

[72] Inventor **Harold Karl Steiner**
 3224 S. 92nd St., Milwaukee, Wis. 53227
 [21] Appl. No. **775,438**
 [22] Filed **Nov. 13, 1968**
 [45] Patented **Jan. 19, 1971**

2,428,035 9/1947 Palm 222/61
 2,631,761 3/1953 Gates 222/390
 3,056,179 10/1962 Lordng 222/63
 3,104,031 9/1963 Wagner 222/390X

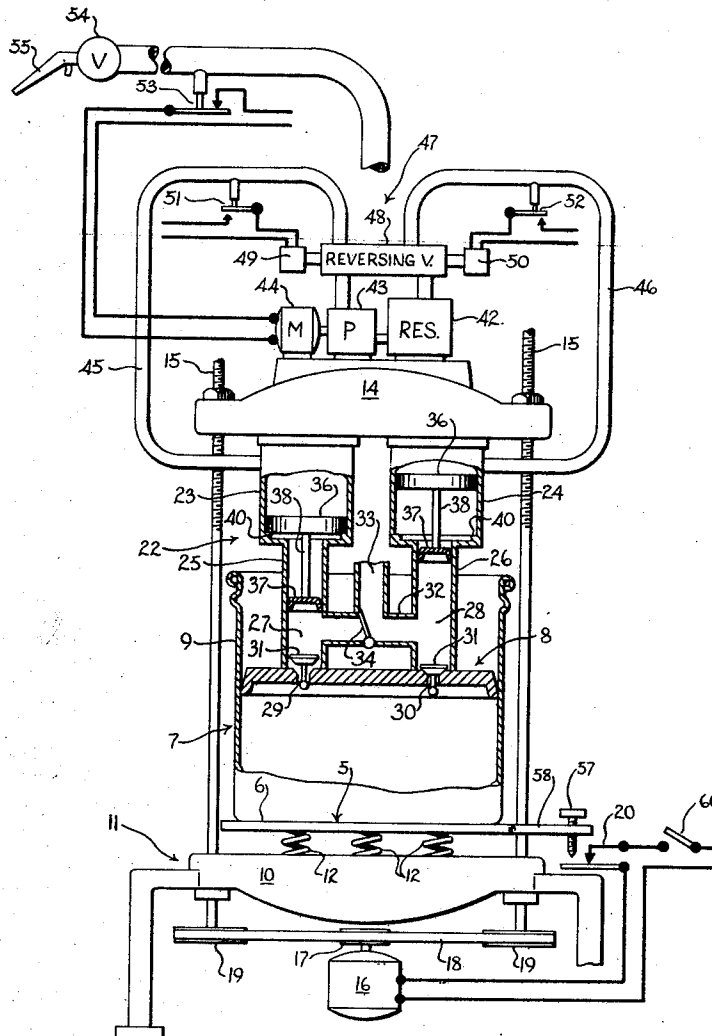
Primary Examiner—Robert B. Reeves
 Assistant Examiner—Norman L. Stack, Jr.
 Attorney—Ira Milton Jones

