

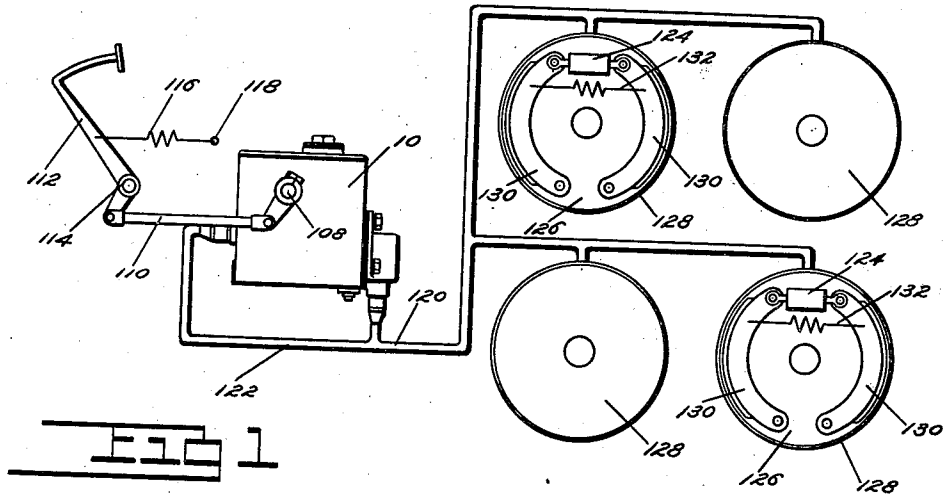
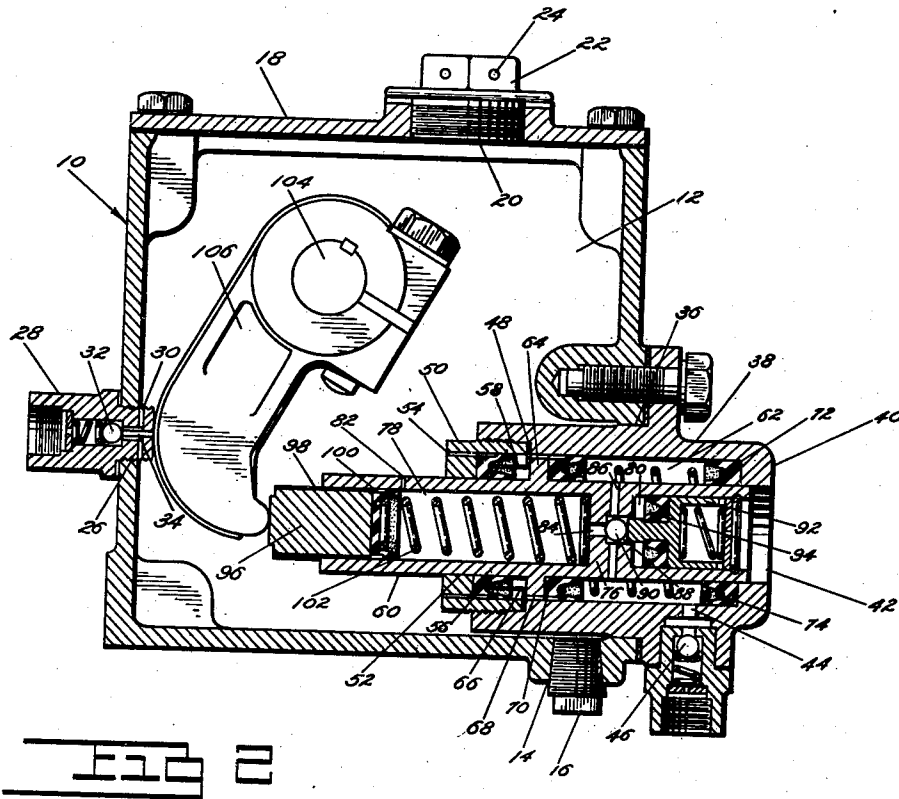
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FLUID PRESSURE PRODUCING DEVICE

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FLUID PRESSURE PRODUCING DEVICE

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This invention relates to fluid pressure systems and more particularly to fluid pressure producing devices for such systems.

An object of the invention is to provide a two-phase fluid pressure producing device operative to increase pressure on fluid without proportionately increasing the applied or activating force.

Another object of the invention is to provide a fluid pressure producing device including a low pressure producing means and a high pressure producing means, and means for maintaining the low pressure means in static position upon attaining a predetermined pressure.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawing forming a part of this specification and in which—

Fig. 1 is a schematic view of a braking system embodying the invention, and

Fig. 2 is a vertical sectional view of a fluid pressure producing device incorporated in the system.

