provided with telescopic sections adapted to be extended and collapsed by means independent of the means employed for turning the spout as a whole; and (3) mechanism adapted to be operated to raise and lower the blower casing and the discharge spout with reference to the roadway.

The present invention provides a simple mechanism for controlling a plurality of motors employed for operating the aforesaid adjustable parts of the patented machine.

Proceeding now to a more detailed description of the present invention reference will be had to the accompanying drawings wherein—

Fig. 1 is a diagrammatic view of the complete control apparatus.

Fig. 2 is a vertical sectional view of one of the control valves.

Figs. 3 and 4 are views similar to Fig. 2 but showing the valve turned to different operating positions.

Figs. 5, 6 and 7 are views illustrating the construction of the movable valve element embodied in the valve assembly shown in Figs. 2, 3 and 4.

Fig. 8 is a longitudinal sectional view showing a slight modification of said valve assembly.

Fig. 9 is a transverse sectional view taken along the line 9—9 of Fig. 8.

Referring more particularly to the drawings, 5 designates a pump which is driven from a motor or other suitable power plant 6 through the agency of the pulley 7, belt 8 and pulley 9. The suction side of pump 5 is connected, by pipe 10, to an oil reservoir or storage tank 11. The pressure side of pump 5 is connected to an oil delivery pipe 12 which, in turn, is adapted to be selectively connected to the fluid motors 13*a*, 13*b*, 13*c* and 13*d* through the agency of the control valves 14*a*, 14*b*, 14*c* and 14*d*. As shown in Figs. 2 to 4, each of said valves comprises a casing 15 and a rotary valve plug 16, the latter being equipped with an operating handle 17. The casing 15 is provided with four ports 18, 19, 20 and 21. The ports 18 and 19 are formed in opposite sides of the casing and are located diametrically opposite each other. The ports 20 and 21 are preferably formed in the same side of the casing and are respectively located above and below the ports 18 and 19, as shown in Fig. 2. The valve plug 16 is provided with upper and lower annular grooves 22 and 23. Opposite sides of the plug 16 are recessed between the grooves 22 and 23 to provide the reversely arranged T-shaped ports 24 and 25. The ports 24 and 25 are reversely arranged so that the T-head portions thereof lie in the same horizontal plane but at opposite sides of the plug 16. The stem portion of port 24 opens into the upper annular groove 22 while the stem portion of the port 25 opens into the lower annular groove 23.

The port 18 of valve 14*a* is directly connected to the oil supply line 12. The remaining port 19 of valve 14*a* is connected, by pipe 27, to the casing port 18 of valve 14*b*. The remaining casing port 19 of the last mentioned valve is connected, by pipe 28, to the casing port 18 of valve 14*c*. The casing port 19 of valve 14*c* is connected, by pipe 29, to the casing port 18 of valve 14*d*. The remaining casing port 19 of valve 14*d* is connected, by a return line 30, to the oil reservoir 11. The motors 13*a*, 13*b* and 13*d* are shown as double acting motors comprising a piston 13*e* operating in a cylinder 13*f* provided with end ports 13*h* and 13*i*. The remaining motor 13*c* is a single acting motor in which the piston 13*j* operates in a cylinder 13*k* provided with a port 35.

The ports 20 and 21 of control valves 14*a*, 14*b* and 14*d* are respectively connected by pipes 32, and 33 to the cylinder ports 13*h* and 13*i* of the motors 13*a*, 13*b* and 13*d*. The port 20 of control valve 14*c* is connected by pipe 34 to the cylinder port 35 of motor 13*c*. The remaining port 21 of valve 14*c* is connected by a bypass 35, pipe 29 and valve 14*d* to the return line 30.

