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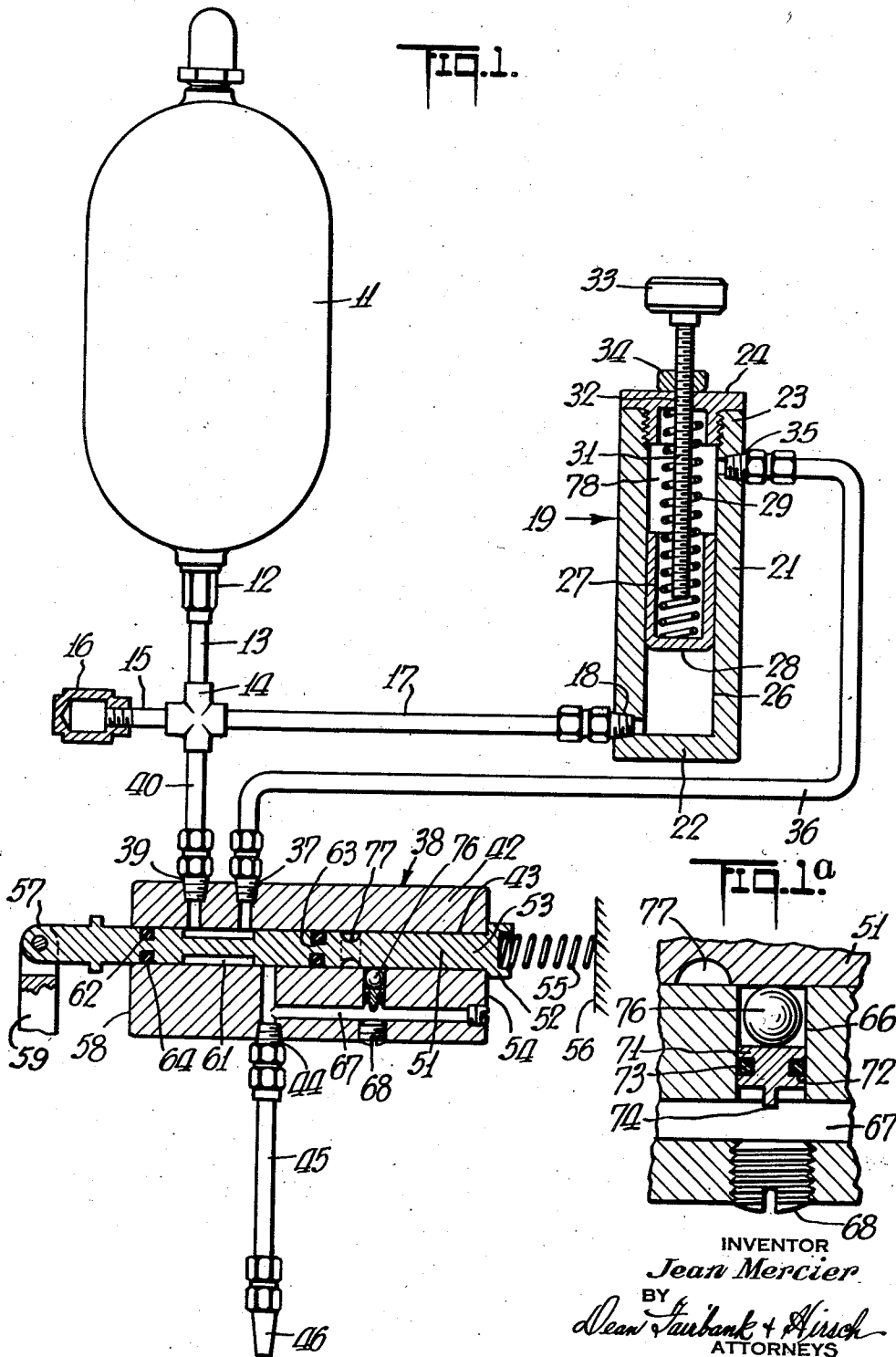
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FLUID DISPENSING EQUIPMENT

