Feb. 14, 1933. S. SAMSON 1,897,075

FLUID PRESSURE SYSTEM

Filed Nov. 5, 1930

FIG. 1

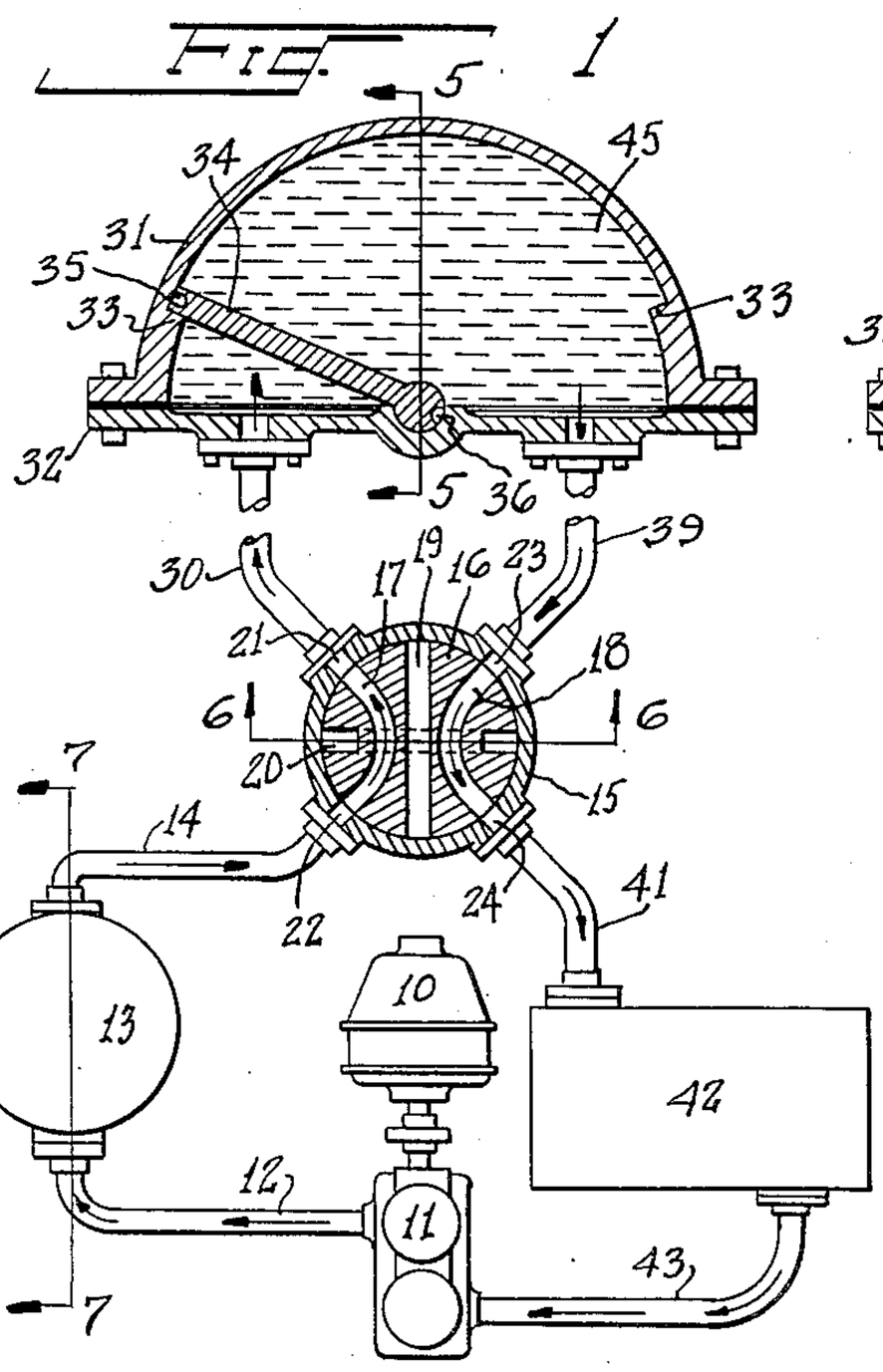


FIG. 2

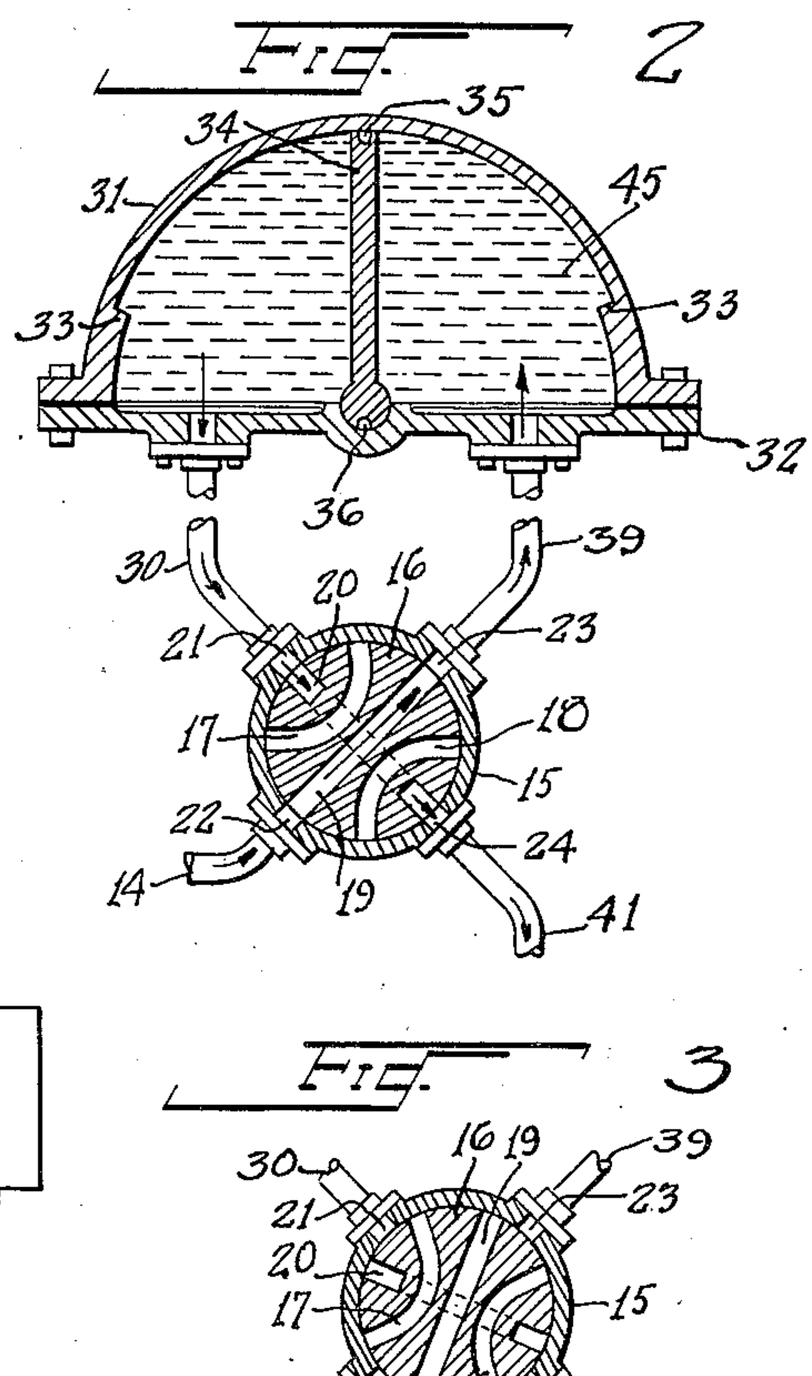


FIG. 3

FIG. 5

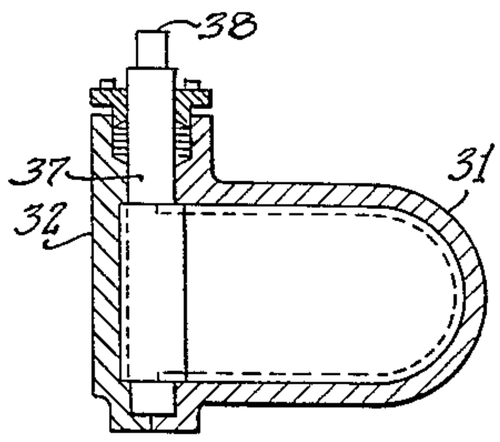


FIG. 6

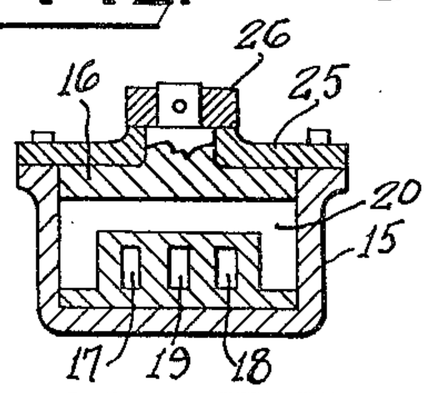


FIG. 4

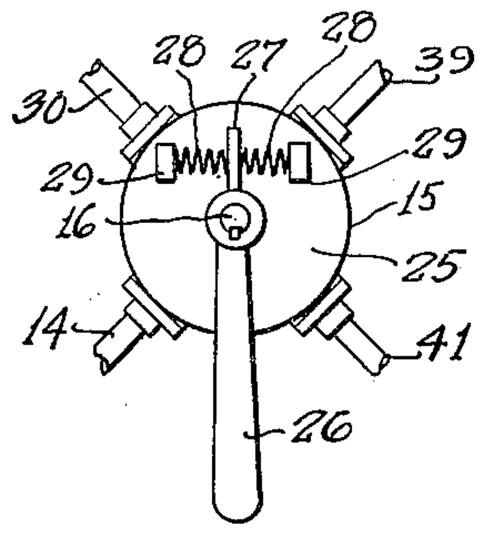


FIG. 7