The plug 16 of each control valve is provided with a transverse port 36 normally positioned, as shown in Fig. 3, to provide a direct connection between the casing ports 18 and 19. With the valve plugs in this position the oil supply through line 12 is passed directly through the several valves to the return line 30, no oil being diverted to the motors 13*a*, 13*b*, 13*c* and 13*d*. When it is desired to operate one of the motors the valve plug

of the associated control valve is turned to the position shown in Fig. 2. In this position of the valve the port 18 is connected to the port 20 by the T-shaped port 24 so that the line 12 is connected to the line 32 leading to one of the motor cylinders 13a, 13b and 13d. At the same time the line 33, leading from said motor cylinder, is connected through groove 23 and port 25 to the return line 30 leading to the oil reservoir. In this connection it will be understood that the port 19 of the valve in operation is connected to return line 30 through the remaining valves whose plugs are positioned as shown in Fig. 3.

The operation of the valve controlling the motor 13b is substantially the same except that the fluid passes to and from the motor cylinder through the single pipe connection 34 which, by manipulation of the plug 16 of valve 14c, may be alternately connected with the supply line 12 and the return line 30.

As shown in Figures 8 and 9, the ports 18 and 19 of each control valve may be connected by a bypass port 40 bypassing the valve plug 16. A check valve in port 40 permits flow of fluid from port 18 to port 19 when the pressure in any of the motor cylinders supplied by said control valve exceeds a predetermined value. As here shown said check valve comprises a ball valve 41 adapted to close against a seat 42. Valve 41 is held in closed position by the spring loaded valve closing plunger 43. This plunger is urged in a valve closing direction by a spring 44 confined between the plunger shoulder 45 and a spring-tension adjusting plug 46, the latter being threadedly engaged with the wall of the bypass 40, one end of which is closed by the plug 44. When the valve plug 16 is turned to the position shown in Figures 8 and 9, fluid supplied to port 18 passes through ports 25 and 21 to the cylinder served by said valve. If the fluid pressure thus supplied to the cylinder through the control valve exceeds a predetermined value, the check valve 41 opens automatically and the excess pressure is relieved through the bypass port 40, port 19 and pipe 29. In this connection it may be explained that the fluid pressure required to operate each of the motors 13a to 13d inclusive may vary and the loading of the bypass valves is accordingly adjusted. So that when the pressure supplied through each control valve exceeds a predetermined value, the associated bypass valve will open automatically.

In the use of the valve mechanism described herein each of the control valves 14a, 14b, 14c and 14d is initially operated to connect the supply line 12 to one end of the cylinder of the motor controlled thereby and then to the opposite end of said cylinder. The purpose of this initial operation of the valves is to expel air from the cylinders of the motors and to ensure complete filling of the system, including the pipes 32 and 33 of each motor, with oil under pressure. The pressure developed in the supply line 12 is preferably substantially in excess of the pressure required to operate any one of the individual motors. Under these circumstances it will be seen that when the valve 14a is operated to supply oil to one end of the cylinder of motor 13a the fluid which is forced from the other end of the cylinder through line 33 passes into the pipe cannection between the ports 19 and 18 of valves 14a and 14b and is supplemented by fluid which is forced past the relief check valve 41 of valve 14a so that there is sufficient fluid pressure available in the pipe line connection between the valves 14a and 14b to provide for operation of the motor 13b.

From this description it will be apparent that when any one of the several main control valves is operated there will be sufficient fluid pressure in the line connection between this valve and the next succeeding valve to provide for operation of the latter.

Having thus described my invention, what I claim is:

1. In apparatus of the character described a control valve comprising a valve casing having aligned ports in opposite wall portions thereof, a valve plug in said casing provided with a transversely extending port adapted to be aligned with said casing ports, said valve plug being also provided with longitudinally extending T-shaped ports located at opposite sides of the transverse port, said T-shaped ports being arranged so that the T-head portions thereof lie centrally of the ends of the plug and directly opposite each other, said plug being further provided with grooves into which the stems of the T-shaped ports open and further ports formed in said valve casing and communicating with said grooves.

2. A control valve as set forth in claim 1 including a bypass port connecting the first mentioned ports of said casing and a spring loaded excess pressure relief valve normally closing the passageway through said bypass port.

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