June 27, 1967 R. W. MURRAY 3,327,740

AUTOMATIC NOZZLE

Filed Jan. 18, 1965

2 Sheets-Sheet 1

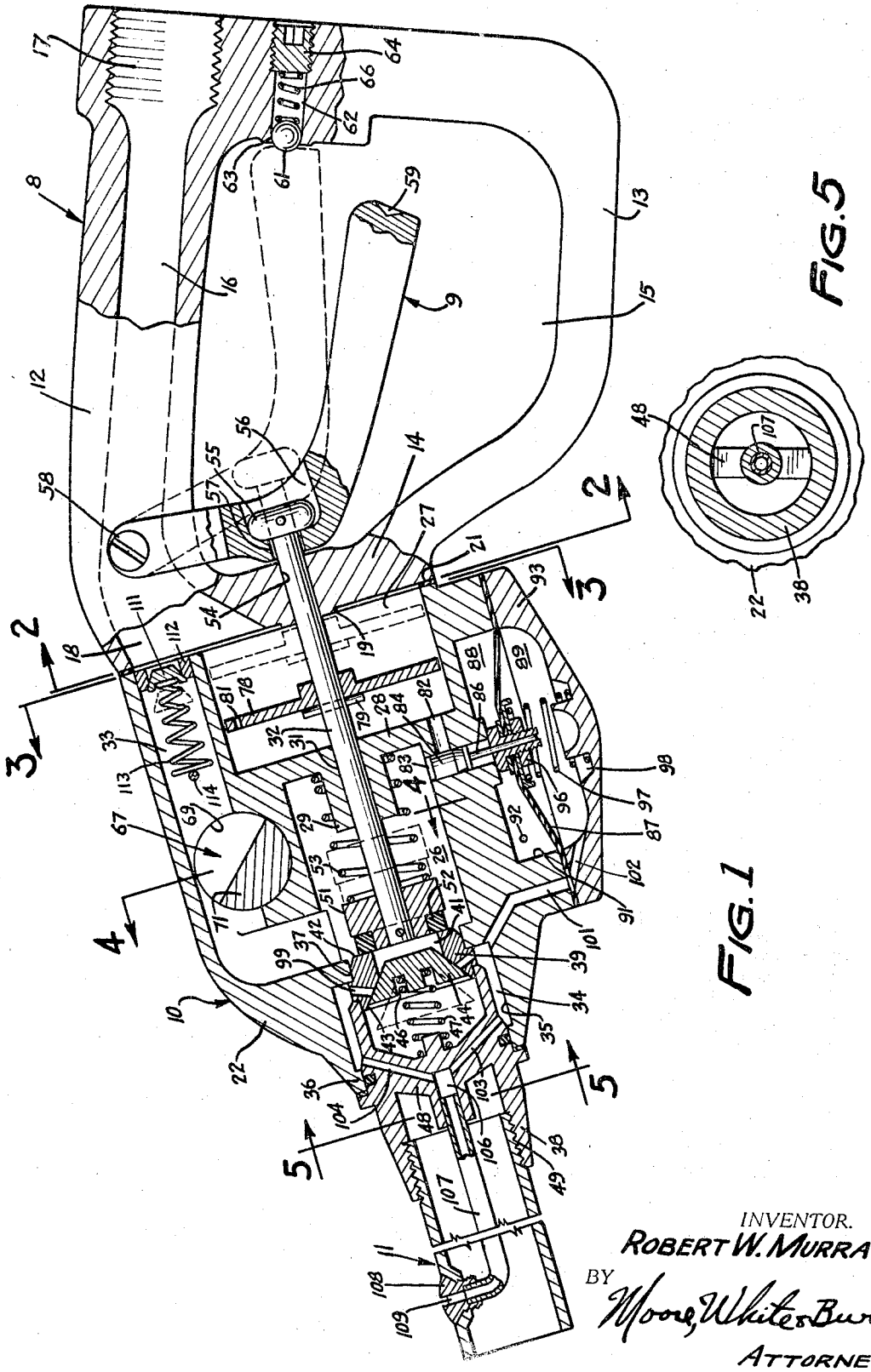

FIG. 1

FIG. 5

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2 Sheets-Sheet 2

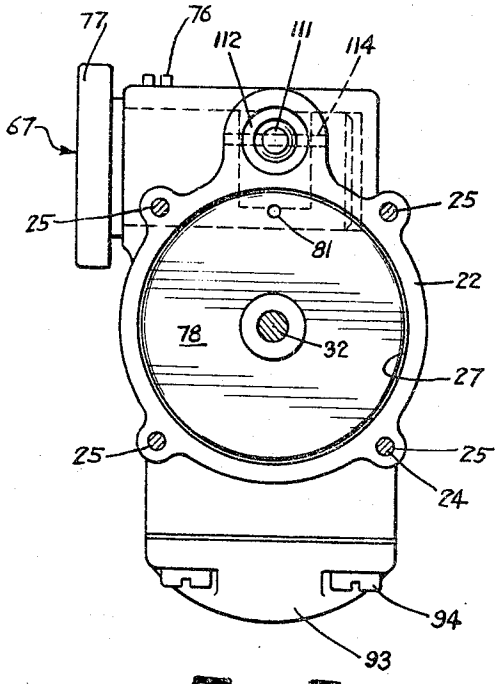

FIG. 3

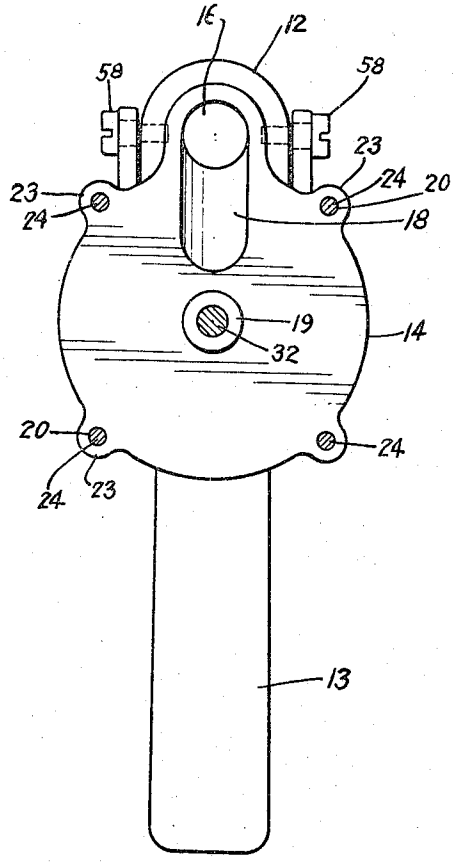

FIG. 2

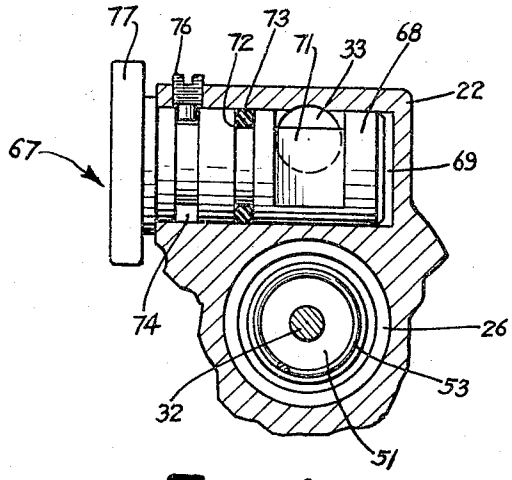

FIG. 4

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3,327,740

AUTOMATIC NOZZLE

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16 Claims. (Cl. 141—209)

This invention relates to a combination valve and nozzle assembly for and method of dispensing liquid into a container and more particularly to a valve unit which automatically closes when the container is substantially full of liquid.

It is the object of this invention to provide an improved combination nozzle and valve which is mechanically held in an open position to dispense liquid into a container and automatically closes when the container is substantially full of liquid.

Another object of the invention is to provide a liquid dispenser having a valve unit with means for selectively adjusting the rate of flow of liquid discharged by the valve unit.

A further object of the invention is to provide a valve unit having a main valve releasably locked in an open position and movable to a closed position by a piston moved by the pressure of the liquid supplied to the valve unit.

Another object of the invention is to provide an improved method of controlling the dispensing of liquid into a tank.

An additional object of the invention is to provide a combination valve and nozzle with a control system having a minimum number of working parts operable to automatically shut-off the valve when the nozzle contacts the dispensed liquid.

A further object of the invention is to provide compact and rugged liquid dispenser which is relatively simple and economical in construction, maintenance free, and reliable and efficient in use.

Other objects of the invention will become apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention comprises the features hereinafter fully described and particularly pointed out in the claims. The following description sets forth in detail a particular illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

The invention is illustrated by the accompanying drawings in which the same numerals refer to corresponding parts and in which:

