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2,387,233

DISPENSING PUMP

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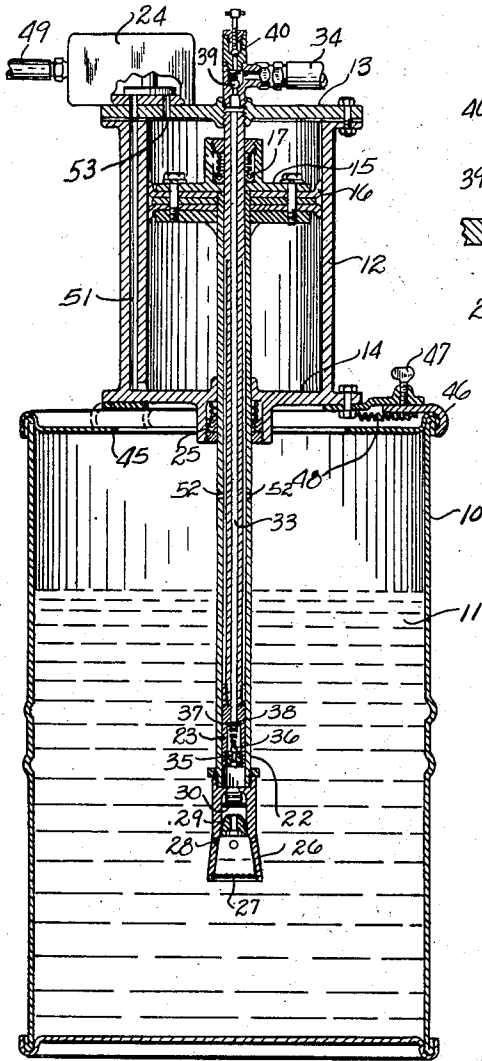


