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FLUID PRESSURE DEVICE

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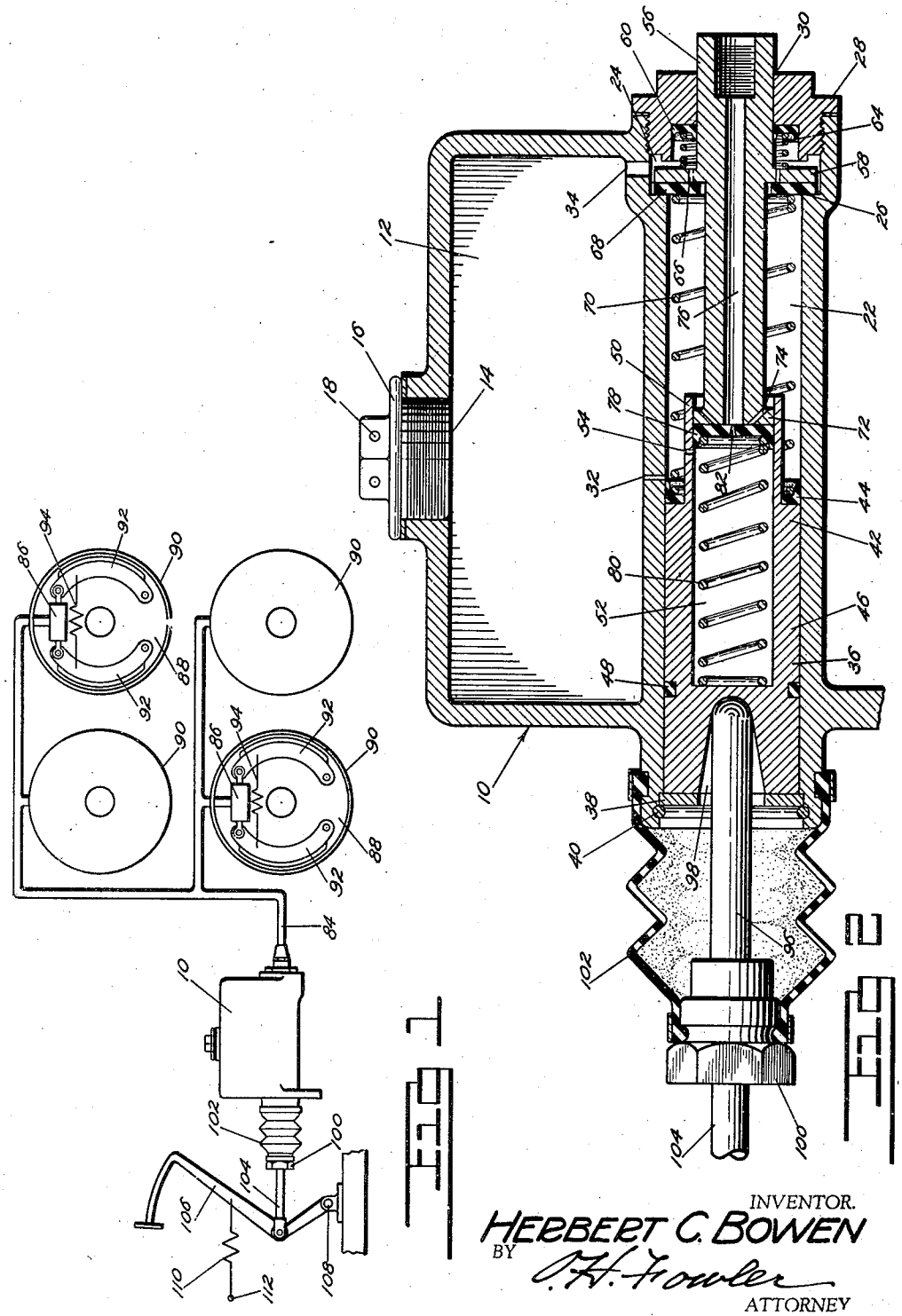

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FLUID PRESSURE DEVICE

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9 Claims. (Cl. 60—54.6)

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

In an illustrated embodiment of the invention, a two-phase fluid pressure producing device includes a reservoir, a large chamber communicating therewith, and a piston movable in the chamber for creating pressure. The piston has a small chamber concentrically disposed therein, and a correspondingly small piston received by the small chamber for creating pressure on the fluid therein carrying means for releasing pressure on the fluid in the large chamber.

