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MOTOR

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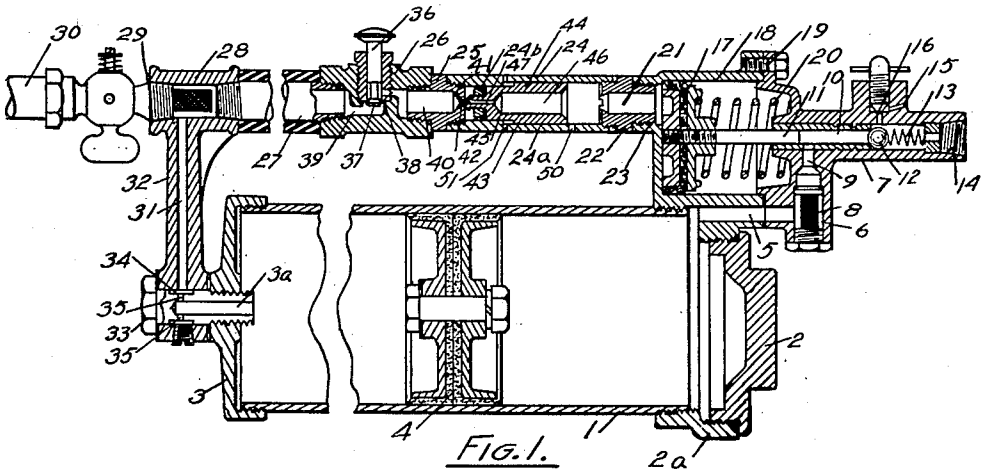


FIG. 1.

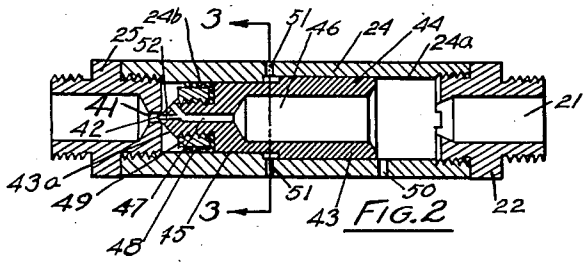


FIG. 2.

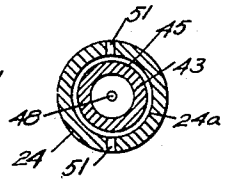


FIG. 3.

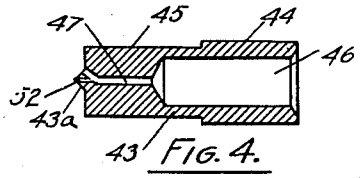


FIG. 4.

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MOTOR

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4 Claims. (Cl. 121—150)

The invention herein is exemplified as applied to a grease gun pump.

With pumps used in this relation it is desirable to have the pump automatically continue its pumping action. An example of a pump of this type is one delivering a lubricant into joints. The commonest type of pump accomplishing this purpose has been provided with a receptacle which fed the lubricant to a pump having a plunger of comparatively small area driven by a piston of larger area and in the operation of these pumps the plunger has been reciprocated in response to the manually actuated valve and reset on the release of the valve. So that where more than one plunger charge of lubricant is required it has been necessary to manually operate the control valve a sufficient number of times to deliver the desired amount of lubricant. With the present invention a motor is provided which will automatically continue its reciprocation so long as the manually operated control valve is maintained in open position. The invention contemplates a convenient and simple mechanism for controlling a motor along this line and is particularly useful with a lubricating pump and is so illustrated and exemplified. Features and details of the invention will appear from the specification and claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing as follows:—

Fig. 1 shows a central section through the pump and receptacle.

Fig. 2 an enlarged view of the automatic valve.

Fig. 3 a section on the line 3—3 in Fig. 2.

Fig. 4 a detached view of an alternative valve plunger.

1 marks the cylinder of a lubricant receptacle. This has a removable cover 2 through which the receptacle may be filled and a cover 3 at the opposite end of the receptacle having an air inlet 3*a* introducing air to exert pressure on a plunger 4 placing the lubricant in the receptacle under pressure.