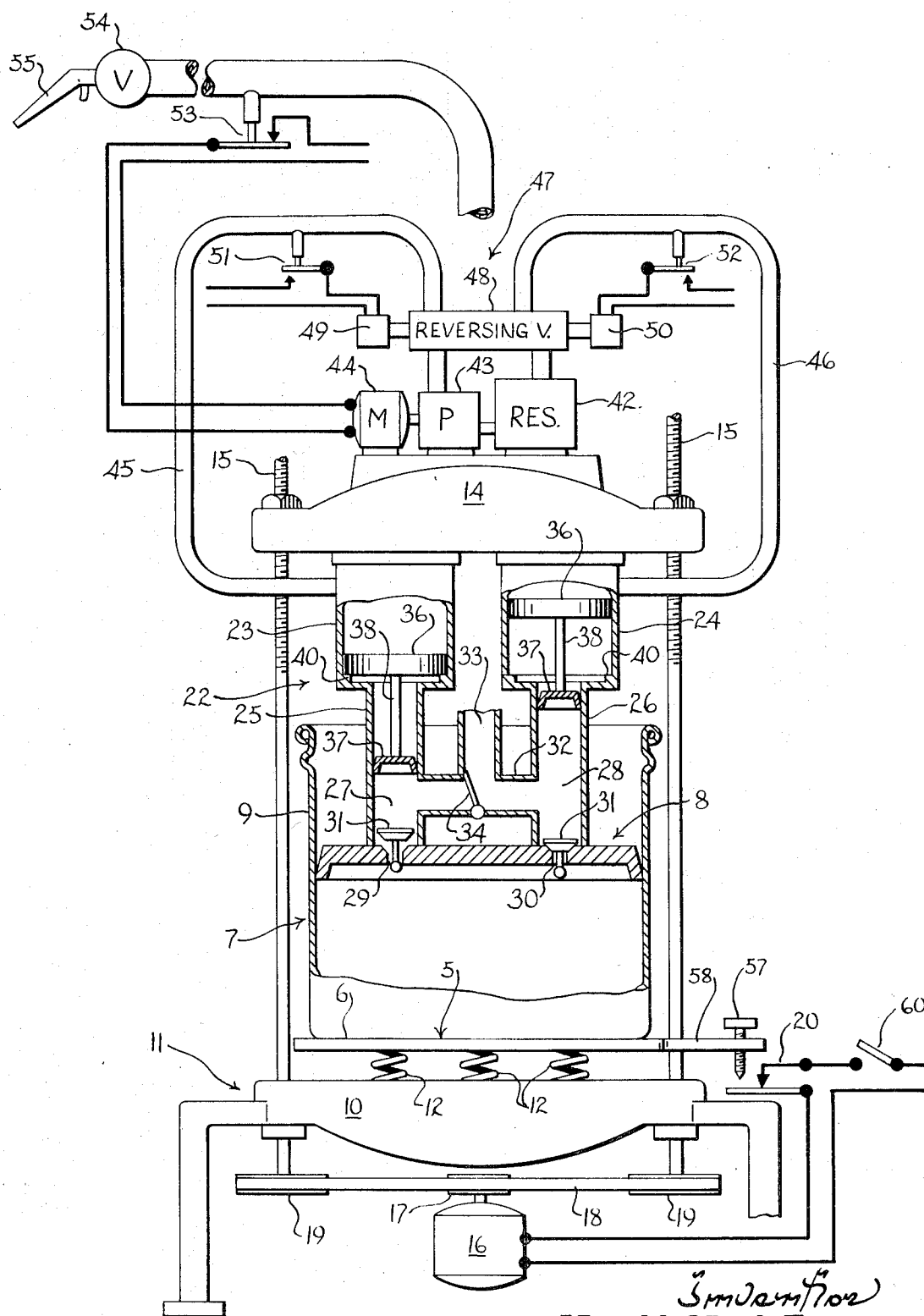
[54] **DISPENSER FOR VISCOUS PRODUCTS**
 12 Claims, 1 Drawing Fig.

[52] U.S. Cl. 222/61,
 222/390
 [51] Int. Cl. **B67d 5/18**
 [50] Field of Search 222/61, 63,
 76, 390, 379, 384, 386, 387, 258, 262, 405;
 103/(Inquired); 141/192, 95

[56] **References Cited**
UNITED STATES PATENTS
 1,567,825 12/1925 Williams 222/262X

ABSTRACT: An electric motor driven piston member effects displacement of viscous semiliquid product from its shipping vessel into either of a pair of pump cylinders whose pistons are alternately power driven to expel the product to a delivery line. The pistons of hydraulic actuator cylinders drive the pump pistons under the control of a reversing valve which is reversed each time one of the actuator pistons completes its drive stroke. The electric motor that drives the product-displacing piston member is deenergized whenever the latter effects bodily displacement of the product vessel beyond a predetermined range of motion.





Inventor
 Harold Karl Steiner
By *William Jones*
Attorney

DISPENSER FOR VISCOUS PRODUCTS

This invention relates to dispensers, and has more particular reference to power operated dispensing apparatus capable of dispensing a viscous semiliquid product directly the vessel in which the product is shipped.

