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LUBRICATING DEVICE

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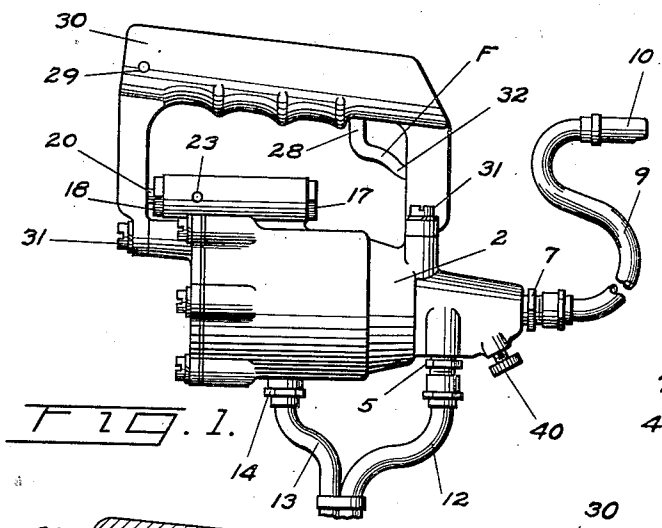


FIG. 1.

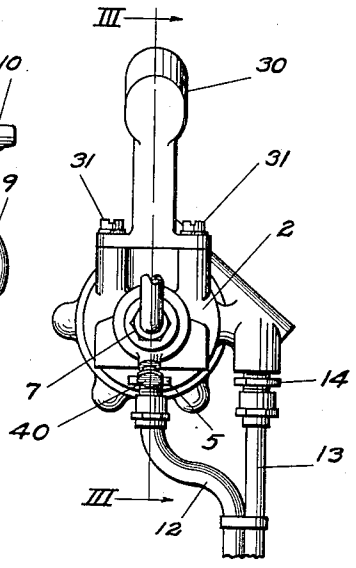


FIG. 2.

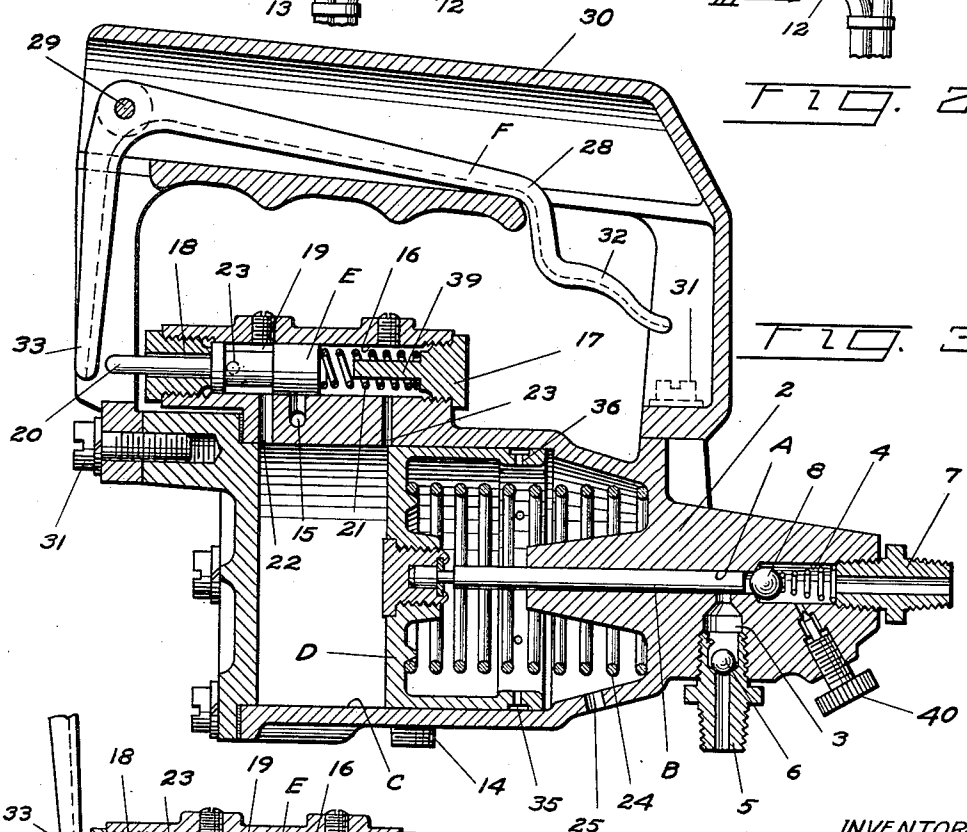


FIG. 3.

