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CONTROL MECHANISM

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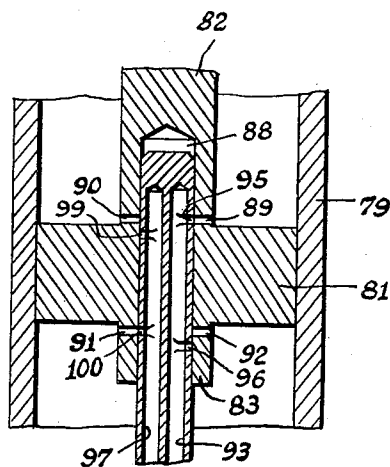
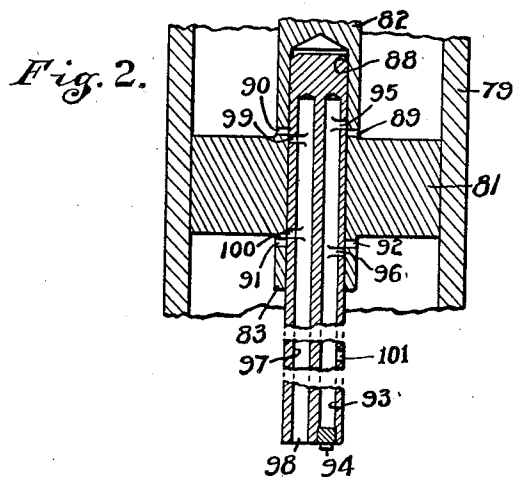
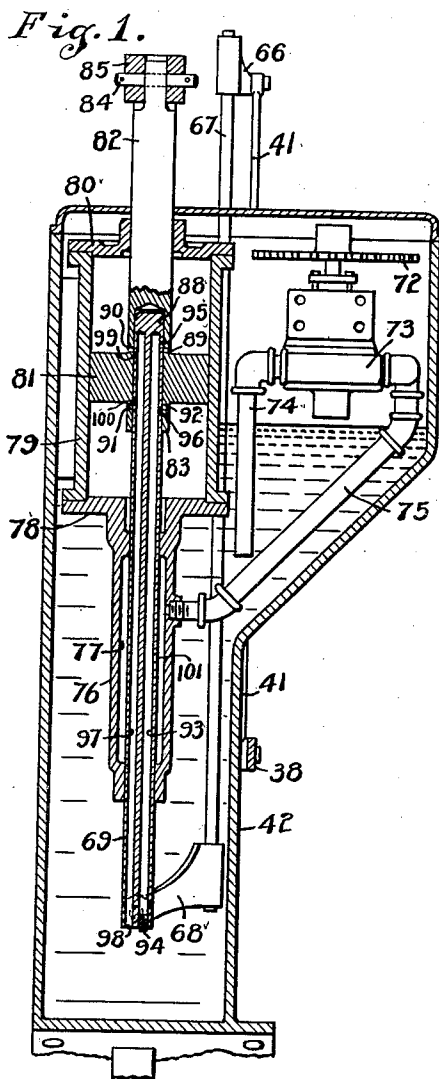


Fig. 3.

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CONTROL MECHANISM

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2 Claims. (Cl. 121-41)

The present invention relates to a hydraulic motor mechanism and controlling means therefor, and the primary object of the invention is to provide a mechanism delicately and instantaneously responsive to movements of the controlling means. Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the form illustrated in the accompanying drawing, attention being called to the fact, however, that the drawing is illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a vertical sectional view of my motor and controlling mechanism; and

Figs. 2 and 3 are enlarged sectional detail views of certain parts of the control mechanism.

Referring more particularly to the drawing, it will be seen that I have illustrated a casing 42 forming a liquid reservoir and housing the operating mechanism of my hydraulic motor and control. A rod 41 is connected at its upper end, through a bracket 66, to the upper end of a rod 67 extending into the interior of the casing 42 and connected, at its lower end, through a bracket 68, with a valve member 69. An electric motor (not shown) suitably mounted within the casing 42, is suitably connected to drive a sprocket 72 on the shaft of a pump 73 which is operable to draw liquid from within the casing 42 through the inlet pipe 74, and to discharge it through the outlet pipe 75. Said outlet pipe is connected to a casing 76 providing a chamber 77, said casing 76 being formed with a flange 78 at one end, and said flange being positioned to close one end of a fluid motor cylinder 79. The opposite end of said cylinder is closed by a cap 80; and a piston 81 is reciprocable within said cylinder. A stem 82 projects upwardly from said piston 81, being integral therewith, and said piston is further formed with a downward extension 83, likewise integral therewith. The stem 82 projects outwardly through the cap 80 and, at its upper end, receives a pin 84 through which a cross member 85 is connected to said stem 82, said cross member 85 being operatively connected to a driven mechanism.