Referring to the drawing for more specific details of the invention, 10 represents a fluid pressure producing device including a reservoir 12 having in its bottom a drain opening 14 normally closed as by a plug 16. The reservoir has a removable top 18 provided with a filling opening 20 normally closed as by a plug 22 having openings 24 therethrough for venting the reservoir to the atmosphere.

Arranged in the wall of the reservoir is an opening 26 having secured therein a valve housing 28 opening into the reservoir as by an intake port 30 controlled by a spring pressed ball valve 32 enclosed in the housing and adapted to be opened by a plunger 34 extended through the intake port 30 into the reservoir.

The reservoir also has in its wall an opening 36 arranged in oppositely disposed relation to the opening 26 and adjacent the bottom of the reservoir. A cylinder 38 supported in the opening 36 extends partly within the reservoir and partly outside of the reservoir and the outer end of the cylinder has a head 40 provided with a concentric opening 42. The cylinder also has adjacent its head a discharge port 44 controlled as by a one-way valve 46.

The end of the cylinder 38 opening into the reservoir has a small portion of increased diameter providing an annular shoulder 48, and a plug 50 secured in this portion of the cylinder has a concentric opening 52 of the same

diameter as the opening 42 in the head 40 of the cylinder 38 and in axial alignment therewith. The plug 50 also has a plurality of spaced passages 54 therethrough providing communications between the reservoir and the cylinder, and a sealing cup 56 seated on the plug for control of the passages is held against displacement by a retainer 58 clamped between the plug and the annular shoulder 48.

A piston 60 supported in the opening 42 in the head 40 of the cylinder 38 and the opening 52 in the plug 50 for reciprocation in the cylinder has an external diameter materially smaller than the inner diameter of the cylinder and provides in conjunction with one another an annular chamber 62.

The piston 60 has a head 64 normally seated on the retainer 58 in spaced relation to the plug 50 so as to provide a chamber 66 between the back of the head 64 of the piston and the plug 50. The head has a plurality of spaced passages 68 therethrough providing communications between the chambers 62 and 66, and a sealing cup 70 seated on the head 64 controls the passages 68. Another sealing cup 72 embraces the piston 60 and seats on the head 42 of the cylinder 38 to inhibit seepage of fluid from the chamber 62 past the piston, and a spring 74 interposed between the cups 70 and 72 serves to retain the cups against displacement and also to return the piston to its retracted position.

The piston 60 is hollow and a partition 76 divides the interior of the piston into a chamber 78 opening into the reservoir and a chamber 80 opening to the atmosphere. The chamber 78 has a port 82 arranged in its wall in spaced relation to the open end of the chamber and a discharge port 84 communicating with the annular chamber 62 by way of passage 86 through the partition. The chamber 80 also communicates with the passages 84 as by a port 88.

A ball valve 90 controls the discharge port 84 and a spring pressed piston 92 in the chamber 80 has thereon a sealing cup 94 and a concentric extension engaging the ball valve 90 so as to normally retain the valve in closed position.

A piston 96 reciprocable in the chamber 78 has a plurality of passages 98 therethrough. A sealing cup 100 seated on the head of the piston controls the passages 98, and a spring 102 interposed between the cup and the partition 76 serves to retain the cup against displacement and also to return the piston 96 to its retracted position.

A shaft 104 mounted transversely of reservoir in the walls thereof has a part extended outside of the reservoir. An actuator 106 secured on the shaft engages the piston 96 and the thrust pin 34 to normally retain the valve 32 open, and a crank 108 also secured on the shaft is connected as by a rod 110 to a foot pedal lever 112 rockable on a stub shaft 114 and connected as by a retractile spring 116 to a fixed support 118.

A fluid pressure delivery line 120 connected to the discharge port 44 has a branch 122 connected to the valve 28 and other branches connected respectively to fluid pressure actuated motors 124 preferably arranged in pairs, one pair for actuating brakes associated with the front wheels of a vehicle and another pair for actuating brakes associated with the rear wheels of the vehicle.

The brakes are of conventional type, each including a fixed support or backing plate 126, a rotatable drum 128 associated therewith, a pair of friction elements or shoes 130 pivoted on the backing plate for cooperation with the drum, a retractile spring 132 connecting the shoes, and a motor corresponding to the motors 124 mounted on the backing plate and connected to the shoes for activating the shoes into engagement with the drum against the resistance of the retractile spring.

In a normal operation, upon depressing the foot pedal lever 112, force is transmitted therefrom through the rod 110, the crank 108 to the shaft 104 resulting in rotation of the shaft carrying with it the actuator 106. This movement of the actuator releases the plunger 34, whereupon the valve 32 is urged to its seat to close the port 30, and simultaneously therewith the piston 96 is advanced on its compression stroke.