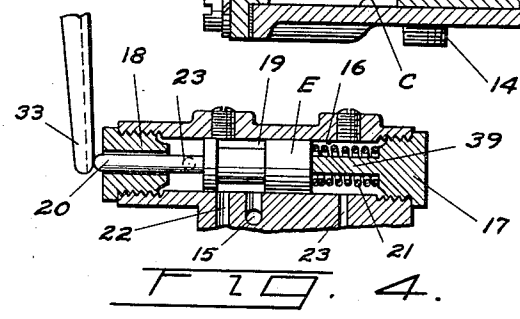


FIG. 4.

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LUBRICATING DEVICE

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9 Claims. (Cl. 221—47.3)

This invention relates to improvements in lubricating devices and more particularly to fluid operated lubricant guns such as may be used for delivering lubricant under pressure into lubricant receiving nipples or fittings.

Heretofore small hand guns have been provided of the air operated type wherein a series of successive lubricant shots may be discharged therefrom upon successive trigger movements, each complete cycle of trigger movement resulting in the discharge of a singe slug of lubricant. This type of apparatus, however, is incapable of delivering large quantities of lubricant in short duration of time because of the inability of the human hand to function in applying a series of trigger thrusts above a certain relatively low speed, therefore, limiting the total number of successive lubricant shots per minute to a comparatively small amount. The present invention contemplates the use of a trigger operated control valve wherein the operating fluid for the gun functions to shift the valve against manual pressure upon the trigger at the end of each power stroke so that all the operator need do to provide a rapid succession of lubricant shots is to press lightly upon the trigger to overcome the action of the valve spring. Thereafter the trigger will be returned against finger pressure thereupon by fluid pressure action and the second of a series of operating cycles may occur which will continue as long as the operator presses the trigger as described. The manual function involved may be considered as analogous to that represented by the placing of one's hand upon a rapidly moving oscillating device such as a pitman wherein manual pressure in the direction of the moving element may result in the following of the rapid movement thereof whereas an attempt to move the hand independently to follow the rapid movement of the device would fail completely as in attempting to operate the trigger of an air gun of the commonly known type at a speed comparable with a gun constructed according to the present invention.

An object of the invention is to provide a fluid operated lubricant gun incorporating manually operated trigger controlled means for delivering one shot of lubricant upon a certain predetermined pressure upon the trigger or, a series of shots in rapid succession upon the application of a different predetermined manual pressure upon the gun trigger.

Another object is to provide a fluid operated lubricant gun which is highly flexible in operation and wherein the operator may substantially control the rate of successive lubricant shots by finger tension upon the control trigger.

Other objects, the advantages and uses of the invention, will be or should become apparent after reading the following description and claims and after consideration of the accompanying drawing forming a part of this specification, in which:

Fig. 1 is a side elevation of an air operated lubricant gun constructed in accordance with the invention;

Fig. 2 is a front elevation of the lubricant gun of Fig. 2;

Fig. 3 is a sectional view along the line III—III of Fig. 1; and

Fig. 4 is a fragmentary sectional view of the control valve in an operative position other than that illustrated in Fig. 3.

In general, the air operated lubricant gun selected for illustration herein comprises, in unitary assembly, a lubricant pressure cylinder A having a piston B mounted for reciprocation therein, an air motor cylinder C of relatively large diameter aligned with the cylinder A, an air motor piston D, in the cylinder C, coupled to the piston B, a semi-automatic motor control air valve E, and manually operated trigger mechanism F for actuating the valve E.

The cylinders A and C are formed with a common body casting 2 having bores 3 and 4 communicating with the cylinder A comprising lubricant inlet and discharge ports respectively. A screw plug connector stud 5 incorporating an inlet check valve 6 may be inserted within the mouth of the port 3 and a standard screw connector stud 7 inserted within the mouth of the discharge port 4. A discharge check valve 8 of the spring pressed ball type is disposed between the plug 7 and the mouth of the cylinder A to preclude the return of lubricant into the cylinder A. With reference to Fig. 1 the connector stud 7 is intended for connection through a suitable discharge hose 9 with a lubricant discharge nozzle or coupler 10 through which lubricant may be discharged into a lubricant receiving nipple or fitting with which the nozzle or coupler is engaged. The connector stud 5 is intended for connection to a hose line 12 forming a part of the source of lubricant supply.

Air under pressure may be admitted to the gun through an air hose 13 connected at its outer end by threaded engagement to a connector stud 14 communicating with an air inlet port 15 of the valve cylinder 16 within which the valve E is mounted for reciprocation. The valve cylinder 16 is formed of a bore provided in the body cast-

ing 2 and is closed at its forward end by a screw plug 17 and at its rearward end by a bushing 18 through which a push rod 20 formed integral with the valve member E extends.