One such dispenser is disclosed in my U.S. Pat No. 3,281,020 dated Oct. 25, 1966. The dispenser of that patent was particularly designed to dispense such semiliquid and viscous products as epoxy mortar and caulking compounds such as are used in the building trades, directly from the five gallon containers in which those products are ordinarily shipped. The provision of a significantly improved dispenser of that type constitutes the primary object of this invention.

In the dispenser of my aforesaid patent, semiliquid product is displaced from the vessel containing the same and through a port in a piston member bearing upon the surface of the product, in consequence of relative movement between the piston member and a base member upon which the vessel is supported. Because the product was also forced through a delivery line to the point of use in consequence of such relative movement between the base and piston members, the force expended upon the product in the vessel was apt to be of such magnitude as to cause bulging and even rupturing of the cylindrical sidewall of the vessel. In either event, it would be impossible to thereafter continue dispensing of the product.

In contrast, it is a purpose of this invention to provide an improved dispensing apparatus featuring independent first and second force applying means for respectively effecting displacement of viscous product from the vessel containing the same, and for thereafter effecting forceful flow of the displaced product through a delivery line to the point of use. As a result, it is possible for the apparatus of this invention to effect displacement of the product from a vessel under greatly reduced force which the sidewalls of the vessel can easily bear without rupturing or even objectionable bulging.

In a more specific sense, it is a further object of this invention to provide an improved dispensing apparatus of the character described featuring drive means for concurrently effecting product-displacing motion of a piston member into a vessel containing the product to be dispensed, along with loading of spring means having a restoring force great enough to effect product-displacing motion of the vessel relative to the piston member at times when the drive means is rendered inoperative.

Still another object of the invention resides in the provision of means for rendering inoperative the drive means mentioned in the preceding object, in consequence of loading of said spring exemplify to a predetermined degree.

With these observations and objects in mind, the manner in which the invention achieves its purpose will be appreciated from the following description and the accompanying drawing. This disclosure is intended merely to exemplify the invention. The invention is not limited to the particular structure or method disclosed, and changes can be made therein which lie within the scope of the appended claims without departing from the invention.

The drawing illustrates one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

The single FIG. of the drawing more or less diagrammatically illustrates the dispensing apparatus of this invention, along with hydraulic and electrical control instrumentalities therefor.

As shown in the accompanying drawing, the dispensing apparatus of this invention comprises a substantially circular base member 5, having a flat and horizontal upper surface 6, to receive and support the 5 gallon vessel 7 containing a viscous product to be dispensed, and a piston member 8 which is located directly over the base member 5, and which is adapted to fit within the cylindrical sidewall 9 of a vessel in place on the base member to displace product therefrom upon relative movement between the piston and base members to dispose them in closer relationship to one another.

The base member 5 is yieldingly supported from the bed plate 10 of a base structure 11 by means of a number of relatively strong coiled compression springs 12. The springs are adapted to yield and allow the base member to be depressed toward the bed plate when product displacing force of a predetermined magnitude is applied to the body of product confined between the underside of the piston member 8 and the bottom of the vessel 7 in which the product is contained.

The piston member is rigidly carried by a platen or pressure head 14. In turn, the pressure head is supported from the bed plate 10 for up and down motion relative thereto, by three or more angularly equispaced upright drive shafts 15. The lower end portions of the drive shafts are freely rotatably but axially immovably mounted in the bed plate 10 and rise therefrom at locations alongside the periphery of the base member 5. Screw threaded connections between the upper end portions of the shafts and the pressure head 14 provide for the transmission of up or down translating motion to the pressure head, depending upon whether the shafts are rotated clockwise or counterclockwise in unison.

Such rotation is transmitted to the shafts by an electric motor 16 having a drive pulley 17 connected by a belt 18 with driven pulleys 19 on the lower end portions of the shafts. The motor is connectable with a source of energizing current through a normally closed electric switch 20 which can be opened automatically to break the motor-energizing circuit in a manner to be later described.