Fig. 1

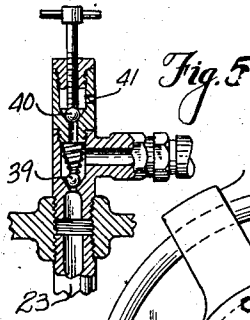


Fig. 5

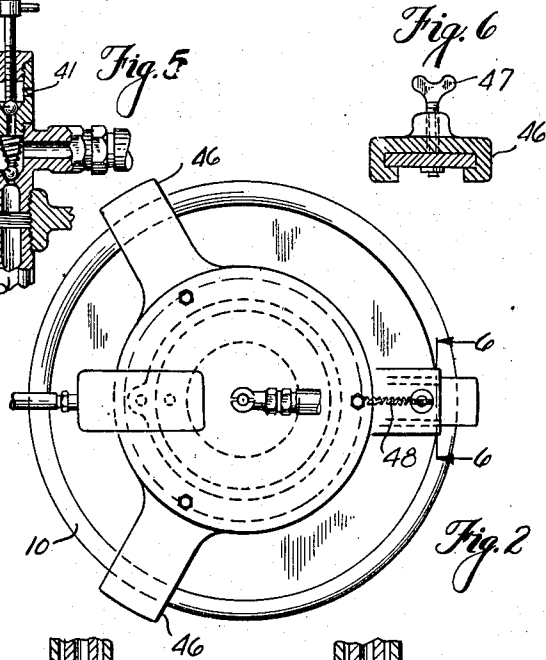


Fig. 2

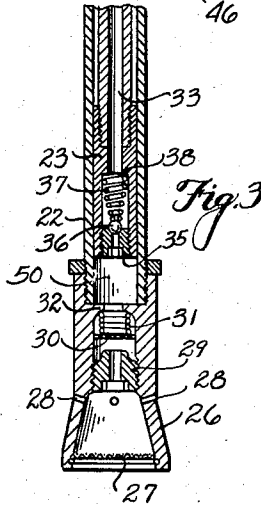


Fig. 3

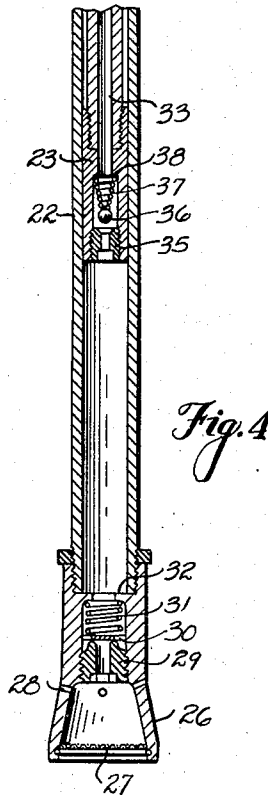


Fig. 4

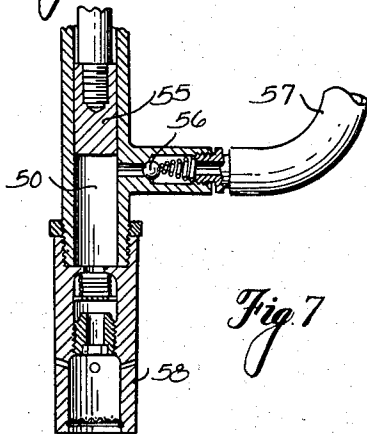


Fig. 7

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DISPENSING PUMP

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9 Claims. (Cl. 222—334)

This invention relates in general to a fluid pump and more particularly to an improved pump for dispensing viscous and semi-plastic materials. One particular application for my invention is dispensing greases for lubricating equipment and machinery.

Pumps which are available for dispensing such viscous materials rely on the suction created by a movable piston within a cylinder to suck the material into the pump cylinder. These materials, being semi-fluid, often contain air and when a suction or vacuum is used to draw the material into the pump, only air or air and material enters the cylinder. Hence, such pumps are most inefficient and require an operator's continuous attention to keep them functioning.

My invention utilizes the combination of vacuum loading the cylinder with a new and novel method of ram or forced loading of the pump cylinder.

Most pumps designed and used for the service of dispensing viscous materials have movable pistons which reciprocate within a cylinder. My invention reverses this old and common practice by having a stationary piston with a movable and reciprocating cylinder, which produces new and efficient results, as will be explained herein.

One of the objects of my invention is to provide a pump which will positively feed grease and other viscous materials without interruption due to air pockets.

Another object is to provide a pump for dispensing viscous materials of different viscosities.

Another object is to provide a pump of simple construction so that the working parts are easily renewable or replaceable by laymen in the trade.

Another object is to provide a pump, the piston and cylinder of which do not have to be packed against the discharge pressure of the material being dispensed.

Another object is to provide a pump which can be subjected to very high discharge pressures without damaging the pump mechanism.

Other objects of my invention and the invention itself will become more apparent from the following description of the various parts and their operation.

Figure 1 illustrates the complete pump unit mounted on a conventional steel drum commonly used for storage and transportation of such viscous materials;

Figure 2 is a plan view of my pumping unit as shown in Figure 1;

Figure 3 is a fragmentary and enlarged view of the lower end of the pump mechanism with

the reciprocating cylinder shown in a position representing the beginning of its downward stroke with the valves positioned as if material were entering the pump chamber;

Figure 4 is a view similar to Figure 3 but shows the reciprocating cylinder in a position representing the beginning of its upward stroke with the valves positioned as if material were being dispensed;

Figure 5 is an enlarged fragmentary view of a manual relief valve to be used under certain emergency conditions to bleed air from the discharge material;

Figure 6 is an enlarged cross-sectional view taken along the line 6—6 of Figure 2; and

Figure 7 is an enlarged fragmentary view showing a modified form of my pump assembly.

The material drum is represented by the reference character 10 while the material to be dispensed is shown as 11.

The unit as shown in Figure 1 has a piston and cylinder fluid motor for actuating the material dispensing unit comprising a reciprocating cylinder 22 and a stationary piston 23. The fluid motor comprises an air cylinder 12 enclosed by a top head 13 and a bottom head 14. Within the confines of cylinder 12, top head 13 and bottom head 14, is a motor piston 15, the outer diameter of which is sealed by a packing 16, the feather edges of which are located in a position toward the top head 13 and the bottom head 14. Packing seals 17 compressed by a spring are used to seal the air around the stationary piston 23. Valve mechanism 24 controls the inward flow and discharge of the motor fluid, compressed air being generally used for this purpose.