A discharge passage 5 leads from the receptacle and is formed in a fitting 2*a* in which the cover 2 is mounted. This discharge passage leads to a passage 6 in a fitting 7 and the passage 6 leads to a strainer 8 and a passage, or port 9 leads to a pump cylinder 10. The pump cylinder has a pump plunger 11. A check valve 12 operates in the cylinder in the ordinary manner and is urged to its seat by a spring 13. A connecting end 14 is provided to which the hose, or pipe, leading to the point of use may be secured. A relief passage 15 is provided, this being controlled by a valve 16 through which the back pressure on the discharge connection may be relieved.

A piston 17 operates the plunger 11. It is very materially larger, or stepped up in size and operates in a cylinder 18 which in effect is a step extension of the cylinder 10. The cylinder 18 is arranged in the fitting 2*a* and the fitting 7 is secured to this cylinder by screws 19. A spring 20 operates on the piston 17 and gives to the piston its return stroke.

An inlet passage 21 leads to the cylinder 18. This passage is arranged in a nipple 22 which is screwed into an inlet extension 23 on the cylinder 18. A valve cylinder 24 is secured on the nipple 22. A nipple 25 is secured in the opposite end of the valve cylinder and a manually actuated control valve 26 is secured on the nippel 25. A nipple 27 is secured in the valve 26 and an air supply fitting 28 is secured on the nipple 27. A supply valve 29 is secured in the fitting 28 and a supply pipe 30 leads to the valve 29. A passage 31 is arranged in an arm 32 extending laterally from the fitting 28. The end of the arm is secured on the cover 3 by a screw 33. This screw has an annular passage 34 communicating with the passage 31 and radial passages 35 connect the annular passage 34 with the inlet passage 3*a*. It will be seen, therefore, that when air is put on the device through the valve 29 air is immediately delivered to the receptacle 1 so as to exert pressure on the lubricant therein and air is immediately made available at the manually actuated control valve. The manually controlled valve has a stem 36 terminating in a valve head 37, the valve head operating on a seat 38. The valve 26 has an air passage 39 leading through it which passage is controlled by the valve head. The nipple 25 has a passage 40 which terminates in a restricted inlet passage 41 having a valve seat 42 on its inner end.

The valve cylinder 24 is a stepped cylinder having a larger diameter 24*a* and a smaller diameter 24*b*. A valve plunger 43 has a larger end 44 operating in the cylinder end 24*a* and a smaller end 45 operating in the cylinder end 24*b*. The valve plunger has a passage 46 extending partially through it and this is extended through the valve plunger by a restricted passage 47. A flexible cup 48 is secured on the plunger by a nut 49. The cylinder has an exhaust passage 50 which is opened as the plunger reaches its extreme position to the left. The cylinder also has passages 51 which relieve the pressure at the stepped end of the valve plunger. The end of

the plunger is conical and forms a valve head 43a operating on the seat 42 so that with pressure on the plunger 43 the inlet passage 41 is closed.

In the operation of the device when the manually actuated control valve is open, air is delivered against the valve head 43a. While the area of this is very small the valve plunger has no pressure resistance to movement. The valve here is immediately opened and air moves through the restricted opening 47 and passages 46, 21, to the cylinder 18 operating on the piston 17 and forcing the pump plunger forward. The valve plunger when it starts to move immediately moves to the extreme end of its position because there is full pressure at the small end of this plunger and practically no pressure at the larger end. The initial movement of this valve plunger 43 closes the exhaust valve, but there still remains a preponderance of pressure at the small end of the plunger because of the movement and yielding of the piston 17. When the piston 17 reaches the end of its stroke, which is limited by the fitting 7 at the end of the cylinder 10, pressure immediately builds up in the cylinder 18 and also at the enlarged end of the plunger 43 so that it soon balances the pressure at the smaller end of the plunger 43. Immediately this happens the differential pressure on this plunger, due to the differences in exposed areas, results in a quick movement of the valve plunger to the left, closing the inlet passage 42 and opening the exhaust. The piston 17 then immediately begins its return movement under the influence of the spring 20, forcing the air from the cylinder and connected parts out through the exhaust. As soon as the piston reaches the rearward end of its stroke, the pressure exerted on the plunger 43 is reduced and as soon as it reaches a point low enough to permit the air working on the end of the head 43a to open the valve, the valve plunger 43 is again moved radially back to the position to the right closing the exhaust, opening the air to the piston 17 so as to repeat the operation. In this manner the piston 17 may be made to reciprocate rapidly so long as the manually actuated control valve 36 is maintained in an open position. As soon as the manually actuated valve is closed there is a balancing of pressure throughout the parts between the controlling valve and the piston 17 and as soon as this pressure has balanced the pressure at the two ends of the plunger 43 the differential pressure on the larger end of the plunger causes the plunger to move to the left in position to close the valve head 43a and to open the exhaust and this permits the piston 17 to be moved back to the initial position. It will be understood that the force of the spring 20 must be sufficient to maintain a pressure in the valve cylinder to close the valve head 43a during the exhausting period. This involves a proper proportioning of the exhaust passage 50. It also involves such a proportioning of the passage 47 as to maintain a preponderance of pressure at the left of the plunger 43 during the forward movement of the piston as it is this preponderance that maintains the automatic valve in its open position and the exhaust closed. It is desirable to make the passage 47 and the inlet passage 42 as large as possible so as to get a more rapid action and at the same time maintain the operative relations just described. This relation may be more readily achieved by providing a small auxiliary opening 52 connecting the passage 47 direct with the inlet passage 42 which will deliver a small amount of air to the valve cylinder during the exhausting period and will thus add slightly to the pressure in that cylinder over and above the pressure which the return of the piston 17 produces, it being understood that the friction and suction effort of the plunger 11 in the cylinder 10 may retard this movement slightly. Thus with this small communicating passage 52 these relations may be more definitely assured.