The piston member 8 is rigidly carried by the pressure head 14, at its underside. For this purpose, it is joined to the pressure head by an assemblage 22 that provides side-by-side actuator cylinders 23 and 24, and a pair of pump cylinders 25 and 26 that communicate with the actuator cylinders 23 and 24 respectively. Each pump cylinder is disposed on a common vertical axis with its actuator cylinder and while the latter cylinders have been shown larger in diameter than the pump cylinders, they need not always be, as their diameters are determined by the pressure and delivery rate required in the pump cylinders for the various products to be dispensed.

The actuator cylinders 23, 24 are located above their respective pump cylinders and are fixed to the pressure head in any suitable manner. The pump cylinders 25, 26 have coaxial downward extensions which provide ductlike pumping chambers 27, 28 each directly below one of the pumping cylinders 25, 26 respectively, and in open communication therewith. The ductlike pumping chambers 27 and 28 are fixed to the back of the piston member 8, in register with ports 29 and 30, respectively, in the piston member. A check valve 31 is provided for each of said ports, to close the same whenever pressure in the associated pumping chamber exceeds the pressure at the underside of the piston member 8.

The ductlike pumping chambers 27 and 28 are joined by a horizontal duct 32 that extends between them and cooperates therewith to provide a manifold to receive product displaced upwardly through the ports 29, 30 upon descent of the piston member 8 into the product vessel 7. A delivery line 33 connects with the duct 32, intermediate its ends, and is communicable with the pumping chambers 27, 28 under the control of a flap valve 34. The valve 34, when swung to the left as shown, closes off the delivery line from pumping chamber 27 and communicates pumping chamber 28 with the delivery line. When swung to the right, it communicates the delivery line with chamber 27 and closes it off from chamber 28. The flap valve, of course, is actuated to close off the delivery line from either pumping chamber in response to predominating pressure in the other chamber.

Each of the actuator cylinders contains a piston 36 which is connected to the piston 37 in its associated pump cylinder by a common piston rod 38. The pistons 36 in the actuator cylinders collide with abutments 40 adjacent to the junctions of the actuator and pump cylinders to limit downward travel of said pistons in their actuating strokes.

From the description thus far, it will be apparent that product contained in the vessel 7 will be displaced upwardly through one or the other of the ports 29, 30 therein, as a con-

sequence of downward propulsion of the piston member produced by rotation of the screw threaded drive shafts 15 in one direction, or upon upward movement of the base member 5 relative to the piston member under the restoring force of the springs 12. It will also be appreciated that if either one of the pump pistons 37 is being driven downwardly by its actuator piston during displacement of product from the vessel under either of the conditions mentioned above, the downwardly driven pump piston will generate pressure in its associated pumping chamber of a magnitude such as to effect closure of its associated check valve 31 and to also hold the flap valve 34 in position communicating its associated pumping chamber with the delivery line.

Concurrently, with the above, product displaced from the vessel will flow upwardly past the other check valve and into the pumping chamber beneath the piston in the other pump cylinder to drive the same upwardly in its retraction or charging stroke, provided of course, that fluid is free to exhaust from the upper end of the actuator cylinder therefor.

From this, it will be seen that the pump cylinders are self charging, and that their actuator cylinders can be of the single acting type each having only one pressure fluid line connecting with its upper end, to communicate it with either a reservoir 42 or with the outlet of a pump 43 driven by an electric motor 44. As shown, one such line 45 is provided for cylinder 23, and the other cylinder 24 has its own pressure line 46.

It is also important to note that the force exerted by the pumping pistons is not transmitted to the vessel 7 through product therein, and pumping force is entirely independent from product-displacing force exerted on the product by piston member 8.

According to this invention, control means 47 is provided to assure that the upper ends of the actuator cylinders will be alternately vented to the reservoir and connected with the pump, in such synchronization that one such actuator cylinder will always be vented when pressure fluid is flowing into the other. Such control means comprises a reversing valve 48 by which either pressure line 45 and 46 can be connected with the pump while the other pressure line is connected to the reservoir.