An object of the invention is to provide a low pressure producing means and a high pressure producing means, and means for release of pressure on the fluid in the low pressure producing means after attaining a predetermined pressure and simultaneously transferring the pressure from the low pressure producing means to the high pressure producing means.

Another object of the invention is to provide a two-phase fluid pressure producing means operative to maintain a predetermined pressure at all times so as to avoid loss of motion, particularly during the initial actuation of the pressure producing means.

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 operative concomitantly, and to effect a transition from low to high pressure without materially increasing the applied activating force.

A feature of the invention is a fluid pressure producing device including a reservoir, a cylinder communicating therewith, and telescopic pistons in the cylinder for creating pressure on the fluid, one manually actuated and the other movable within certain limits by pressure on the fluid, and means carried by the latter for control of the communication between the reservoir and the cylinder.

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 fluid pressure 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 a filling opening 14 normally closed as by a plug 16 having openings 18 therethrough for venting the reservoir to the atmosphere.

A cylinder at the base of the reservoir includes a chamber 22 and a chamber 24 arranged forward of, concentric to and in direct communication with the chamber 22 and provides at its junction with the cylinder 22 an annular shoulder 26. The chamber 24 is closed as by a head 28 provided with a concentric opening 30. Arranged in the wall of the cylinder is a port 32 providing a communication between the chamber 22 and the reservoir, and a port 34 providing a communication between the chamber 24 and the reservoir.

A piston 36 reciprocable in the chamber 22 is held against displacement by a washer 38 seated on a shoulder in the open end of the chamber 22 and secured in place by a retaining ring 40 seated in a groove in the wall of the chamber. The piston 36 includes a head 42 having thereon a sealing cup 44, and a body portion 46 supports a sealing ring 48 for inhibiting seepage of fluid from the cylinder past the piston. The piston 36 has an extension 50, and this extension and the body portion of the piston are bored to provide a chamber 52 opening directly into that portion of the chamber 22 forward of the piston, and arranged in the wall of the extension 50 is a port 54 providing a communication between the chambers 22 and 52.

A piston 56 reciprocable in the opening 30 in the head 28 of the chamber 24 has a circumferential flange providing a head 58, restricted in its movement between the annular shoulder 26 and the head 28 of the chamber 24. A sealing cup 60 seated on the head 28 embraces the piston 56 to inhibit seepage of fluid past the piston 56, and a spring 64 interposed between the cup and the back of the piston 56 serves to retain the cup against displacement and also to normally retain the head 58 against the annular shoulder 26. The head 58 has a plurality of spaced passages 66 therethrough providing communications between the cylinders 22 and 24, and a sealing cup 68 on the head 58 controls the passages and also serves to seal the head 58 on the annular shoulder 26, and a spring 70 interposed between the washer on the head 58 and the sealing cup 44 serves to retain the washer and cup against displacement and also to return the piston 36 to its retracted position.

The piston 56 also has a head 72 movable in the chamber 52. The head 72 has a plurality of spaced passages 74 therethrough providing communications between the chamber 22 and the

chamber 52. The head 72 and the body of the piston 56 are axially bored to provide a passage 76 therethrough, and the outer end of this passage is enlarged and threaded for attachment of a fluid pressure delivery pipe or conduit.

A sealing cup 78 seated on the head 72 controls the passages 76, and a spring 80 interposed between the bottom of the chamber 52 and the cup serves to retain the cup against displacement. The cup 78 is provided with a centrally disposed conical opening 82 providing a controlled communication between the chamber 52 and the passage 76 through the piston 56. The opening 82 is of such character that the fluid in the passage 76 and the fluid pressure delivery lines connected to this passage is maintained under a predetermined pressure.