Filed April 5, 1954

2 Sheets-Sheet 1



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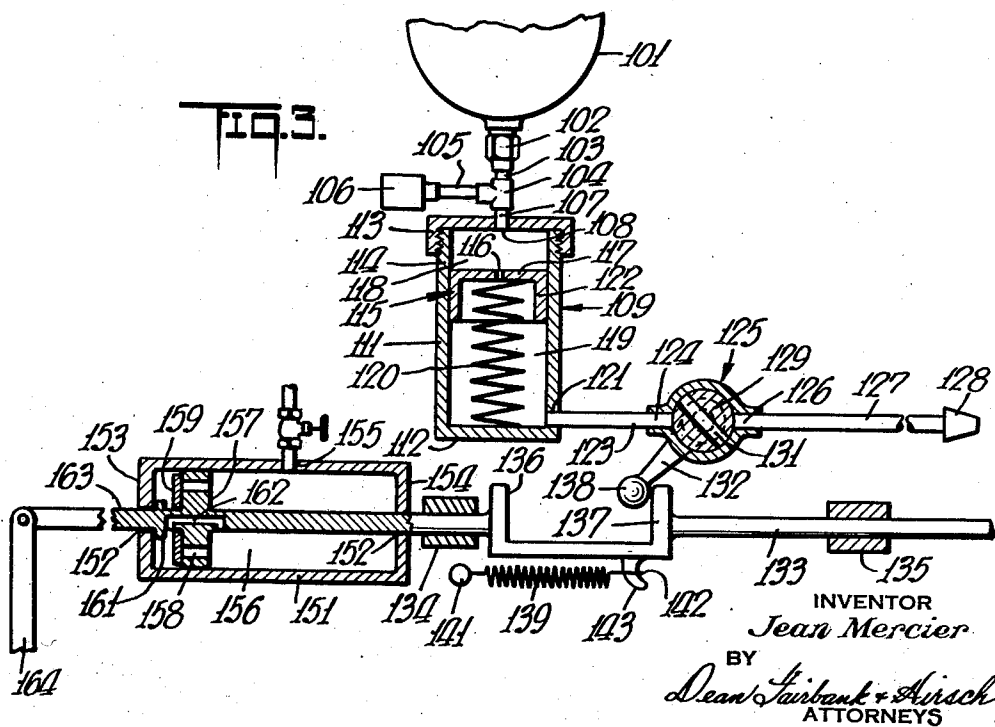
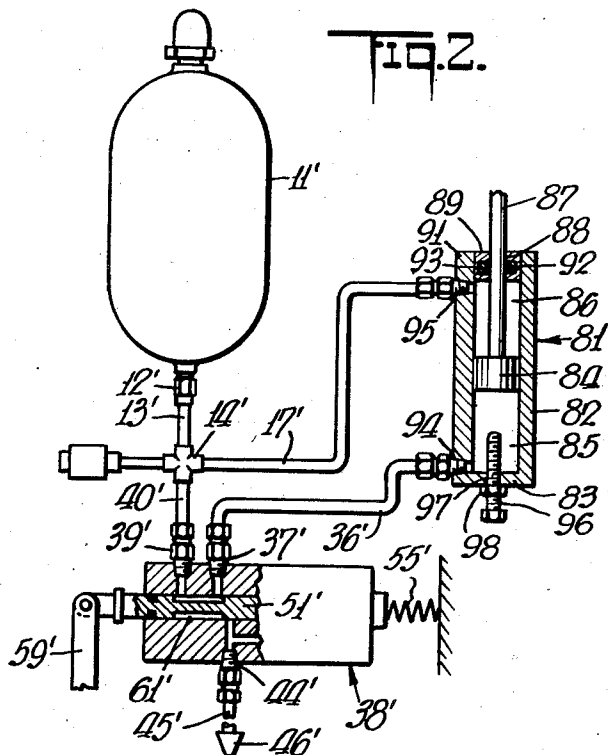
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FLUID DISPENSING EQUIPMENT

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5 Claims. (Cl. 222—335)

This invention relates to the art of fluid dispensing equipment, and more particularly to a self-charging dispensing device for delivering a predetermined quantity of fluid.

It is among the objects of the invention to provide a fluid dispensing equipment which is neat, compact and not likely to become deranged even with long use and will operate for long periods of time without need for replenishing of the fluid supply, which equipment is automatic in operation and upon momentary actuation which starts the fluid dispensing cycle, will dependably dispense a predetermined quantity of fluid even though the actuating force has been removed and will automatically recharge itself ready for the next dispensing cycle.

According to the invention, these objects are accomplished by the arrangement and combination of elements hereinafter described and particularly recited in the claims.