The structure of the plunger shown in Fig. 4 is similar to that shown in Fig. 2 except that the cup 24b is omitted and the plunger fit is depended on for forming a closure with the cylinder walls.

What is claimed as new is:—

1. A motor comprising a body; a piston operating in the body; a pressure fluid supply means delivering fluid to the body in pressure relation to the piston; and a valve mechanism in said supply means comprising a valve chamber, a reciprocating valve seating in the chamber and controlling an alternate fluid supply and exhaust to and from the body, said valve having opposed differential surfaces subjected to the supply fluid with the surface of lesser area subjected to ingoing fluid and the surface of greater area to the outgoing fluid, said chamber having an inlet for the ingoing fluid, an outlet leading to the body and an exhaust port discharging the fluid from the outlet side of the valve, said exhaust being closed during the building up of pressure in the body and valve chamber, the valve being immediately responsive in alternative movement to pressure differences on the opposite ends of the valve induced by fluid pressure differences.

2. A motor comprising a body; a piston operating in the body; a pressure fluid supply means delivering fluid to the body in pressure relation to the piston; and a valve mechanism in said supply means comprising a valve chamber, a reciprocating valve seating in the chamber and controlling an alternate fluid supply and exhaust to and from the body, said valve having opposed differential surfaces subjected to the supply fluid with the surface of lesser area subjected to ingoing fluid and the surface of greater area to the outgoing fluid, said chamber having an inlet for the ingoing fluid, an outlet leading to the body and an exhaust port discharging the fluid from the outlet side of the valve, said exhaust being closed during the building up of pressure in the body and valve chamber, the valve being immediately responsive in alternate movement to pressure differences on the opposite ends of the valve induced by fluid pressure differences, said pressure differences in the body being induced at one end of the power stroke by the stoppage of the piston.

3. A motor comprising a body; a piston operating in the body; a pressure fluid supply means delivering fluid to the body in pressure relation to the piston; and a valve mechanism in said supply means comprising a valve chamber, a reciprocating valve seating in the chamber and controlling an alternate fluid supply and exhaust to and from the body, said valve having opposed differential surfaces subjected to the supply fluid with the surface of lesser area subjected to ingoing fluid and the surface of greater area to the outgoing fluid said chamber having an inlet for the ingoing fluid, an outlet leading to the body and an exhaust port discharging the fluid from the outlet side of the valve, said exhaust being closed during the building up of pressure in the body and valve chamber, the valve being imme-

diately responsive in alternate movement to pressure differences on the opposite ends of the valve induced by fluid pressure differences, said pressure differences in the body being induced at one end of the power stroke by the stoppage of the piston and at the return stroke of the piston by the exhaust.

4. A motor comprising a body; a piston operating in the body; a pressure fluid supply means leading to the body; an automatic valve mechanism in the supply means comprising a step cylinder; a restricted inlet to the cylinder; a valve seat at the inlet; an exhaust passage; a step valve plunger in the cylinder having a head operating on the seat, said plunger moving over the exhaust passage to open the same as the inlet is closed, the small end of the plunger being at the inlet end of the plunger; and a restricted port through the plunger.

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