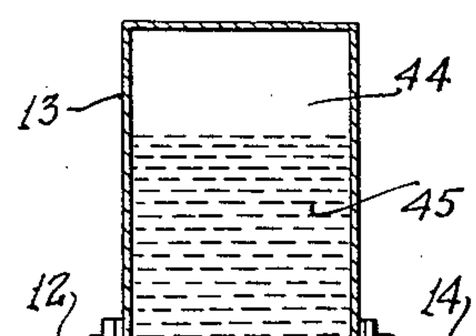
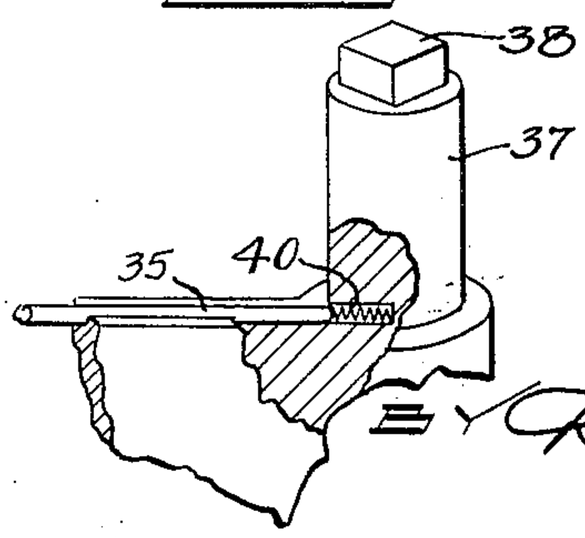


FIG. 8



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UNITED STATES PATENT OFFICE

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FLUID PRESSURE SYSTEM

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This invention is directed to a control mechanism wherein a control element is operated by a variation in pressure of hydraulic means on the respective sides of said element at will, the control of the pressure of the hydraulic means being through a manually operable valve of peculiar formation to provide for the variation in pressure of the hydraulic means with respect to the element at will.

