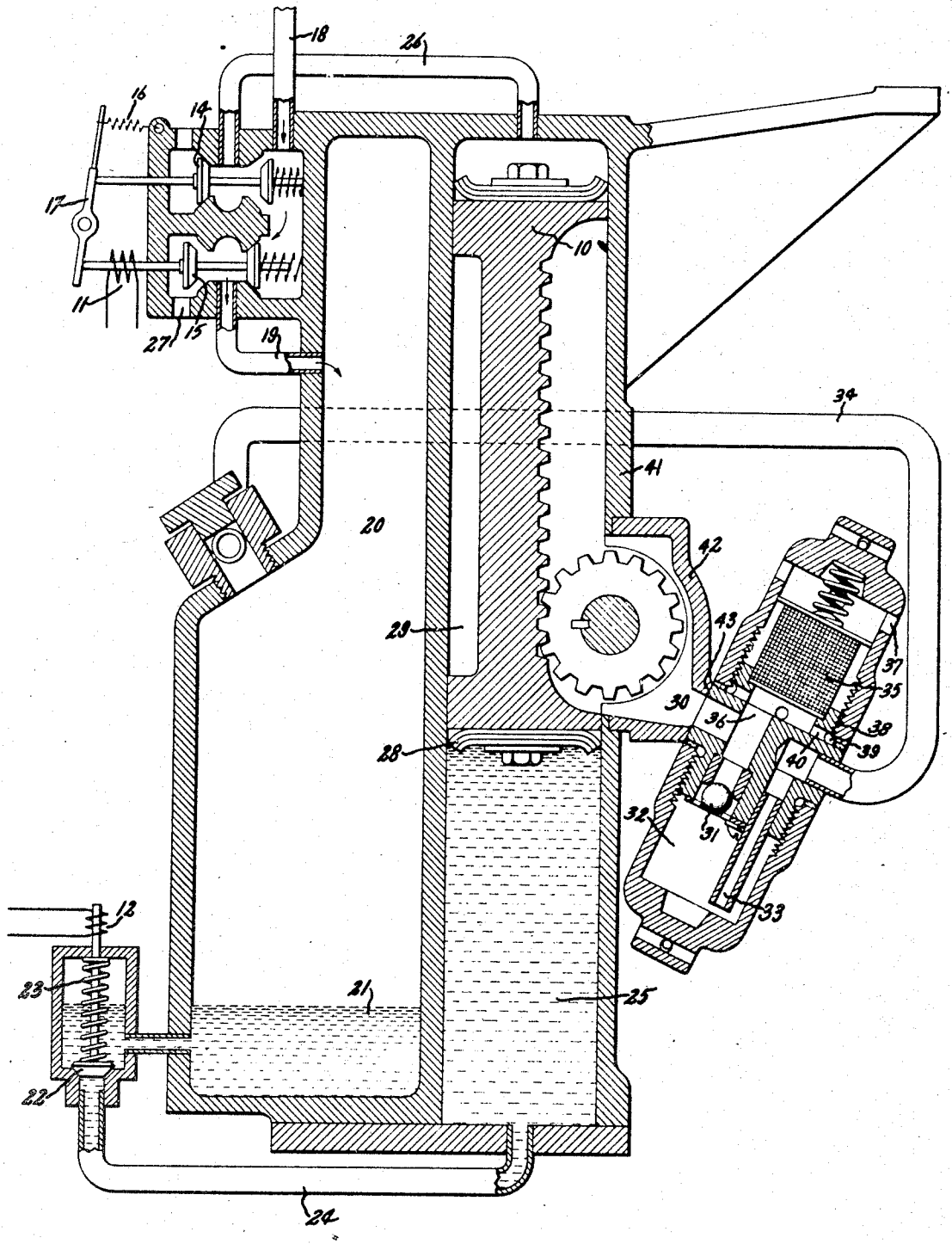
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HYDRAULIC MECHANISM

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HYDRAULIC MECHANISM

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My invention relates to hydraulic mechanism, more particularly to hydraulic motor of the piston type, and has for its object means for automatically returning any fluid that leaks past the piston.

My invention is particularly applicable to operating devices of the air and oil type such as used for driving electric railway control devices. An operating device of this kind is disclosed in the Tritle et al. Patent No. 2,120,957, issued June 14, 1938. In carrying out my invention, I provide a reservoir for oil leaking past the piston together with automatic pumping means operated by the application of air pressure to the device for forcing the oil back into the oil chamber.

For a more complete understanding of my invention, reference should be had to the accompanying drawing, the single figure of which is a view in section of a fluid operating device of the special type embodying my invention.