The reversing valve 48 has a valve element (not shown) which is movable to each of a pair of operating positions to effect such reversals in the pump and reservoir connections. If desired, the reversing valve may be actuated hydraulically in consequence of pressure changes in lines 45 and 46. Alternatively, a pair of solenoid actuators as indicated at 49 and 50 can be provided to effect shifting of its valve element from one to the other of its operating positions.

Energization of the solenoid 49 is controlled by a normally open pressure switch 51 that is adapted to close and complete an energizing circuit for the solenoid in response to the abrupt rise in pressure in line 45 that occurs at the conclusion of the actuating stroke of the piston in cylinder 23. Similarly solenoid 50 is energized by closure of a normally open pressure switch 52 in response to the abrupt rise in pressure in line 46 that occurs when the piston in cylinder 24 reaches the end of its actuating stroke.

The control system also comprises a third normally closed pressure switch 53, which is adapted to open whenever there is adequate dispensing pressure in the delivery line 33, to disrupt the energizing circuit for the pump motor 44. The pressure switch 53 responds to the pressure in the delivery line anywhere upstream from a valve 54 that controls discharge flow of the product through a dispensing nozzle 55.

As mentioned hereinbefore, the switch 20, when opened, breaks the energizing circuit to the electric motor 16 for the drive shafts 15. The contactor of the switch 20 is adapted to be actuated to its switch open position by the extremity of a screw 57 adjustably threaded into a tab 58 projecting outwardly from the periphery of the base member 5, after the latter has been moved downwardly through and beyond a predetermined range of motion permitted by the springs 12 supporting the same. Opening of the switch 20, of course takes

place before the force exerted on the product in the vessel increases to the point where the walls of the vessel might bulge or become ruptured. Such downward motion is indirectly imparted to the base member 5, to load springs 12, by the piston member 8 as the latter is forced downwardly against the product contained in the vessel 7. As soon as the switch 20 is opened, the descent of the piston member is halted, but displacement of product from vessel 7 continues uninterruptedly under the restoring force of springs 12, and until the motor 16 is again energized by the reclosure of switch 20 that takes place after a certain amount of upward motion of the base member.

It will be appreciated, of course, that switch 20 can be of the type wherein reclosure thereof can be delayed for a suitable interval, so that it does not immediately close as soon as the base member 5 begins to move upwardly relative to the piston member 8 under the restoring force of the springs 12.

To start operation of the apparatus with its components in their positions shown, and assuming that both pumping chambers are filled with product from the vessel 7, both the pump motor 44 and the motor 16 for the drive shafts 15 are energized as by closure of a line switch 60. This starts the shafts 15 rotating in the direction to effect descent of the piston member 8 toward the bed plate 10. Also, assuming that the control valve 48 had been actuated in consequence of closure of pressure switch 51 to its position communicating pump 43 with pressure line 46, while venting pressure line 45 to the reservoir, pressure fluid will flow into the upper end of actuator cylinder 24 to drive its piston 36 and that of pump cylinder 26 downwardly in its pumping stroke to keep its associated check valve 31 closed and to keep the flap valve in position to permit product to flow to the delivery line during the pumping stroke of the piston in cylinder 26.

The downward motion imparted to the piston member 8 by the screw threaded shafts 15 causes product from the vessel to be displaced upwardly through port 29 and into pumping chamber 27 to charge the pumping cylinder 25. This forces the piston 37 of pump cylinder upwardly, in its charging stroke, and the corresponding motion of the piston in its actuating cylinder exhausts the fluid in the upper end of the actuating cylinder to the reservoir through pressure line 45 and the control valve 48.

Consequently, the displaced product forces the piston in pump cylinder 25 upwardly in its charging stroke while pressure fluid delivered to actuator cylinder 24 causes the piston of pump cylinder 26 to be driven downwardly in its pumping stroke. As soon as piston 36 in the cylinder 24 bottoms on its abutment, the pressure rises abruptly in line 46 to effect closure of pressure switch 52. Solenoid 50 is energized by such closure of pressure switch 52 so as to cause reversal of the control valve 48 for connection of pressure line 45 with the pump 43 and communication of pressure line 46 with the reservoir 42. Then, the piston of pump cylinder 25 is driven downwardly in its pumping stroke to keep its associated check valve 31 closed and the flap valve in the opposite position allowing product pumped out of chamber 27 to flow to the delivery line. At the same time, product will be displaced upwardly through port 30 into pump cylinder 26 to charge the same. When downward motion of the piston 36 of actuator cylinder 23 is stopped by abutment 40, pressure switch 51 is actuated to closed position by the abrupt rise in pressure in line 45, to thus effect energization of solenoid 49. This again reverses valve 48 to start the cycle over again with cylinder 26 pumping and cylinder 25 charging.

