This invention relates to dispensing apparatus, and more particularly to apparatus for dispensing lubricant from a drum.

The invention is especially concerned with apparatus for forcing lubricant out of a drum for delivery of lubricant from the drum under pressure to a pump, and thereby acting to pressure-priming the pump, but it will be understood that the apparatus described will be useful for dispensing materials other than lubricant.

One type of prior apparatus of this class essentially comprises a follower which fits in the drum for pressing down on lubricant in the drum, the follower being actuated by an air cylinder. The latter is adapted to lower the follower into a drum to rest on the surface of lubricant in the drum, and then the weight of the follower is utilized to pressurize the lubricant and force the lubricant upward through a passage in the follower to an inlet of a pump which may be mounted on the follower, and is also adapted to raise the follower out of a drum to permit removal of the drum and replacement with another drum. However, in such prior apparatus raising of the follower out of a drum may require relatively high force because of the tendency to draw a vacuum in the drum below the follower when the follower is raised. Accordingly, among the several objects of this invention may be noted the provision, in apparatus of this class, of means for breaking the vacuum below the follower on raising of the follower and assisting in raising the follower; the provision of such means which utilizes air exhausted from the air cylinder for the follower for breaking the vacuum and assisting in raising the follower; and the provision of means such as described in which actuation of a control valve for the air cylinder to the position for raising the follower automatically results in delivery of air exhausting from the cylinder below the follower to break the vacuum and assist in raising the follower. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a view in front elevation of a dispensing apparatus of this invention, with parts broken away to reduce the height of the view;

FIG. 2 is an enlarged view in side elevation of the FIG. 1 apparatus with parts broken away and shown in section;

FIG. 3 is a horizontal section taken on line 3—3 of FIG. 2;

FIG. 4 is a horizontal section taken on line 4—4 of FIG. 2; and

FIG. 5 is a section of a so-called air assist valve of the apparatus.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a dispensing apparatus of this invention, particularly for dispensing lubricant from a drum D, is shown to comprise a frame generally designated 1. This comprises a base 5, on which the drum is placed, and an arch 5 consisting of a channel member bent to U-shape and mounted in inverted position on the base. Extending down from the top of the arch is a fixed piston rod 7 having a piston 9 on its lower end. Piston 9 is received in an elongate air cylinder 11 which is slideable up and down relative to the piston and piston rod, the latter extending through a head 13 at the upper end of the cylinder. Cylinder 11 carries a follower 15 at its lower end adapted to have a sliding sealing fit in the drum. Follower 15 closes the lower end of the cylinder. The arrangement is such that by supplying compressed air to the cylinder below the piston and exhausting air from the upper end of the cylinder, the cylinder and follower may be lowered, and by supplying compressed air to the cylinder above the piston and exhausting air from the lower end of the cylinder, the follower may be raised. In accordance with this invention, a so-called air assist valve 17 is provided for effecting delivery of air which is exhausted from the lower end of the cylinder through the follower into the drum below the follower for breaking the vacuum below the follower and assisting the raising of the follower.

Follower 15 has annular peripheral grooves 19 accommodating packing rings 21 for wiping on the interior of the cylindrical wall of the drum. The follower is adapted to press down on lubricant in the drum and force lubricant upward to a chamber 23 which opens downward from the follower for admission of lubricant. Chamber 23 is defined by an upward extending tubular boss 25 on the follower, located radially outward from cylinder 11, having a cap plate 27 fastened on its upper end. The follower carries a pump 29 for pumping lubricant from the drum. This pump, which is of a well-known type conventionally used for pumping lubricants, has a tubular pump body extending down through the cap plate 27 into the chamber 23, and is driven by an air motor 31 mounted on its upper end. A priming tube 33 is provided on the cap plate, carrying a priming plug 35, for initially priming the pump.

Arms 37 extending laterally outward from the upper head end 13 of cylinder 11 have their ends slideable in the sides of the arch 5, and keep cylinder 11 and follower 15 from rotating while allowing them to slide up and down. Follower 15 has a port 39 for admission to and exhaust of air from the lower end of cylinder 11, and a port 41 for passage of air below the follower. Head 13 has a port 43 (see FIG. 3) for admission of air and exhaust of air from the upper end of cylinder 11.

A four-way control valve 45 is mounted on a bracket 47 carried by the right-hand arm 37 as viewed in FIG. 1. This valve is of a conventional type, having an inlet, an exhaust outlet, upper and lower transfer ports 49 and 51 and an operating lever 53. Compressed air is supplied from a suitable source (not shown) via a flexible hose (not shown) to the valve inlet. When the lever is swung upward (as in FIG. 1), the valve inlet is placed in communication with the upper port 49 and the lower port 51 is placed in communication with the exhaust outlet. When the lever is swung down, the valve inlet is placed in communication with the lower port 51 and the upper port 49 is placed in communication with the exhaust outlet. When the lever is placed in a neutral horizontal position extending toward the right as viewed in FIG. 1, the inlet is blocked by a lock-out fixture 55 bearing arrows indicating that lever 53 is to be swung up for raising the follower, down for lowering the follower, and positioned horizontally to cut off compressed air is provided on bracket 47.