In the accompanying drawings in which are shown one or more of various possible embodiments of the several features of the invention,

Fig. 1 is a diagrammatic view of one embodiment of the invention, partly in cross section,

Fig. 1a is a detail view on a greatly enlarged scale of the control rod locking means, and

Figs. 2 and 3 are views similar to Fig. 1 of other embodiments of the invention.

Referring now to Fig. 1 of the drawings, the equipment desirably comprises a reservoir 11 which may be a pressure accumulator of conventional type charged with a fluid such as grease under a pressure of say 100 atmospheres.

The port 12 of the accumulator is connected by line 13 to a junction 14 to which is connected an inlet line 15 through which grease may be forced under pressure to charge the system, the line 15 normally being closed by a threaded cap 16.

The junction 14 is connected by a line 17 to the port 18 of a discharge unit 19 which desirably comprises a cylindrical container 21 closed at one end as at 22 and having the port 18 adjacent such closed end. The opposed end 23 of the cylinder is closed, desirably by means of a threaded plug 24, screwed into the end 23 which is threaded to receive such plug.

Slidably mounted in the bore 26 of the container 21 and fitting snugly therein is a piston 27, preferably cup-shaped as shown, and having its closed end 28 adjacent the closed end 22 of the container. A coil spring 29 is positioned in the bore of the container 21 compressed between the end 28 of the piston 27 and the plug 24, thereby normally urging the piston 27 toward the closed end 22 of the container. To limit the upward movement of the piston in the container, a screw 31 extends through a threaded opening 32 in the plug 24 and has a knob 33 at its outer end for adjustment, a nut 34 desirably encompassing the screw 31 on the exterior of the plug to lock the screw in any position of adjustment.

The container 21 desirably has a port 35 near its end 23 which is connected by line 36 to one of the inlet ports 37 of an actuator valve 38, the latter having a second inlet port 39 connected by line 40 to junction 14. As shown in Fig. 1, the actuator desirably has a cylindrical body portion 42 having an axial bore 43 extending com-

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pletely therethrough. The actuator, in addition to ports 37 and 39 which are in communication with bore 43, has an outlet port 44 also in communication with said bore to which is connected a line 45 having a nozzle 46 at its free end from which fluid will be ejected in the manner hereinafter to be described.

Slidably mounted in the bore 43 of the actuator 38 and extending therethrough is a control rod 51 which has a stop member 52 affixed at one end 53 and normally retained against the end 54 of the body portion 42 by means of a coil spring 55 compressed between the stop and a fixed member 56. The other end 57 of the rod which extends from end 58 of the body portion is operatively connected to a suitable lever 59 so that, for example, when a train passes by the lever, a trip member on the train will pivot the lever 59 to move the rod 51 into the bore 43 of the actuator, against the tension of the coil spring 55.

The rod 51 has an elongated annular groove 61 therein which, when the stop 52 is against the end 54 of the actuator, provides communication between the ports 37 and 39 and at such time the port 44 is closed by the rod 51. To prevent leakage of fluid from the actuator, the rod 51 desirably has a pair of spaced annular grooves 62 and 63 on each side respectively of annular groove 61 and a resilient seal ring such as an O ring 64 is positioned in each of the grooves 62 and 63.

Means are desirably provided to retain the control rod 51 in actuated position until the pressure on the fluid ejected from nozzle 46 falls below a predetermined amount. To this end, the body portion 42 of the actuator has a chamber 66 therein which extends radially outward from the bore 43. The chamber 66 is in communication with port 44 by means of a passageway 67 and is closed at the exterior of the body portion by means of a plug 68. Slidably mounted in the chamber 66 is a piston 71 which desirably has an annular peripheral groove 72 in which a resilient sealing member 73 such as an O ring may be positioned. In order that pressure may be exerted against the bottom of the piston 71, the latter desirably has a projection 74 which is designed to abut against the plug 68. Positioned between the piston 71 and the control rod 51 is a ball lock 76 which is designed to coact with a complementary annular depression or groove 77 in the rod to lock the latter in valve open position in the manner hereinafter to be described.

In the operation of the system shown in Fig. 1, the accumulator 11 is first charged with a fluid such as grease under a pressure say in the order of 100 atmospheres, through the filling line 15. Fluid will also flow under pressure through the junction 14 and line 17 into the port 18 of the discharge unit 19 and through line 40, port 39, annular groove 61 of the actuator 38, port 37 and line 36 into the port 35 of the discharge unit. As the pressure on the fluid forced into the ports 18 and 35 of the discharge unit is identical, by reason of the tensed coil spring 29, the piston 27 will be forced to the bottom 22 of the container 21 and the chamber 78 thereof will be charged with fluid.