If at any time during such pumping of product into the delivery line the valve 54 is closed to stop flow of product out of the dispensing nozzle 55, the pressure in the delivery line quickly rises to the value at which pressure switch 53 is actuated to its open position, and the energizing circuit to the pump motor 44 is then disrupted to stop pumping of the product.

Thereafter, or at any other time, the piston member 8 may exert enough force on the product to move the base member 5

downwardly against the action of its springs 12, through and beyond a predetermined range of motion such as to effect opening of switch 20. The motor 16 from which the shafts 15 are driven will then stop and the restoring force of the springs 12 will be available to drive the base member 5 upwardly relative to the piston member to cause displacement of product into the pumping chambers to be continued without interruption unless, of course, the valve 54 is closed and pumping has been interrupted.

When all the product has been displaced from the vessel 7, the motor 16 can be reversed, if desired, to drive the screw threaded shafts in the opposite direction necessary for retraction of the piston member 8 from the vessel.

From the foregoing description, together with the accompanying drawings, it will be apparent to those skilled in the art that this invention provides an improved dispenser for viscous products, featuring piston means driven by first power means to effect displacement of viscous product from a vessel in which it is shipped; along with second power means for pumping the displaced product through a delivery line without exertion of force on the product in the vessel.

I claim:

1. Dispensing apparatus comprising a piston member and a base member opposing the same, the base member being adapted to support a vessel having a sidewall providing a cylinder to slidably receive the piston member so that movement of one of said members toward the other effects displacement of viscous product from the vessel through port means in the piston member for flow to a delivery line, said apparatus being characterized by:

- A. said port means comprising a pair of ports opening to the pressure face of the piston members;
- B. a pair of pump cylinders, one for each of said ports, to receive and be charged by displaced product debouching from their respective ports, each of said pump cylinders having a piston which is driven in its retraction stroke by viscous product debouching into its cylinder;
- C. a manifold connecting with the pump cylinders to conduct viscous product expelled therefrom to the delivery line on the pumping strokes of their respective pistons;
- D. pressure actuable valve means operable to close off either pump cylinder from the delivery line in response to the pressure produced in the other pump cylinder during the pumping stroke of its piston;
- E. a check valve associated with each of said ports and arranged to close in response to the pressure obtaining in the associated pump cylinder on the pumping stroke of its piston;
- F. and means for driving the pump pistons.

2. The dispensing apparatus of claim 1 further characterized by:

- A. a base structure from which the base member is supported;
- B. yieldable means on the base structure supporting the base member for movement in one direction relative to the base structure in consequence of force required to expel viscous product from a vessel on the base member;
- C. power operated means for effecting motion of said one member toward the other member;
- D. and control means for said power operated means, for rendering the same inoperative in response to movement of the base member in said direction relative to the base structure beyond a predetermined range of such relative movement.

3. The dispensing apparatus of claim 2, further characterized by:

- A. said power operated means comprising an electric motor;
- B. and said control means comprising a normally closed electric switch controlling energization of the motor and connected with the base member to be opened thereby whenever the base member is moved beyond said predetermined range.

4. The dispensing apparatus of claim 1, wherein said means for driving the pump pistons comprises:

- A. an actuator cylinder for each pump cylinder; having
 - 1. a diameter larger than that of its associated pump cylinder;
 - 2. a piston drivingly connected with the piston of its associated pump cylinder;
 - 3. and a chamber into which pressure fluid can be directed to effect the pumping stroke of its associated pump piston, and from which pressure fluid can be exhausted to provide for charging of its associated pump cylinder with viscous product displaced into its associated pump cylinder;
- B. a reversing valve mechanism for effecting flow of pressure fluid to either chamber while concurrently providing for exhaust flow of pressure fluid from the other chamber;
- C. and means for effecting reversal of said valve mechanism in consequence of the rise in pressure occurring in each of said chambers at times when the actuator piston associated therewith reaches the end of its stroke.