The valve member E is of the piston type adapted to closely engage the walls of the cylinder 16 and is formed with an annular circumferential groove 19 adjacent its rearward end. A compression spring 21 disposed between the valve E and the adjacent end of the plug 17 functions to normally retain the valve, yieldingly, in the position shown in Fig. 3 to shut off the air inlet port 15 and to establish communication through the grooved portion 19 thereof between an air passage 22 between the cylinders C and 16 and the air exhaust port 23 of the gun. In Fig. 3, the parts are shown immediately after the shifting of the valve E rearwardly of the cylinders 16 under influence, of the spring 21, and air under pressure, from within the cylinder C admitted to the cylinder 16 through a passage 23 open to the cylinder C upon the termination of the pressure stroke of the air motor piston D as shown. A compression spring 24 is provided between the forward side of the piston D and adjacent wall of the body casting 2 for returning the piston D to the rearward end of the cylinder C which function takes place immediately upon the movement of the valve E to the position shown in Fig. 3 as described. During the return of the piston D the air within the cylinder C is exhausted through the passage 22, the valve E, and port 23 to atmosphere. An air bleed opening 25 open to atmosphere is provided through the body 2 ahead of the piston D so as to assure free movement of the piston within the cylinder C under influence of air within the cylinder during its pressure stroke and of the spring 24 during its return stroke.

The trigger mechanism F comprises a lever 28 pivotally mounted at 29 upon a handle member 30, fixed to the body casting 2 by screws 31, and is formed with a finger engaging trigger portion 32 located adjacent to the forward end of the handle member. The remote end 33 of the lever 28 extends downwardly and into registration with the push rod 20 of the air control valve E.

In operation the lubricant gun, subsequent to its connection with a suitable air and lubricant supply as described, may be held in the hand of the operator by manually grasping the handle member 30 with one finger positioned to engage the outer end 32 of the control trigger. At this time the various elements of the gun are in the position shown in Fig. 3 except that the piston D is returned to the rearward end of the cylinder C. If, now, a single shot or charge of lubricant is to be delivered by the gun measured by the displacement of the piston B in the cylinder A, the operator may depress the trigger portion 32 thus forcing the control valve to assume the position shown in Fig. 4 against the influence of the spring 21. During this operation air ahead of the valve member E will be expelled from the cylinder 16 through the passage 23 with which a groove 35 about the skirt of the piston D is in registration, through the said grooved portion of the piston D and through radially disposed passages 36 in the piston skirt located at the base of the groove 35 and into the cylinder C ahead of the piston to atmosphere by way of the bleeder opening 25. Forward movement of the valve member E is limited by a stop 39 formed on the screw plug 17 so as to cause the grooved portion 19 of the valve member to establish communication between the previously closed air inlet port 15 and the passage 22 as shown. Air under pressure is thereupon admitted to the cylinder C to force the air motor piston D forwardly to produce a pressure stroke of the lubricant pressure piston B and thus discharge a measured charge of lubricant through the port 4 and lubricant discharge line. The operator may next release the trigger mechanism F and air under pressure within the cylinder 16 admitted thereto from the cylinder C through the passage 23 at the termination of the pressure stroke of the piston D together with the force exerted by the spring 21 will function to return the valve to the position shown in Fig. 3 and thereupon close the air inlet port 15 and open the exhaust port 23 to the passage 22 as described thereby permitting the piston D to return under influence of the spring 24.

In the preceding description of the operation of the gun it is assumed that the operator has applied manual force in depressing the trigger mechanism in excess of the counter force of the spring 21 an amount equal to or greater than the added force of air under pressure applied to the valve member E through the passage 23 at the end of the power stroke of the piston D.

If a series of shots or lubricant charges are to be discharged from the gun in rapid succession the operator need only to press lightly upon the trigger an amount sufficient just to overcome the force of the spring 21 whereupon air admitted to the cylinder 16 at the end of the first pressure stroke of the piston D will move the valve back to the position of Fig. 3 against manual pressure upon the trigger to produce a second and thereafter continuing series of air motor piston strokes in rapid succession. During this function of the gun the finger of the operator's hand acts as a yieldable instrumentality to urge the valve E against the stop 39. In this manner an operator may bring about trigger movement at a speed many times that which would be possible if he were to rely upon a series of trigger movements, each movement representing an independent discharge of lubricant from the gun. Such successive trigger actuation must be necessarily limited to the physical capability of the coordination between the reflex muscular action of the trigger finger and the mental forces of the operator.

If desired, an air bleed valve 40 may be provided at the discharge port 4 through which air entrapped in the cylinder A may be expelled and for purposes of relieving pressure within the discharge line when difficulty is encountered in detaching the nozzle 10 from a fitting with which it may be connected.