Assuming that a train should run past the lever 59 connected to the control rod 51, the latter will be moved to the right, thereby closing port 39 and providing communication between ports 37 and 44 through annular groove 61. At such time the fluid under pressure in the accumulator 11 will be forced through line 13, junction 14 and line 17, into port 18 of the discharge unit 19 to react against the undersurface of the piston 27. As the chamber 78 is connected through port 35, line 36, port 37, annular groove 61, port 44, line 45 to nozzle 46 which is open to the atmosphere, the piston 27 will be free to move toward end 23 of the discharge unit. As a result, the fluid charged into chamber 78 will be forced

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from such chamber through the port 35, line 36, port 37, annular groove 61, port 44 and line 45 to be ejected from nozzle 46 against a switch joint. The quantity of fluid charged into the chamber 78 is determined by the position of the screw 31 which limits the movement of the piston 27 in the bore 26 of the discharge unit.

To insure that all of the fluid in the chamber 78 will be discharged therefrom against the switch joint, means are provided to retain the control rod 51 in operating position even after the actuating force against the lever controlling the latter is relieved. For this purpose, it is to be noted that the fluid forced from the port 44 will of course be under pressure as long as the piston 27 is moving in bore 26 and such pressure is transmitted through passageway 67 into chamber 66 to react against the undersurface of the piston 71 in the latter, moving the latter radially inward and urging the ball 76 against the rod 51. The ball 76 will enter the annular groove 77 when the latter is in juxtaposition with chamber 66 and will be retained in such annular groove as long as there is pressure in passageway 67, to lock the control rod 51 in operating or valve open position against the tension of spring 55.

Thus, it is not until substantially all of the fluid in chamber 78 is discharged therefrom and the bottom 28 of the piston is resting against the end of the screw 31, that the pressure in passageway 67 will fall to atmospheric pressure. At this time the spring 55 reacting against rod 51 will overcome the atmospheric force urging the piston 71 and ball 76 inwardly, to force the rod to the left thereby moving the ball and piston into chamber 66 and the spring 55 will restore the rod 51 to normal position with ports 37 and 39 in communication and with port 44 sealed by the rod.

Consequently, the discharge unit will again charge in the manner previously described and be ready for the next fluid ejecting action when the control rod 51 is moved by the force of the train.

The embodiment shown in Fig. 2 is substantially identical to that shown in Fig. 1, except for the discharge unit 81 and corresponding parts have the same reference numerals primed. Thus, as shown in Fig. 2, the discharge unit desirably comprises a substantially cylindrical container 82 closed at one end as at 83 and in which is slidably mounted a piston 84, which defines chambers 85 and 86. Affixed at one end to piston 84 is a piston rod 87 which extends through an axial bore 88 in a plug 89 screwed into the end 91 of the container. Desirably the wall of the bore 88 has an annular groove 92 in which a resilient O ring seal 93 is positioned to prevent leakage of fluid from the container.

The container 82 has a port 94 near its closed end 83 and a port 95 near its other end 91, said ports leading into chambers 85, 86, respectively, and being connected by lines 36' and 17', respectively to port 37' of the actuator and to junction 14'.

To control the amount of fluid forced from the discharge unit 81, a screw 96 extends through a threaded bore 97 in the closed end 83 of the container and is retained in desired position of adjustment by means of a nut 98.

In the operation of the embodiment shown in Fig. 2, after the reservoir 11' has been charged with fluid under pressure, such fluid will be forced from the accumulator port 12', through line 13', junction 14', line 17' into port 95 of the discharge unit. In addition, the fluid will be forced from the accumulator through line 13', junction 14', line 40', port 39', annular groove 61', port 37', line 36' into port 94 of the discharge unit. As the surface area of the piston 84 in chamber 85 of the discharge unit is greater than the surface area of the piston in chamber 86 due to the presence of the piston rod 87 in such chamber 86, although the fluid forced into ports 94, 95 will be under the same pressure, more force will be exerted against the surface of the piston in chamber

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85 and consequently the piston 84 will move toward end 91 of the container and the chamber 85 will charge with fluid.