The reciprocating cylinder 22 is rigidly attached to the motor piston 15 and is sealed at the bottom head 14 by spring compressed packing seals 25. The free or bottom end of the reciprocating cylinder 22 terminates in a bell-shaped housing 26. This housing 26 contains a screen 27 for straining any foreign matter which might enter the material in the drum. A series of vents 28 are located at the upper portion of the bell-shaped housing 26 in order that air may return to the drum without entering the pump. A valve plug 29 is located in the bottom of the reciprocating cylinder 22 in order to form a seat for a plate valve 30 which is retained in a closed position by a spring 31 which is held by a retainer 32.

The material dispensing piston 23 is stationary and held rigid by being connected to the top head 13 of the motor cylinder. The piston 23

has a hollow bore 33 for discharging the material through the pump to the conduit or hose 34.

The bottom end of the stationary piston 23 is equipped with a valve retainer plug 17 so as to keep a ball valve 36 from passing out of the bottom end of the stationary piston 23. The ball valve 36 is held in a closed position by a compression spring 37 which is held by a shoulder 38.

At the top of stationary piston 23 another discharge ball valve 39 is located which is an auxiliary valve to 36 and which is often required to assist in retaining the high back pressures created in the discharge hose. A manual ball release valve 40 is used to bleed air through a vent 41 from the discharged material, should the pump become airbound after the material 11 is exhausted in the drum 10.

A drum cover 45 is securely attached to the fluid power motor and is also detachably secured to the top of the drum 10 by cleats 46, one of which is shown as being slidably adjustable in a slot so as to accommodate various diameters of drums, see Figures 2 and 6. A winged thumb screw 47 may be provided to clamp the slidable cleat in the slot. A spring 48 is provided to draw the cleats tightly against the drum. The cleats 46 hold the entire pump unit steady when the reciprocating cylinder 22 forges into the viscous material 11 in the drum 10. The actual operation of the entire pump unit can now be explained in a simple manner after a review of the component parts described above.

When a new drum of material is ready for dispensing, the cover on the top of the drum is removed and the pump unit which dispenses the material is inserted through the drum opening and the cleats 46 are quickly secured to the top of the drum. A source of fluid or compressed air is connected to the orifice 49 and the valve mechanism 24 directs this compressed air to the top of the motor piston 15, forcing this piston downward. The reciprocating cylinder 22 being rigidly connected to the movable motor piston 15 plunges downwardly into the viscous material and the bell-shaped housing 26 directs the material through the plate valve 30 into the chamber 50. At the same time a vacuum is created in the chamber 50 which assists in drawing the material into said chamber.

The combined action of the vacuum and the packing of the material within the bell-shaped housing 26 functions simultaneously to prevent my dispensing pump from becoming airbound which often occurs when a vacuum only is relied upon. The downward movement of the bell-shaped housing 26 into the material packs the material therein and expels the air which is contained in the material out through the vent opening 28, with the result that the material which enters the chamber 50 is free of air pockets. The material which is pumped is accordingly free of air during the continuous operation of the pump. The dual function performed by the vacuum and the packing of the material into the bell-shaped housing 26, when the housing plunges down into the material, solves a problem which has long been a nuisance in the trade. In addition to the dual action of the vacuum and the packing of the grease within the housing, the plunging action performs another function, in that the material which is in the vicinity of the lower end of the reciprocating cylinder 22 is "worked" so that all of the air has been churned substantially out of the material before it enters the bell-shaped housing.

When the motor piston 15 reaches the bottom head 14, the valve mechanism 24 releases the compressed air above the piston 15 to atmosphere and simultaneously allows the compressed air to enter through a conduit 51 to the bottom of the motor piston 15 which forces the reciprocating cylinder 22 to move upwardly. The instant that the reciprocating cylinder 22 moves upwardly, the plate valve 30 closes and forces the material confined in the chamber 50 through the ball piston valve 36, into the hollow bore 33 of the stationary piston 23 and out through the ball valve 39 into the discharge conduit or hose 34. Vents 52 in the side wall of the reciprocating cylinder 22 permit any material which might seep past the stationary piston 23 to return to the drum instead of being forced up the outside diameter of the piston 23 and into the motor cylinder.

During the upward stroke of the reciprocating cylinder 22 a vacuum is created in the material previously occupied by the bottom of the reciprocating cylinder so that the channel formed in the material by the upward movement of the reciprocating cylinder closes in and permits a solid column of churned material to be forced into the bottom of the bell-shaped housing 26 on the next succeeding downward stroke.