It is to be understood that the above described embodiments of the invention herein set forth are presented for the purpose of illustration only, and various changes may be made therein without departing from the spirit and scope of the invention.

We claim:

1. A fluid motor comprising, a motor cylinder, a movable element in said cylinder, a valve movable through a fixed path for controlling inlet and exhaust of fluid to and from said motor cylinder, yielding means for urging said valve to one limit of its travel, means for moving the valve against the force of said yielding means to the opposite limit of its travel, and fluid pressure responsive means operable upon movement of said movable element to a predetermined position in said cylinder for augmenting said yielding means to oppose force applied to said valve through the medium of said valve moving means.

2. In combination with a fluid motor having an inlet port and an exhaust port, a valve so constructed and arranged as to open the inlet port and close the exhaust port when in one position and to close the inlet port and open the exhaust port when in another position, yieldable means for moving said valve to said second named position, means for moving said valve to said first named position and fluid pressure responsive means operable at the termination of the power cycle of said motor for augmenting the force of said yielding means to move the valve to said second named position.

3. A lubricating device comprising, a lubricant pump having a piston mounted for reciprocation, a fluid motor having a piston mounted for reciprocation and directly connected to said pump piston, a control valve for said fluid motor for admitting fluid to said motor when in one position and for exhausting fluid when in another position, resilient means for urging said valve to said last named position, a member for moving said valve to said first named position against the force of said resilient means and fluid pressure responsive means operable upon the arrival of said motor piston at the end of its pressure stroke for augmenting the force exerted upon said valve by said resilient means.

4. A semi-automatic fluid motor, comprising a motor cylinder, a motor piston mounted for reciprocation in said cylinder, means tending at all times to urge the piston inwardly of the cylinder, a valve for admitting fluid under pressure to said cylinder when in one position, and for exhausting fluid from said cylinder when in another position, means for applying fluid under pressure to said valve to urge the valve to said second-named position upon the termination of the full pressure stroke of said motor piston outwardly of the cylinder, a trigger for manually urging said valve to said first-named position when the trigger is depressed, and resilient means arranged yieldingly to resist depression of said trigger.

5. In a lubricating device, a fluid motor comprising a cylinder, a piston reciprocably mounted in said cylinder, means for urging the piston toward one end of the cylinder, a movable valve for controlling inlet and exhaust of fluid under pressure to the cylinder, resilient means urging said valve to its exhaust position, manually controlled means to urge said valve to its inlet position, and means under the control of the piston to admit fluid under pressure to the valve to urge it to its exhaust position.

6. In a lubricating device, a fluid motor comprising a cylinder, a piston reciprocably mounted in said cylinder, means for urging the piston toward one end of the cylinder, a movable valve for controlling inlet and exhaust of fluid under pressure to the cylinder, resilient means urging said valve to its exhaust position, manually controlled means to urge said valve to its inlet position, and means under the control of the piston to admit fluid under pressure to the valve to urge it to its exhaust position, said means being so constructed and arranged as to exhaust the fluid from said valve when the piston has returned to said end of the cylinder.

7. In a lubricating device, a fluid motor comprising means movable in response to fluid under pressure, a movable valve to control inlet and exhaust of fluid under pressure to said means, a manually operable trigger engaging said valve to urge it to its inlet position, resilient means opposing movement of said trigger which urges the valve to its inlet position, and means controlled by said movable means to admit fluid under pressure to said valve to urge it to its exhaust position thereby creating a reaction on said trigger.

8. A lubricating device comprising a body having a small bore therein constituting a high pressure lubricant cylinder, a coaxial larger bore constituting a power cylinder and a valve chamber, lubricant inlet and outlet means to said small cylinder, inlet and exhaust ports for fluid under pressure to said valve chamber, a connection between said valve chamber and power cylinder, rigidly connected pistons in said lubricant and power cylinders, a valve in the valve chamber movable to establish communication between said connection and either its inlet or exhaust port, resilient means for urging the valve to its exhaust position, a manual lever for urging the valve to its inlet position, and a second connection between the valve chamber and power cylinder controlled by the position of the power piston for admitting fluid under pressure to said valve chamber to urge the valve to its exhaust position, thereby to create a reaction on the lever.

9. In a lubricating device, a fluid motor comprising means movable in response to fluid under pressure and having a working stroke, a movable valve to control inlet and exhaust of fluid under pressure to said means, a manually operable trigger engaging said valve to urge it to its inlet position, resilient means opposing movement of said trigger which urges the valve to its inlet position, and fluid pressure responsive means controlled by said movable means to urge said trigger to its valve exhaust position when the movable means is at the end of its working stroke.

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