When the lever 59' is moved, say by the action of the train passing thereby and the control rod 51' of the actuator 38' is moved to the right against the tension of the coil spring 55', the port 39' will be sealed and ports 37' and 44' will be connected. At such time the fluid under pressure in the accumulator 11' will be forced through line 13', junction 14' and line 17' into port 95 of the discharge unit to react against the surface of the piston in chamber 86. As the port 94 is connected by line 36', port 37', annular groove 61', port 44', line 45' to nozzle 46' which is open to the atmosphere, the pressure in chamber 85 will be less than that in chamber 86 and the piston 84 will move downwardly, limited by the screw 96, thereby forcing fluid through the nozzle 46' to be ejected against the switch joint.

In the manner previously described with respect to the embodiment of Fig. 1, the ports 37' and 44' will be maintained in communication until substantially all of the fluid is ejected from the chamber 85 at which time the control rod 51' will be moved by spring 55' to connect ports 37' and 39' and close port 44' for recharging of the discharge unit 81.

The embodiment of the device shown in Fig. 3, desirably comprises a reservoir or pressure accumulator 101 which may be charged with a fluid such as grease under pressure, say in the order of 100 atmospheres. The port 102 of the accumulator is connected by line 103 to a junction 104 which has an inlet 105 designed to be connected to a source of fluid under pressure and normally closed by a cap 106.

The junction 104 is connected by line 107 to the port 108 of a discharge unit 109, which as shown in Fig. 3 desirably comprises a cylindrical container 111 closed at one end 112 and which may have a cap 113 screwed on its other end 114 in which the port 108 is provided. Slidably mounted in the container 111 is a cup-shaped piston 115 which has a small vent hole 116 in its floor 117, the piston defining chambers 118 and 119 in the container. The piston 115 is normally urged toward the cap end 114 of the container by means of a coil spring 120 compressed between the end 112 of the container and the floor 117 of the piston. The container 111 has a port 121 adjacent the end 112 thereof leading into the chamber 119. The port 121 is designed to be closed by the side wall 122 of the piston when the latter is moved into engagement with the end 112 of the container. Port 121 is connected by line 123 to the inlet port 124 of a valve 125, which has an outlet port 126 connected by line 127 to a nozzle 128. The valve has a rotatable member 129 therein with a passageway 131 therethrough designed to provide communication between ports 124 and 126 and such rotatable member is controlled by means of a lever 132 connected thereto.

To actuate the lever 132, a control rod 133 is provided, slidably mounted in bearings 134 and 135 rigidly affixed in any suitable manner. The rod 133 has a pair of spaced abutments or stops 136 and 137 thereon, straddling the free end 138 of the lever 132 and is normally urged to valve closing position by means of a coil spring 139 affixed at one end as at 141 and connected at its other end as at 142 to a projection 143 affixed to the rod. By reason of the tension of coil spring 139, the rod will normally be urged to the left with the stop 137 engaging the free end 138 of lever 132 retaining the valve 125 in closed position, and when the rod 133 is moved to the right in the manner hereinafter to be described, the stop 136 will engage the free end 138 of lever 132 to move the valve 125 to open position.

Suitable means are provided to dampen the return movement of the rod 133 from valve open to valve closed position. To this end, as is shown in Fig. 3, a cylindrical housing 151 is provided having longitudinally aligned

axial bores or openings 152 in its ends 153 and 154 through which the rod 133 extends, the housing also having an inlet port 155 for charging with a suitable dampening fluid. Affixed to the rod 133 in the bore 156 of the housing 151 is a piston 157 which has a plurality of openings 158 therethrough. The rod 133, in the housing 151, is encompassed by a washer or valve member 159, the movement of which is limited by the piston 157 and an annular collar 161 affixed to the rod. The rod 133 may have a passageway 162 extending from one side of the piston to the other, the purpose of which will hereinafter be described. The free end 163 of the rod which extends from the end 153 of the housing is suitably connected to an actuating lever 164.

In the operation of the equipment shown in Fig. 3, fluid under pressure will flow from the accumulator 101 through line 103, junction 104 and line 107 into port 108 of the discharge unit 109. As a result, the piston 115 therein will be forced downwardly, compressing the coil spring 120 and charging chamber 118. As the valve 125 is normally closed, by reason of leakage of fluid through the small vent 116 and the tension of the coil spring 120, the piston 115 will gradually move toward the end 114 of the container at which time the chamber 119 will be completely charged with fluid.