A first line 57 connects the upper port 49 of control valve 45 and port 43 in the upper cylinder head 13. A second line 59 including a check valve 61 and an air pressure regulator 63 connects the lower port 51 of control
3 valve 45 and port 39 in follower 15. Check valve 61 is adapted to open for supplying air through line 59 to the lower end of cylinder 11 and to close on exhaust of air from the lower end of the cylinder, i.e., it opens in downward direction as viewed in FIG. 1. Regulator 63 is adapted to cause a pressure drop in air supplied through line 59 to the lower end of the cylinder 11. A third line 65 including the air assist valve 17 is connected to the second line 59 on the outlet (downstream) side of the pressure regulator and is connected to the port 41 in the follower. This air assist valve is an air-operated valve, and a control line 67 therefrom is connected to the second line 59 at the inlet of check valve 61 (i.e., upstream from the check valve). A pressure gauge G is connected to the regulator.

The air assist valve 17 (see FIG. 5) comprises a body 69 having a nipple 71 at one end which is threaded into a port in the air pressure regulator 63 and an extension 73 at the other end on which is threaded an adapter 75 for connection of control line 67. Body 69 has a bore 77 extending inward from the outer end of extension 73 to a shoulder 79 at the inner end of the bore, and a passage 81 from the shoulder through the nipple 71. A plunger 83 is slidable in the bore 77 and is engageable with a valve member 85 adapted to seat against shoulder 79 when block passage 81. Body 69 has a lateral port 87 which is connected by line 65 (see FIG. 1) with port 41 in follower 15.

Straps such as indicated at 91 are provided for holding down the drum D on base 3 of frame 1 and centering the drum relative to the follower. Each strap has one end hinged as indicated at 93 on one side of arch 3 and has an eye 95 at its other end receivable in a C-shaped bracket 97 on the other side of the arch and adapted to receive a locking pin 99 carried by a bead chain 101.

Operation is as follows:

To raise the follower 15, lever 53 is swung up, thereby placing the inlet of control valve 45 in communication with the upper valve port 49 and placing the lower valve port 51 in communication with the exhaust outlet of valve 45. Compressed air is then supplied from port 49 through the first line 57 to the upper end of cylinder 11 above the fixed piston 9 to raise the cylinder 11 and the follower 15 which is attached to the lower end of the cylinder. With the lower valve port 51 in communication with the exhaust outlet of valve 45, control line 67 is open to exhaust, and plunger 83 of the air assist valve 17 is free to move toward the right as viewed in FIG. 5. When allow valve member 85 of the air assist valve to open. Check valve 61 blocks upward flow of air from the air pressure regulator 63. Accordingly, air is exhausted from the lower end of cylinder 11 via port 39 in the follower 15, the second line 59, passage 81 in the air assist valve 17. (the exhausting air pushing open the valve member 85), lateral port 87 of the air assist valve and the third line 65, which delivers the air exhausting from the lower end of cylinder 11 downward through the port 41 in the follower into the drum below the follower to break the vacuum which would otherwise be drawn in the drum D and assists in raising the follower.

To lower the follower 15, lever 53 is swung down, thereby placing the inlet of control valve 45 in communication with the lower port 51 of valve 45 and placing the upper port 49 in communication with the exhaust outlet of valve 45. Compressed air is then supplied via the check valve 61, regulator 63, line 59 and port 39 to the lower end of the cylinder 11, and air is vented from the upper end of the cylinder via port 43 and line 57, thereby to lower the follower. Compressed air is also supplied (at a higher pressure than that on the outlet side of the regulator 63) through control line 67 to the air assist valve plunger 83 to drive the latter as viewed in FIG. 5 and hold the air assist valve member 85 closed. The latter thus blocks off flow of air from the regulator down through line 65.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results are attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

1. In apparatus for dispensing material from a drum, a follower for pressurizing material in the drum, said follower having a port therein, air-operated means for raising and lowering the follower, and means responsive to raising the follower for delivering air exhausting from said air-operated means downward through said port into the drum below the follower.

2. In apparatus for dispensing material from a drum, a follower for pressurizing material in the drum, said follower having a port therein, means comprising an air cylinder and piston for raising and lowering the follower and means responsive to raising the follower for delivering air exhausting from said air-operated means downward through said port into the drum below the follower.

3. In apparatus for dispensing material from a drum, a follower for pressurizing material in the drum, said follower having a port therein, means comprising an air cylinder and piston for raising and lowering the drum, means for supplying air to one end of the cylinder and exhausting air from the other end of the cylinder for raising the follower and for supplying air to said other end of the cylinder and exhausting air from said one end of the cylinder for lowering the follower, and means responsive to raising of the follower for delivering air then exhausting from said other end of the cylinder downward through said port into the drum below the follower.