A fluid pressure delivery line or conduit 84 connected to the passage 76 has branches connected respectively to fluid pressure actuated motors 86, 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 88, a rotatable drum 90 associated therewith, a pair of corresponding interchangeable friction elements or shoes 92 pivoted on the backing plate for cooperation with the drum, a retractile spring 94 connecting the shoes, and a motor corresponding to the motors 86 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.

A thrust pin 96 has one of its ends seated in a socket 98 in the back of the piston 36, and the other end of the thrust pin has thereon a coupling 100 connected as by a flexible boot 102 to the open end of the chamber 22 for the exclusion of dust and other foreign substances. A rod 104 connects the coupling to a foot pedal lever 106, rockably mounted on a stub shaft 108, and connected by a retractile spring 110 to a fixed support 112.

It is to be realized that for a successful operation of the device the combined strength of springs 70 and 80 is less than the strength of spring 64. In a normal operation, upon depressing the foot pedal lever 106, force is transmitted therefrom through the rod 104 and thrust pin 96 to the piston 36, resulting in movement of the piston on its compression stroke. During the initial movement of the piston 36 on its compression stroke, the sealing cup 44 on the head of the piston closes the port 32, and thereafter, as the piston proceeds on its compression stroke, fluid is displaced from the chamber 22, through the passages 74 in the head 72 of the piston 56, beneath the cup 78 thereon, thence through the passage 76 and fluid pressure delivery line or conduit 84 into the motors 86, causing energization of the motors with the resultant actuation of the friction elements 92 into engagement with the drums 90 against resistance of the retractile springs 94 to effectively retard rotation of the drums.

During this operation, a relatively large volume of fluid is displaced from the chamber 22 into the motors 86, causing a rapid energization of the motors, resulting in correspondingly rapid movement of the friction elements into engagement with the drums. As the piston 36 advances on its compression stroke, the pressure on the fluid in the system is quickly built up, due to reaction, to a predetermined degree, whereupon the pressure on the fluid in the chamber 22 acting on the head 58 moves the piston 56 against the head 28 of the chamber 24 and thereby establishes communication between the chamber 22 and the reservoir. Thereafter, as the piston 36 advances on its compression stroke, the fluid in the chamber 22 is displaced therefrom through the port 34 into the reservoir, and the fluid in the chamber 52 is displaced therefrom through the opening 82 in the sealing cup 72 into the passage 76, thence through the fluid pressure delivery line 84 into the fluid pressure actuated motors 86, causing further energization of the motors with the resultant further activation of the brakes.

Upon conclusion of the braking operation, the foot pedal lever 106 is released, and is returned to its retracted position under the influence of the spring 110. This results in retracting the rod 104 and thrust pin 96, with the consequent release of the piston 36, whereupon the piston 36 is returned to its retracted position under the influence of the spring 70 assisted by the spring 64, the latter urging the piston 56 to its retracted position wherein the supply port 34 is normally closed.

During this operation, a partial vacuum is created in the chamber 22, and fluid is drawn from the reservoir through the port 34 into the chamber 24, thence through the passages 66 in the head 58 of the piston 56, past the sealing washer 68, into the chamber 22, thence through the passages 74, past the cup 78, into the chamber 52, completely filling the chambers. During this operation, fluid is also returning from the fluid pressure actuated motors 86 and the fluid pressure delivery lines connecting the motors to the passage 76. This may result in the chamber 52 receiving a quantity of fluid in excess of its capacity, and in that event the excess fluid is displaced therefrom, through the port 54, into the chamber 22, thence through the port 32, into the reservoir.

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 having a head and a supply port, a small piston reciprocable in the head having a part for control of the supply port and a fluid discharge passage extended therethrough, a relatively large piston reciprocable in the cylinder having a chamber receiving the small piston, and means for actuating the large piston.