When the lever 164 is actuated, say by the movement of the train thereby, the control rod 133 will be moved to the right from the position shown in Fig. 3. Although the housing 151 of the damping device is filled with fluid, as the washer 159 will move away from the openings 158 in the piston with movement of the latter to the right, the movement of rod 133 will be substantially unimpeded. Such movement of rod 133 to the right will cause the stop 136 to abut against the free end 138 of the lever 132 to rotate the member 129 so that ports 124 and 126 are in communication.

Although the train may have passed by the lever 164 at this time, and the coil spring 139 tends to move the rod 133 to the left, as such movement will cause the washer 159 to move against the piston 157, the openings 158 therein will be sealed and consequently movement of the rod would be substantially stopped except for the fact that there is slight leakage through the small passageway 162 which permits relatively slow movement of the rod to the left.

As the result of such damping action, the rod 133 will move slowly to the left under the urging of spring 139 and the valve 125 will remain open until the stop 137 abuts against the free end 138 of the lever 132, which will not occur until the discharge unit has emptied.

Due to the opening of valve 125, the fluid under pressure from the accumulator 101 which reacts against the piston 115 of the discharge unit 109, will force such piston toward end 112 against the tension of coil spring 120 and consequently fluid will be forced from chamber 119 through port 121, line 123, open valve 125 and line 127 from the nozzle 128 until the side wall 122 of the piston 115 seats against the end 112 of the container 111, at which time the port 121 will be closed.

Thereupon, the gradual movement of the rod 133 to the left permitted by the flow of fluid through passageway 162 will cause stop 137 to abut against the end 138 of lever 132 to close valve 125.

When this occurs, due to slight leakage through the vent 116 in the floor 117 of the piston 115, the latter will gradually move under the urging of spring 120 to cap 113 to recharge the chamber 119 so that the equipment is ready for the next cycle of operation.

The equipment above described has many applications. Thus for example, in addition to its use to lubricate a switch joint, the equipment may be used to lubricate automatic machinery of any type so that as the latter operates, at predetermined times, a cam or any suitable controlling means may operate the control rod of the equipment to provide for the ejection of lubricating oil on a desired bearing.

As many changes could be made in the above equipment, and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, 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.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. Equipment of the character described comprising a discharge unit having a piston slidable in the bore thereof and having a pair of ports positioned near each of the ends of said discharge unit respectively on opposite sides of the piston, means in said discharge unit when fluid under pressure is applied to the two ports thereof to effect movement of the piston therein toward one end of the unit for charging of the latter, a valve comprising a body portion having a bore therethrough and having a pair of ports leading into said bore, means connecting the port of said discharge unit remote from the end of the latter toward which the piston is moved for charging of said discharge unit to one of the ports of said valve, said body portion of said valve having an outlet port leading into said bore, said outlet port having an outlet connected thereto, slidable means in the bore of said body portion normally providing communication between said first two ports and closing said outlet port, said slidable means being conformed to provide communication upon movement thereof between the port of said valve connected to the port of said discharge unit and said outlet port and to close the other port of said valve, whereby when a source of fluid under pressure is applied to the other port of said discharge unit the piston therein will be moved to eject the fluid therein through the outlet, and means controlled by the pressure in said connecting means to retain said slidable means in position to provide communication between the port of said valve connected to the port of said discharge unit and said outlet port until such pressure has fallen below a predetermined amount, for discharge of substantially all of the fluid from said discharge unit and thereupon to move said slidable means to cut off such communication.

2. The combination recited in claim 1 in which the means in said discharge unit comprises a piston rod affixed at one end to the piston in said discharge unit and extending axially through the latter beyond the end of the bore in said discharge unit.

3. The combination recited in claim 1 in which said last named means comprises a chamber in the body portion of said valve, said chamber being in communication with said outlet port, said slidable member has a locking conformation movable into juxtaposition with said chamber, and slidable means are provided in said chamber movable into engagement with said locking conformation to retain the slidable member in valve open position.

4. The combination recited in claim 3 in which said locking conformation in said slidable member comprises a depression therein and the slidable means in said chamber comprises a piston, a ball positioned between said piston and said bore and movable by said piston into said depression in said slidable member.

5. The combination set forth in claim 4 in which said chamber extends radially outward from the bore in said body portion.

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