Referring to the drawing, I have shown my invention in one form as applied to a combined air pressure and fluid operating device such as shown in the aforesaid Tritle and McNairy patent. Briefly stated, the piston 10 is controlled by energizing or de-energizing the coils 11 and 12. As shown, these coils are de-energized. The valves 14 and 15 are forced by the biasing spring 16 to the positions shown, the valve rods being interlocked through a lever 17. When the coil 11 is energized, the valves are moved to admit compressed air from a suitable supply source, not shown, through the pipe 18, the valve 15 and pipe 19 to a pressure chamber 20 in which is a suitable liquid 21, preferably oil. The coil 12 controls a valve 22 which is normally biased to its closed position as shown by a spring 23. When the valve 22 is opened by energization of the coil 12, oil is forced from the chamber 20 through the valve and pipe 24 to the chamber 25 under the piston 10. This forces the piston upward to its upper position as shown in the drawing. When the valve 22 is closed, the piston is held by the oil in its upper position.

To return the piston to its lower position, the coil 12 is energized to open the valve 22 and the coil 11 is de-energized whereby the valves 14 and 15 are moved to their positions shown. In this position the valve 14 connects the air pressure pipe 18 with a pipe 26 leading to the upper end of the chamber 25 whereby air pressure is applied directly to the upper end of the piston to force it down. The valve 15 connects the chamber 20 through the pipe 19 to an air exhaust port 27.

In the operation of the piston 10, a small amount of oil escapes past the packing 28 on the lower end of the piston and collects around the lower end of the piston in the space 29. In accordance with my invention, I provide a conduit passage 30 leading from the space 29 at the lowermost point of the space 29 when the piston is in its uppermost position through which the leakage oil is drained through a ball-type check valve 31 into a reservoir or well 32. The bottom of this reservoir 32 is connected by a pipe 33 extending downward to the bottom of the reservoir and a pipe 34 to the air chamber 20 at a point of the chamber 20 above the level of the liquid 21.

During the operation of the device, whenever air is admitted to the chamber 20 it also is admitted through the pipes 34 and 33 to the reservoir 32, the check valve 31 closing to prevent application of the air pressure to the space 29. When the leakage oil has collected in the reservoir 32 to such depth as to submerge the lower end of the pipe 33, the air entering through the pipe 33 rises up through the oil and builds up pressure in the space above the oil. When the air pressure is released from the chamber 20 for reverse movement of the piston 10, the pressure is likewise relieved in the pipes 33 and 34. The entrapped air in the reservoir 32 thereupon forces the oil out through the pipes 33 and 34 into the chamber 20.

I have also found that during the closing of check valves of the ball-type 31, a puff of air escapes past the valve. In this particular application of the check valve, the ball and its seat are covered by a thin film of oil and consequently this puff of air picks up oil in the form of fine spray and, unless means were provided to prevent it, the oil would enter the passage 30.

To prevent that, I provide a filter 35 consisting of a fine screen. An exhaust opening 36 leads from the upper side of the passage 30, which is bent downward at its end where the check valve is placed, at a point directly above and opposite the check valve 31 into the interior of the filter 35. The puffs of oil spray, which are directed substantially upward, thus escape through the opening 36 into the filter 35. The air is free to pass through the filter and escapes to the outside atmosphere through the openings 37. The oil in the spray, however, is removed by the filter and returns by gravity through the check valve 31 to the reservoir 32.

Provision is also made for collection of the very small quantity of oil which may escape through the filter screen. This oil runs down the outside

surface of the filter, through the threaded joint 38 by capillary attraction, and collects in the groove 39 from which it is fed back into the opening 36 through the holes 40.

Preferably the ball valve 31 is arranged with its seat at a slight angle with the horizontal in order to provide for free flow of the leakage oil past it into the reservoir 32. As shown in the drawing, the entire assembly containing the reservoir 32, the valve and the associated mechanism is for that purpose mounted on the housing 41 of the fluid operating device so as to be inclined at a small angle such as approximately 25 degrees with the vertical. As shown, the supporting bracket 42 is provided with an inclined face 43 to which the reservoir and mechanism is secured.

When the seat for the ball valve 31 is horizontal, the oil, I have found, tends to seal the valve against the escape of air which tends to prevent the oil from flowing through the valve into the reservoir 32. When the valve seat is inclined, the oil tends to flow through the lower side which leaves the higher side open for the escape of air. It will be understood that the operating mechanism is mounted with the cylinder 25 in a vertical position as indicated in the drawing.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto, since many modifications may be made and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination with a liquid actuated operating device provided with a liquid chamber arranged to contain a quantity of liquid, means for admitting a compressed gas to said chamber to effect operation of said device, walls forming an enclosed reservoir for collecting liquid escaping from said device, means between said reservoir and said device preventing the flow of liquid from said reservoir to said device, and conduit means connecting a point of said chamber above the level of the liquid therein with the bottom of said reservoir whereby compressed gas from said chamber is entrapped in said reservoir and, when gas is thereafter exhausted from said chamber, forces the liquid in said reservoir through said conduit means into said chamber.