The primary object of the present invention is the provision of a control element open to selective hydraulic pressure through a manually operable control valve in order that the element may be moved to any extent in one direction or the other or held in fixed position to thereby correspondingly govern the instrumentalities connected with said control element.

A further object of the present invention is the provision of a manually operable valve for the control of hydraulic medium under pressure, with such valve constructed to selectively control the flow of the medium or interrupt such flow, the construction of the valve providing for a minimum valve movement from one extreme to the other.

The invention is illustrated in the accompanying drawing, in which:—

Figure 1 is a view in plan partly in section, showing the control valve set to admit hydraulic pressure to one side of the control element, while exhausting such hydraulic medium from the other side.

Figure 2 is a similar view indicating a reverse position of the control valve and a corresponding reversal of the pressure admittance and exhaust.

Figure 3 is a horizontal section of the control valve with the parts in a neutral position.

Figure 4 is a plan view of the control valve, illustrating particularly the manually operable means therefor.

Figure 5 is a section on the line 5—5 of Figure 1.

Figure 6 is a section on the line 6—6 of Figure 1.

Figure 7 is a section on the line 7—7 of Figure 1.

Figure 8 is a broken perspective view illustrating the spring packing in the edge of the control element.

The invention is here illustrated as providing for the automatic control through the pressure of a hydraulic medium of the movement of a control element in either direction or the holding of that element in any set position, it being understood that the element may control and hold in place large hydraulic butterfly valves for the governing of mechanism, may be connected to hold and control a rudder on a boat or the rudder of an aeroplane, or may be used for steering heavy cars, busses, tractors and the like.

As illustrated more particularly in Figure 1 of the drawing, a hydraulic pressure system is shown including a motor 10 coupled to operate a pump 11, the suction side of which leads through a pipe 43 from a tank 42, while the pressure side of such pump leads through a pipe 12 to a pressure equalizer 13 having an air equalizing space 44 and from the pressure equalizer through a pipe 14 to a valve casing 15. Leading from the valve casing 15 on the side of the pressure inlet pipe 14 is an outlet pipe 30 leading to the control cylinder to be later described. A second pipe 39 leads from this control cylinder to the valve casing diametrically opposite the connection of the pipe 14, a pipe 41 also leading from the valve casing diametrically opposite the pipe 30, said pipe 41 opening into the tank 42.

Arranged within the valve casing 15 is a valve body 16 formed with a diametric port 19 and further formed on one side of the diametric port with a curved port 17 and on the opposite side with an identical curved port 18. The valve body 16 is further formed with a diametric port 20 opening through the valve body above the diametric port 19, said port 20 having communication with slots extending axially of the valve body at each end of the port 20 and terminating at their lower ends on a plane with the port 19. Thus the port 20, which is disposed at right angles to the port 19 and is formed through the valve body above the port 19, is nevertheless in effect in the same plane as the port 19 by reason of the fact that the respective ends

of the port 20 terminate on a plane with such port 19.

The arcuate ports 17 and 18 have such curvature that their terminals in a predetermined position of the valve body will register with the respective pipes on the same side of the diametric line of such valve body. That is to say, when the valve body is in the position shown in Figure 1, the curved port 17 of such body will register with and establish communication between the pipes 14 and 30, while at the same time the curved port 18 of the valve body will register with and establish communication between the pipes 39 and 41.