During the initial movement of the piston 96 on its compression stroke, the sealing cup 100 on the head of the piston 96 covers the port 82 and thereafter as the piston 96 advances the piston 60 is also advanced due to pressure on the fluid trapped in the chamber 78 maintained by the load on the valve 88, and as the pistons 60 and 96 further advance fluid is drawn from the reservoir through the passages 54 into the chamber 66 and the fluid in the chamber 62 is displaced therefrom through the discharge port 44 past the valve 46 and through the fluid pressure delivery lines 120 and branches thereof into the fluid pressure actuated motors 124 causing energization of the motors with the resultant actuation of the friction elements 130 into engagement with the drums 128 to effectively retard rotation of the drums.

Upon attaining predetermined pressure on the fluid in the chambers 78 and 80, the valve 88 cracks. This results in the piston 60 assuming a static position due to the fluid trapped in the chamber 66 back of the head 64 of the piston 60, also in advance of the piston 96, to displace fluid from the chamber 76 through the discharge port 84 past the valve 88 and through the passages 86 into the annular chamber 62, thence through the discharge port 44 past the valves 46 and through the pressure delivery lines 120 into the motors 124 causing further energization of the motors and the resultant further actuation of the friction elements into engagement with the drums.

Upon completion of a braking operation, the foot pedal lever 112 is released and is returned to its retracted position under the influence of the retractile spring 116. This results in retracting the rod 110 and movement of the shaft 104

through an angle causing retraction of the actuator 106. This movement of the actuator results in release of the piston 96 and cracking of the valve 32. Upon release of the piston 96, the piston is returned to its retracted position under the influence of the spring 102 and simultaneously therewith the piston 60 is returned to its retracted position under the influence of the spring 74. As the piston 60 returns to its retracted position, fluid in the chamber 66 is displaced therefrom through the passages 68 in the head 64 past the sealing cup 70 into the annular chamber 62 completely filling the chamber. During this period fluid is returning from the fluid pressure actuated motors and the fluid pressure delivery lines connecting the motors to the cylinder and the reservoir, and this surplus of fluid enters the reservoir by way of the valve 32.

While this invention has been described in connection with certain specific embodiments, the principle involved is susceptible of numerous other applications that will readily occur to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

Having thus described the various features of the invention, what I claim as new and desire to secure by Letters Patent is:

1. A fluid pressure producing device comprising a cylinder, a piston movable therein having a head dividing the cylinder into two chambers, one having a discharge port and the other adapted to draw fluid therein during movement of the piston, means controlling the fluid drawn into the chamber the piston having a small chamber communicating with the chamber having the discharge port, means for control of the communication, and means for subjecting the fluid in the small chamber to pressure.

2. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston movable in the cylinder having a chamber therein, a head on the piston dividing the cylinder into a compression chamber and a suction chamber, means providing a communication between the piston chamber and the compression chamber, means for control of the communication, and a piston movable in the piston chamber, said suction chamber communicating with the reservoir and means responsive to fluid pressure in the suction chamber controlling said communication.

3. A fluid pressure producing device comprising a cylinder, a piston movable therein having a head dividing the cylinder into two chambers, one having a discharge port and the other adapted to draw fluid therein during movement of the piston including a one way fluid inlet by-pass means and a one way outlet fluid by-pass means, the piston having an interiorly disposed chamber communicating with the chamber having the discharge port, means for control of the communication, and means for subjecting the fluid in the small chamber to pressure.

4. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston movable in the cylinder, a head on the piston dividing the cylinder into a compression chamber and a suction chamber, a discharge port for the compression chamber, means controlling the suction chamber and providing communication with the reservoir and compression chamber, a chamber in the piston communicating with the reservoir and the compression chamber, a piston movable in the chamber, and means in the pis-

ton controlling the communication between its chamber and the compression chamber.

5. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston reciprocable in the cylinder, a head on the piston dividing the cylinder into two chambers, one having a discharge port and the second chamber adapted to draw fluid from the reservoir during forward movement of the piston, means permitting discharge of fluid from the second chamber into the chamber having the discharge port on reverse motion of the piston, a chamber in the piston communicating with the reservoir and chamber having the discharge port, and individual means controlling the communications.

6. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom, a piston movable in the cylinder, a head on the piston

dividing the cylinder into a compression chamber and a suction chamber, a discharge port for the compression chamber, a portion of the cylinder enclosing the suction chamber and providing a communication therethrough with the reservoir, passages through the head of the piston providing communication between the suction and compression chambers, means controlling the communication between the suction chamber and reservoir, means controlling the communication between the suction and compression chambers, a chamber in the piston, a piston movable in the chamber, said piston chamber communicating with the reservoir and compression chamber, and individual means for controlling said communications.

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