2. An operating device comprising a cylinder, a piston in said cylinder, walls forming a liquid chamber arranged to contain a quantity of oil, conduit means connecting said chamber to said cylinder for supplying oil to said cylinder, a second conduit means for admitting compressed air to said chamber to operate said piston, walls forming an enclosed reservoir communicating with said cylinder for collecting oil leaking past said piston, a check valve between said reservoir and said cylinder preventing flow of fluid from said reservoir to said cylinder, a third conduit means connecting a point of said chamber above the level of the oil therein with the bottom of said reservoir so that air supplied under pressure to said reservoir from said chamber is entrapped in said reservoir and, when air is thereafter exhausted from said chamber, forces the oil in said reservoir through said third conduit means into said chamber.

3. An operating device comprising a cylinder, a piston in said cylinder, walls forming a liquid chamber, conduit means connecting said chamber to said cylinder, said chamber being arranged to contain a quantity of oil filling said conduit means and said cylinder on one side of said piston, a second conduit means for admitting compressed air to said chamber to operate said piston in one direction and to said cylinder on the other side of said piston to operate said piston in the other direction, walls forming an enclosed reservoir communicating with said cylinder for collecting oil leaking past said piston, a check valve between said reservoir and said cylinder preventing flow of fluid from said reservoir to said cylinder, a third conduit means connecting a point of said chamber above the level of the liquid therein with the bottom of said reservoir so that air supplied under pressure to said reservoir from said chamber is entrapped in said reservoir and, when air is thereafter exhausted from said chamber, forces the oil in said reservoir through said third conduit means into said chamber.

4. The combination with an oil actuated device provided with an oil chamber arranged to contain a quantity of oil, means for admitting a compressed gas to said chamber to effect operation of said device, walls forming an enclosed reservoir for collecting oil escaping from said device, conduit means connecting said reservoir and said device including valve means preventing the flow of fluid from said reservoir to said device, said conduit means being provided with a bend and an exhaust opening in said bend opposite said valve means, a second conduit means connecting a point of said chamber above the level of the oil therein with the bottom of said reservoir, and a filter surrounding said exhaust opening for removing oil from the air escaping through said valve means while said valve means is closing.

5. An operating device comprising a cylinder, a piston in said cylinder, walls forming a liquid chamber, conduit means connecting said chamber to said cylinder, said chamber being arranged to contain a quantity of oil filling said conduit means and said cylinder on one side of said piston, a second conduit means for admitting compressed air to said chamber to operate said piston in one direction and to said cylinder on the other side of said piston to operate said piston in the other direction, walls forming an enclosed reservoir, a third conduit means connecting said reservoir with said cylinder for collection of oil leaking past said piston, a check valve in said third conduit means between said reservoir and said cylinder preventing flow of liquid from said reservoir to said cylinder, said third conduit means being provided with a bend and with an exhaust opening in said bend opposite said check valve, a fourth conduit means connecting a point of said chamber above the level of the oil therein with the bottom of said reservoir so that air supplied under pressure from said chamber to said reservoir is entrapped in said reservoir and, when air is thereafter exhausted from said chamber, forces the oil in said reservoir through said fourth conduit means into said chamber, and a filter surrounding said exhaust opening for removing oil from the air escaping through said check valve while said check valve is closing.

6. The combination with a liquid actuated device provided with a liquid chamber arranged to contain a quantity of liquid, conduit means connecting said liquid chamber to said cylinder, means for admitting compressed air to said liquid

chamber for operation of said device in one direction and for exhausting air from said chamber for movement of said device in the opposite direction, walls forming an enclosed reservoir, duct means connecting said device with the top of said reservoir for draining oil escaping from said device into said reservoir, said duct means communicating with the outside atmosphere, a check valve in said duct means preventing the escape of fluid from said reservoir, and conduit means connecting the bottom of said reservoir with said liquid chamber at a point above the level of the liquid in said chamber.

7. An operating device comprising a cylinder, a piston in said cylinder, walls forming an oil chamber arranged to contain a quantity of oil, conduit means connecting said chamber to said cylinder, means for admitting compressed air to said oil chamber to move said piston in one direction and for exhausting air from said chamber for movement of said piston in the opposite direction, walls forming an enclosed reservoir, duct means connecting said cylinder at a point above said piston with the top of said reservoir for draining oil leaking past said piston into said reservoir, said duct means communicating with the outside atmosphere, a check valve in said duct means preventing the escape of fluid from said reservoir, and conduit means connecting the bottom of said reservoir with said oil chamber at a point above the level of the oil in said chamber.

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