The valve body 16 is held within the casing by a cover plate 25, through which extends an axial projection of such valve body to receive an operating handle 26 keyed to such projection, the handle 26 having an extension 27 operating between springs 28, one end of each of which engages the projection and the opposite ends of which are held by abutments 29 on the cover 25. The pipes 30 and 39 open into a semi-cylindrical casing 31 in which a control element in the form of a blade 34 is mounted for swinging around an axial support 36. The cylinder 31 is provided with stops 33 to limit the respective extreme movements of the blade 34 and the edge of said blade is provided with a spring strip 35 under pressure of terminal springs 40 to maintain the sealing cooperation between the edge of the blade and the inner surface of the cylinder.

Pipes 14, 30, 39 and 41 open through the valve casing 15 by means of ports 22, 21, 23 and 24 respectively so that in the position of the valve already described and illustrated in Figure 1 of the drawing, it will be apparent that the pressure of the hydraulic medium, indicated at 45, with which the system is filled, will be directed through the pipe 14, port 22 of the valve casing, curved port 17, port 21 of the valve casing, pipe 30, and against the blade 34, tending to move it in a direction away from the position indicated and toward the opposite stop 33. In this movement of the blade, the hydraulic medium ahead of it will exhaust through the pipe 39, valve casing port 23, valve port 18, valve casing port 24, pipe 41, tank 42, and pipe 43 to the pump to complete the circuit. Obviously, if it is desired to hold the blade 34 in any predetermined position intermediate its limits of movement, the valve 16 may be turned to the position indicated in Figure 3 by appropriate movement of the handle 26, when it will be apparent that all pipes are cut off from intercommuncation, the pressure of the hydraulic medium in the cylinder 31 is balanced, and the blade 34 will remain in the position it occupies when the valve body 16 has been adjusted to the position indicated in Figure 3.

If a reversal of the blade 34 from that resulting from the hydraulic pressure controlled by the position of the valve indicated in Figure 1 is desired, the valve will be turned to the position indicated in Figure 2. In this position it is noted that port 19 of the valve body aligns with the ports 22 and 23 of the valve casing, that is, with the pipes 14 and 39, while the port 20 of the valve body aligns with the casing ports 21 and 24, that is, with the pipes 30 and 41. Under these circumstances, the pump pressure, or more particularly the hydraulic medium under such pressure, is delivered through the pipe 14, casing port 22, valve port 19, casing port 23 and pipe 39 to that side of the blade 34 opposite that subjected to pressure in the position of the valve shown in Figure 1. The exhaust of the hydraulic medium from the cylinder then occurs through pipe 30, casing port 21, valve port 20, casing port 24, pipe 41 and tank 42 to the suction side of the pump.

It is noted that in these particular movements of the valve, the particular arrangement of ports in the valve body is such that a very slight movement of the valve is necessary to direct the pressure to either side of the blade or to arrange the valve in a neutral position when the pressure in the blade chamber is balanced. This is an important feature of the control because it permits of an extremely rapid government of the control element with a minimum movement of the valve and thus insures not only more accurate and speedy control but a more certain control, as no extended movement of the valve handle is necessary and hence the operation can be performed with more certainty than when the valve is compelled to move through a half revolution or more.

If desired, the stem 37 of the blade 34 may have a non-circular terminal 38 providing for the convenient connection with any mechanism which the movement of the blade is to control.

I claim:

A hydraulic control system including a semi-cylindrical body a control blade therein, means in the body for limiting movement of the blade in both directions, said means including shoulders formed in the body and limiting the blade in movement in both directions short of the similar limit of the body, pipes leading into the body on opposite sides of the blade, a valve casing with which the pipes communicate, a pump for the hydraulic medium, pressure and exhaust pipes for the pump leading from the valve casing, and a valve in said casing formed with curved ports to simultaneously establish communication between the respective pipes of the said body and the pressure and exhaust pipes of the

pump, said valve being formed with diametric ports adapted in one position to establish communication between said pipes in a direction reverse to that provided through the curved ports.

In testimony whereof I affix my signature.

SAM SAMSON.