4. In apparatus for dispensing material from a drum, a follower for pressurizing material in the drum, said follower having a port therein, means comprising an air cylinder and piston for raising and lowering the drum, a control valve, a first line connecting the control valve and one end of the cylinder for supplying air to said one end of the cylinder and exhausting air from said one end of the cylinder on lowering the follower, a second line connecting the control valve and the other end of the cylinder for supplying air to said other end of the cylinder for lowering the follower and exhausting air from said other end of the cylinder on raising the follower, a check valve in said second line adapted to open for supplying air through said second line to said other end of the cylinder for lowering the follower and to close on exhaust of air from said other end of the cylinder, a third line connected to said second line downstream from said check valve and connected to said port in the follower and including an air assist valve, and means for controlling said air assist valve to cause it to close in response to supply of air through said second line and to cause it in open in response to exhaust of air through said second line thereby to deliver air exhausting from said other end of the cylinder downward through said port into the drum below the follower.

5. In apparatus for dispensing material from a drum, a follower for pressurizing material in the drum, said follower having a port therein, means comprising an air cylinder and piston for raising and lowering the drum, a control valve, a port 28 of said control valve connected to one end of the cylinder for supplying air to said one end of the cylinder on raising the follower and exhausting air from said one end of the cylinder on lowering the follower, a second line connecting the control valve and the other end of the cylinder for supplying air to said other end of the cylinder for lowering the follower and exhausting air from said other end of the cylinder downward through said port into the drum below the follower.
line to said other end of the cylinder for lowering the follower and to close on exhaust of air from said other end of the cylinder, a third line connected to said second line downstream from said check valve and connected to said port in the follower, an air-operated air assist valve in said third line and a control line for said air assist valve connected to said second line upstream from said check valve, said air assist valve closing in response to supply of air through said second line and concomitant supply of air through said control line and opening in response to exhaust of air through said second line thereby to deliver air exhausting from said other end of the cylinder downward through said port into the drum below the follower.

6. In apparatus as set forth in claim 5, said second line including means for causing a pressure drop connected therein downstream from said check valve, and said third line being connected to said second line on the downstream side of said pressure drop means.

7. In apparatus as set forth in claim 6, said pressure drop means comprising an air pressure regulator.

8. In apparatus for dispensing material from a drum, a frame, a piston rod fixed to and extending downward from the frame, a piston on the rod, a cylinder slideable up and down on the piston, a follower on the lower end of the cylinder for pressurizing material in the drum, said follower having a port therein, means for supplying air to the upper end of the cylinder and exhausting air from the lower end of the cylinder for raising the cylinder and follower and for supplying air to the lower end of the cylinder and exhausting air from the upper end of the cylinder for lowering the cylinder and follower, and means responsive to raising the cylinder and follower for delivering air then exhausting from the lower end of the cylinder downward through said port into the drum below the follower.

9. In apparatus for dispensing material from a drum, a frame, a piston rod fixed to and extending downward from the frame, a piston on the rod, a cylinder slideable up and down on the piston, a follower on the lower end of the cylinder for pressurizing material in the drum, said follower having a port therein, a control valve, a first line connecting the control valve and the upper end of the cylinder for supplying air to the upper end of the cylinder for raising the cylinder and follower and exhausting air from the upper end of the cylinder on lowering the cylinder and follower, a second line connecting the control valve and the lower end of the cylinder for supplying air to the lower end of the cylinder for lowering the cylinder and follower and exhausting air from the lower end of the cylinder on raising the cylinder and follower, a check valve in said second line adapted to open for supplying air through said second line to the lower end of the cylinder for lowering the cylinder and follower and to close on exhaust of air from the lower end of the cylinder, a third line connected to said second line downstream from said check valve and connected to said port in the follower and including an air assist valve, and means for controlling said air assist valve to cause it to close in response to supply of air through said second line and to cause it to open in response to exhaust of air through said second line thereby to deliver air exhausting from the lower end of the cylinder downward through said port into the drum below the follower.

10. In apparatus for dispensing material from a drum, a frame, a piston rod fixed to and extending downward from the frame, a piston on the rod, a cylinder slideable up and down on the piston, a follower on the lower end of the cylinder for pressurizing material in the drum, said follower having a port therein, a control valve, a first line connecting the control valve and the upper end of the cylinder for supplying air to the upper end of the cylinder for raising the cylinder and follower and exhausting air from the upper end of the cylinder on lowering the cylinder and follower, a second line connecting the control valve and the lower end of the cylinder for supplying air to the lower end of the cylinder for lowering the cylinder and follower and exhausting air from the lower end of the cylinder on raising the cylinder and follower, a check valve in said second line adapted to open for supplying air through said second line to the lower end of the cylinder for lowering the cylinder and follower and to close on exhaust of air from the lower end of the cylinder, a third line connected to said second line downstream from said check valve and connected to said port in the follower, an air-operated air assist valve in said third line and a control line for said air assist valve connected to said second line upstream from said check valve, said air assist valve closing in response to supply of air through said second line and concomitant supply of air through said control line and opening in response to exhaust of air through said second line thereby to deliver air exhausting from the lower end of the cylinder downward through said port into the drum below the follower.

11. In apparatus as set forth in claim 10, said second line including means for causing a pressure drop connected therein downstream from said check valve, and said third line being connected to said second line on the downstream side of said pressure drop means.

12. In apparatus as set forth in claim 11, said pressure drop means comprising an air pressure regulator.

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