In Figure 7 I show a modification of my invention, in that the reciprocating cylinder 23 is provided with a ball discharge valve 56 to which a flexible hose 57 is attached for dispensing material directly from the pump chamber 50. A solid stationary piston 55 is employed instead of the stationary hollow piston 23 shown in the other views of the drawing. Instead of showing a bell-shaped housing 26 I employ in this modification a straight bore-receiving chamber 58 which may be desirable with certain types of dispensing materials. The flexible hose may be carried to the outside of the drum through the space between the cleats 46.

Having described my invention, it is not my intention to limit the scope because a modification or different association of the various parts could be employed. Any such changes from the pump, as illustrated, cannot be made without falling within the scope of the following claims.

I claim as my invention:

1. A pump for dispensing viscous material from a container, said viscous material containing air pockets and said pump comprising a fluid motor having a stationary part and a movable part positioned above said container, a pump piston secured to the stationary part of the fluid motor and extending downwardly into the container, a movable pump cylinder connected to the movable part of the fluid motor and extending downwardly into the container, said pump cylinder surrounding said pump piston and having its free end extending therebeyond to form a pressure chamber, said free end of the pump cylinder having an intake opening and being movably plungeable into said viscous material, whereby the plunging of the free end of the pump cylinder into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the pump cylinder to aid in feeding the pump cylinder, and conduit means for discharging viscous material from the pressure chamber to the outside of the container.

2. A pump for dispensing viscous material from a container, said viscous material containing air pockets and said pump compris-

ing a fluid motor having a stationary part and a movable part positioned above said container, a pump piston secured to the stationary part of the fluid motor and extending downwardly into the container, a movable pump cylinder connected to the movable part of the fluid motor and extending downwardly into the container, said pump cylinder surrounding said pump piston and having its free end extending therebeyond to form a pressure chamber, said free end of the pump cylinder having an intake opening and being movably plungeable into said viscous material, whereby the plunging of the free end of the pump cylinder into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the pump cylinder to aid in feeding the pump cylinder, and conduit means for discharging viscous material from the pressure chamber to the outside of the container, said free end of the pump cylinder having a strainer.

3. A pump for dispensing viscous material from a container, said viscous material containing air pockets and said pump comprising a fluid motor having a stationary part and a movable part positioned above said container, a pump piston secured to the stationary part of the fluid motor and extending downwardly into the container, a movable pump cylinder connected to the movable part of the fluid motor and extending downwardly into the container, said pump cylinder surrounding said pump piston and having its free end extending therebeyond to form a pressure chamber, said free end of the pump cylinder having an intake opening and being movably plungeable into said viscous material, whereby the plunging of the free end of the pump cylinder into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the pump cylinder to aid in feeding the pump cylinder, and conduit means for discharging viscous material from the pressure chamber to the outside of the container, said free end of the pump cylinder having an inlet valve at the entrance of the pressure chamber, said free end having air vent means in advance of the valve.

4. A pump for dispensing viscous material from a container, said viscous material containing air pockets and said pump comprising a fluid motor having a stationary part and a movable part positioned above said container, a pump piston secured to the stationary part of the fluid motor and extending downwardly into the container, a movable pump cylinder connected to the movable part of the fluid motor and extending downwardly into the container, said pump cylinder surrounding said pump piston and having its free end extending therebeyond to form a pressure chamber, said free end of the pump cylinder having an intake opening and being movably plungeable into said viscous material, whereby the plunging of the free end of the pump cylinder into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the pump cylinder to aid in feeding the pump cylinder, and conduit means for discharging viscous material from the pressure chamber to the outside of the container, said pump piston being solid and said pump cylinder having intake and discharge valves.

5. A pump for pumping viscous material from a container, said viscous material containing air pockets, said pump comprising a stationary element and a movable element bearing the relationship to each other of piston and cylinder and defining a pump chamber, means for mounting the stationary element and the movable element with reference to the container, whereby the movable element projects in said viscous material in the container, discharge means for said pump chamber, means for reciprocating the movable element to alternately provide an intake stroke and a discharge stroke, said movable element projecting from the reciprocating means and having an intake opening at its projected end, said projected end movably plunging upon the intake stroke into the viscous material, whereby the plunging of the projected end of the movable element into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the movable element to aid in feeding the pump chamber said pump chamber having a cylinder wall and a cylinder head, a piston positioned within said cylinder wall, a valve positioned respectively in said cylinder head and in said piston, said piston having a side wall contacting the cylinder wall, said piston and cylinder walls surrounding the valve which is positioned in said piston.