2. A fluid pressure producing device comprising a cylinder having a head and a supply port, a piston reciprocable in the head concentrically of the cylinder having a fluid outlet passage therethrough, a valve on the piston for control of the supply port, a piston reciprocable in the cylinder having a chamber receiving the first-mentioned piston, said chamber communicating with the fluid outlet, and an actuator for the piston having the chamber therein.

3. A fluid pressure producing device comprising a cylinder having a head and a supply port, a piston reciprocable in the head concentrically of the

cylinder having a passage therethrough for the discharge of fluid from the device, means for limiting movement of the piston in both directions, means carried by the piston for control of the supply port and a second piston reciprocable in the cylinder having a chamber communicating with the cylinder and receiving the first-mentioned piston.

4. A fluid pressure producing device comprising a cylinder having a head and a supply port, a piston reciprocable in the head concentrically of the cylinder having a passage therethrough provided with a fluid discharge port, means for limiting movement of the piston in both directions, means carried by the piston for control of the supply port, a second piston reciprocable in the cylinder having a chamber communicating with the cylinder and receiving the first-mentioned piston, means for the passage of fluid from the cylinder past the first-mentioned piston, means providing communication between the passage in the cylinder reciprocable in the head of the cylinder and the chamber in the second piston, and means for actuating the second-mentioned piston.

5. A fluid pressure producing device comprising a cylinder having a head and a supply port, a piston reciprocable in the head concentrically of the cylinder having a fluid discharge passage therethrough, means carried by the piston for control of the supply port, a second piston reciprocable in the cylinder having a chamber therein communicating with the cylinder and receiving the first-mentioned piston, means providing for flow of fluid from the cylinder through the first-mentioned piston into the chamber, means carried by the first-mentioned piston for control of the flow of fluid into and from the chamber, a communication between the fluid discharge passage and chamber in the second piston, means controlling the passage, and means for actuating the second-mentioned piston.

6. A fluid pressure producing device comprising a reservoir, a cylinder associated therewith having a head and a port communicating with the reservoir, a piston reciprocable in the head concentrically of the cylinder having a passage therethrough, an outlet in the piston communicating with the passage, a valve carried by the piston for control of the port, a second piston reciprocable in the cylinder having a chamber therein communicating with the cylinder and receiving the first-mentioned piston, means providing for the flow of fluid from the cylinder into the chamber, means carried by the first-mentioned piston for control of the flow of fluid into and from the chamber, means providing for communication between the chamber in the piston and the passage in the piston reciprocable in the head of the cylinder, and manual means for activating the second-mentioned piston.

7. A fluid pressure producing device comprising a reservoir, a cylinder associated therewith having a head and a port communicating with the reservoir, a low pressure piston reciprocable in the cylinder having a chamber therein communicating with the cylinder, a high pressure piston movable in the head of the cylinder having a part for control of the port and another part commensurate the chamber in the low pressure piston, a fluid outlet passage for the device in the high pressure piston communicating with the chamber in the low pressure piston, and means for actuating the low pressure piston.

8. A fluid pressure producing device comprising a reservoir, a cylinder supplied therefrom having a head and a port communicating with the reservoir, a large piston having a chamber therein reciprocable in the cylinder for creating pressure, a small piston movable in the head of the cylinder having a head disposed in the chamber of the large piston, communications between the chamber in the piston and cylinder, an outlet passage through the small piston communicating with the chamber, means on the small piston controlling the port, means for actuating the large piston, said pistons cooperating upon relative movement to produce varying low and high stages of pressure.

9. In a fluid pressure producing device, a reservoir, a cylinder associated therewith having a head and a port communicating with the reservoir, a high pressure piston reciprocable in the head of the cylinder, means on the piston normally closing the port, a second piston reciprocable in the cylinder having a chamber therein communicating with the cylinder, a head on the first piston movable within the piston chamber relative to the second piston, a fluid discharge passage through the first piston communicating with the chamber, and means for actuating the second piston.

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