The extension 83, the piston 81, and a portion of the stem 82 are axially bored to provide a socket 88 in which is mounted the upper end of the valve member 69, said valve member being reciprocable in said socket. A port 89 opens outwardly through said socket immediately above

the upper surface of the piston 81, and a second port 90, preferably diametrically opposed to the port 89, likewise opens outwardly from the socket 88 immediately above the upper surface of the piston 81. A port 91 opens from one side of the socket 88 immediately below the lower surface of the piston 81, and a port 92 opens from the other side of said socket, immediately below the lower surface of the piston 81.

As is clearly shown in Fig. 1, the valve member 69 is formed to provide a passage 93, closed at its lower end by a plug 94, and provided with three ports, 95, 96, and 101, opening through the outer wall of the valve member 69. Said ports 95 and 96 are positioned within the socket 88 and are spaced apart a distance slightly greater than the distance between the ports 89 and 92; while the port 101 is positioned within the chamber 77. Said valve member is further formed to provide a second passage 97, open at its lower end 98, and provided with a pair of ports 99 and 100 opening through the outer wall of said valve member. Said ports 99 and 100 are spaced apart a distance slightly less than the distance between the ports 90 and 91.

It is to be understood that the casing 42 will be filled with liquid to a level above the lower end of the pipe 74. If the pump 73 is in operation, the chamber 77 will be always full of liquid under pressure, it being understood that a relief valve (not shown) is provided between the pump 73 and the chamber 77. With the parts in the positions illustrated in Fig. 1, no liquid can flow from the chamber 77 into the cylinder 79, nor can liquid flow from the cylinder 79 into the sump in the casing 42. However, if the rod 41 is moved slightly upwardly, the port 96 will be brought into registry with the port 92; and the port 99 will be brought into registry with the port 90. Liquid under pressure from the pump 73 will thereupon be supplied through the pipe 75 to the chamber 77, through the port 101 into the passage 93, and thence through the ports 96 and 92 to that portion of the cylinder 79 below the piston 81. Thereby, the piston 81 will be moved upwardly. Since the ports 99 and 90 are in registry, such upward movement of the piston 81 forces liquid from above the piston 81 through the ports 90 and 99 and the passage 97 into the sump in the casing 42. If the initial upward movement of the rod 41 is discontinued, such upward movement of the piston 81 will almost immediately move the ports 92 and 90 out of registry with the respective ports 96 and 99, and the system will again come into equilibrium.

Obviously, downward movement of the rod 41 will move the valve member 69 to bring the ports 95 and 100 into registry with the ports 89 and 91, respectively, whereby liquid will be supplied to the upper portion of the cylinder and exhausted from the lower portion of the cylinder 79, the piston 81 thereby being moved downwardly until the ports 89 and 91 again move out of registry with the ports 95 and 100.

The sensitivity of the disclosed system is remarkably high; and at least some of that sensitivity is, in my opinion, due to the fact that the port centers are so positioned that the ports 95 and 96 slightly overlap the ports 89 and 92 when the organization is in a condition of equilibrium.

I claim as my invention:

1. In combination, a cylinder, a piston in said cylinder, a head for one end of said cylinder, a stem on said piston and projecting through and beyond said head, a head for the opposite end of said cylinder and formed to provide a stationary elongated chamber outside said cylinder, said piston being provided with a socket, ports opening from said socket into said cylinder on opposite sides of said piston, a valve mounted for reciprocation in said chamber and extending into cooperation with said socket ports to control the same, the body of said valve closing direct communication between said chamber and said cylinder, a source of fluid under pressure, rigid conduit means connecting said source with said chamber and two independent passages in said valve, one of said passages providing communication between said chamber and certain of said socket ports, and the other of said passages pro-

viding communication between certain of said socket ports and a reservoir.

2. In combination, a cylinder, a piston in said cylinder, a head for one end of said cylinder, a stem on said piston and projecting through and beyond said head, a head for the opposite end of said cylinder and formed to provide an elongated chamber outside said cylinder, said piston being provided with a socket, ports opening from said socket into said cylinder on opposite sides of said piston, an elongated valve mounted for reciprocation in said chamber, one end of said valve projecting from said chamber, into said cylinder, and into cooperation with said socket ports to control the same and closing direct communication between said chamber and said cylinder, and the other end of said valve projecting outwardly through and beyond the end of said chamber remote from said cylinder, a source of fluid under pressure in constant communication with said chamber, an elongated passage formed in said valve and having constant communication with said chamber and provided with ports registrable, at times, with certain of said socket ports, said passage opening through said last-mentioned valve end, means closing the open end of said passage, and a second parallel elongated passage formed in said valve and provided with ports registrable, at times, with certain of said socket ports, said second passage being closed at all times against direct communication with said chamber and being constantly open through said last-mentioned valve end.

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