5. The dispensing apparatus of claim 4, further characterized by:

- A. means providing a source of fluid under pressure, comprising an electric motor driven pump;
- B. and a pressure switch for effecting deenergization of the pump motor in response to attainment of a predetermined high pressure in the delivery line.

6. Dispensing apparatus comprising a piston member and a base member opposing the same, the base member being adapted to support a vessel having a sidewall providing a cylinder to slidably receive the piston member so that movement of one of said members toward the other member effects displacement of viscous product from the vessel through port means in the piston member for flow to a delivery line, said apparatus being characterized by:

- A. first power operated means for driving said one member toward the other to thereby effect displacement of product through said port means to the back of the piston member;
- B. chamber means on the back of the piston member communicating with said port means to receive displaced product debouching therefrom;
- C. pump means spaced from the back of the piston member and communicating with said chamber means for pumping product therefrom to and along the delivery line;
- D. and means for driving said pump means comprising power operated means separate from said first power operated means.

7. The dispensing apparatus of claim 6, further characterized by:

- A. a pressure head from which the piston member is supported;
- B. and said pump means being carried by the pressure head.

8. The dispensing apparatus of claim 7, wherein the piston member is rigidly joined to the pressure head by said pump means.

9. The dispensing apparatus of claim 6, wherein the piston member comprises said one member, and wherein said first power operated means comprises:

- A. a power source;
- B. a pressure head to which the piston member is fixed;
- C. and means drivingly connecting the power source with said pressure head to move the same and the piston member therewith as a unit toward the base member.

10. The dispensing apparatus of claim 6, wherein said displacement of product from the vessel is effected in consequence of movement of the piston member toward the base member, and further characterized by:

- A. a pressure head to which the piston member is fixed;
- B. a bed plate from which the base member is supported;
- C. a plurality of screw threaded shafts freely rotatably journaled in the bed plate and having screw threaded connections with the pressure head;
- D. an electric motor carried by the bed plate;

E. and means drivingly connecting the motor with said shafts.

11. Dispensing apparatus comprising a piston member and a base member opposing the same, the base member being adapted to support a vessel having a sidewall providing a cylinder to slidably receive the piston member so that movement of one of said members toward the other member effects displacement of viscous product from the vessel through port means in the piston member for flow to a delivery line, said apparatus being characterized by:

A. an electric motor operatively connected with the piston member to drive the same in one direction toward the base member;

B. chamber means communicating with said port means to receive displaced product debouching therefrom;

C. pump means for pumping product from said chamber means to and along the delivery line;

D. a bed plate to support the base member;

E. spring means connected between the bed plate and the base member to yieldingly support the same against the thrust of the piston member transmitted thereto through the product being dispensed from a vessel on the base member, whereby the base member can move relative to the bed plate in said direction;

F. and switch means actuated in response to motion of the base member in said direction through and beyond a

predetermined range of motion for effecting disruption of the energizing circuit for the motor.

12. Dispensing apparatus comprising a piston member and a base member opposing the same, the base member being adapted to support a vessel having a sidewall providing a cylinder to slidably receive the piston member so that movement of one of said members toward the other member effects displacement of viscous product from the vessel through port means in the piston member for flow to a delivery line, said apparatus being characterized by:

A. power operated means for driving said one member toward the other to thereby effect displacement of product through said port means in the piston member, said power operated means comprising a motor drivingly connected with the piston member;

B. chamber means communicating with said port means to receive displaced product debouching therefrom;

C. pump means for pumping product from said chamber means to and along the delivery line;

D. spring means mounting the base member for yielding motion under the thrust of the piston member;

E. and means for rendering the motor ineffective in response to a predetermined amount of yielding motion of the base member.

30

35

40

45

50

55

60

65

70

75