6. A pump for pumping viscous material from a container, said viscous material containing air pockets, said pump comprising a stationary element and a movable element bearing the relationship to each other of piston and cylinder and defining a pump chamber, means for mounting the stationary element and the movable element with reference to the container, whereby the movable element projects in said viscous material in the container, discharge means for said pump chamber, means mounted externally of the viscous material for reciprocating the movable element to alternately provide an intake stroke and a discharge stroke, said movable element projecting from the reciprocating means and having an intake opening at its projected end, said projected end movably plunging upon the intake stroke into the viscous material, whereby the plunging of the projected end of the movable element into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the movable element to aid in feeding the pump chamber, said pump chamber having a cylinder wall and a cylinder head, a piston positioned within said cylinder wall, a valve positioned respectively in said cylinder head and in said piston, said piston having a side wall contacting the cylinder wall, said piston and cylinder walls surrounding the valve which is positioned in said piston.

7. A pump for pumping viscous material from a container, said viscous material containing air pockets, said pump comprising a stationary piston and a movable cylinder surrounding said pump piston and defining a pump chamber, means for mounting the stationary element and the movable element with reference to the container, whereby the movable element projects in said viscous material in the container, discharge means for said pump chamber, means for reciprocating the movable cylinder to alternately provide an intake stroke and a discharge stroke,

said movable cylinder projecting from the reciprocating means and having an intake opening at its projected end, said projected end movably plunging upon the intake stroke into the viscous material, whereby the plunging of the projected end of the movable cylinder into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the movable cylinder to aid in feeding the pump chamber, said pump chamber having a cylinder wall and a cylinder head, a piston positioned within said cylinder wall, a valve positioned respectively in said cylinder head and in said piston, said piston having a side wall contacting the cylinder wall, said piston and cylinder walls surrounding the valve which is positioned in said piston.

8. A pump for pumping viscous material from a container, said viscous material containing air pockets, said pump comprising a stationary element and a movable element bearing the relationship to each other of piston and cylinder and defining a pump chamber, means for mounting the stationary element and the movable element with reference to the container, whereby the movable element projects in said viscous material in the container, discharge means for said pump chamber, means for reciprocating the movable element to alternately provide an intake stroke and a discharge stroke, said movable element projecting from the reciprocating means and having an intake opening at its projected end, said projected end movably plunging upon the intake stroke into the viscous material, valve mechanism in combination with the pump chamber establishing upon the intake stroke a vacuum in the chamber for drawing viscous material thereinto, the movably plunging of the projected end upon the intake stroke into the viscous material working air pockets out of the viscous material and forcibly packing the viscous material substantially free of air pockets into the intake opening of the movable element and thereby concurrently aiding the vacuum in loading the pump chamber, said valve mechanism in

combination with the pump chamber establishing upon the discharge stroke pressure in the pump chamber for discharging the viscous material therefrom through the discharge means and at the same time producing a vacuum area in the viscous material in the path of the reciprocation of the movable element and causing said viscous material in the neighborhood of the reciprocating path to flow into said path in readiness for the next cycle of operation, said pump chamber having a cylinder wall and a cylinder head, a piston positioned within said cylinder wall, a valve positioned respectively in said cylinder head and in said piston, said piston having a side wall contacting the cylinder wall, said piston and cylinder walls surrounding the valve which is positioned in said piston.

9. A pump for pumping viscous material from a container, said viscous material containing air pockets, said pump comprising a stationary element and a movable element bearing the relationship to each other of piston and cylinder and defining a pump chamber, means for mounting the stationary element and the movable element with reference to the container, whereby the movable element projects in said viscous material in the container, means for reciprocating the movable element to alternately provide an intake stroke and a discharge stroke, said movable element projecting from the reciprocating means and having an intake opening at its projected end, said projected end movably plunging upon the intake stroke into the viscous material, whereby the plunging of the projected end of the movable element into the viscous material works air pockets out of the viscous material and forcibly packs the viscous material substantially free of air pockets into the intake opening of the movable element to aid in feeding the pump chamber, said pump piston being solid and said pump chamber having intake and discharge valves, and flexible conduit means for discharging viscous material from the pump chamber to the outside of the container.

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