FIGURE 1 is an elevational view partly in section of an automatic shut-off combination nozzle and valve assembly constructed in accordance with this invention;

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1 as viewed in the direction of the arrows;

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 1 as viewed in the direction of the arrows;

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 1; and

FIGURE 5 is a sectional view taken along the line 5—5 of FIGURE 1.

Referring to the drawing there is shown in FIGURE 1 the combination valve and nozzle assembly of this invention indicated generally at 7. The valve and nozzle assembly 7 is a liquid dispenser which receives liquid, such as gasoline, under pressure and dispenses the liquid to a tank or similar container. The assembly 7 comprises a handle 8 adapted to be coupled to a hose for carrying liquid under pressure from a source such as a pump. The handle 8 carries a control lever 9 for a valve unit 10 operable to control the flow of liquid to a nozzle 11. Included in the valve unit 10 is a control system which automatically stops the flow of liquid to the nozzle 11 when the container is substantially full of liquid. This control system is described hereinafter in detail.

In use, the nozzle 11 is inserted into the top of a tank or a conduit leading into the tank. After this is done the lever 9 is moved to open the valve unit 10 and thereby permit the flow of liquid through the valve unit 10 into the nozzle 11 for discharge into the tank. As long as the valve unit 10 is open liquid will flow into the tank. When the tank is substantially full or when the level of the liquid in the tank raises above the discharge end of the nozzle the control system automatically closes the valve unit 10 stopping the flow of fluid into the nozzle 11 and tank.

The handle 8 has a cylindrical back 12 integral with a generally U-shaped hand guard 13 and a circular head 14. The hand guard 13 and back 12 form a D-shaped opening 15 which accommodates the lever 9. The back 12 has a tubular shape and includes an axial passage 16 having a threaded inlet 17 adapted to receive a liquid supply hose (not shown) and an elongated outlet 18. As shown in FIGURE 2, the outlet 18 projects radially inward toward a boss 19. A gasket 21 surrounds the boss 19 and provides a seal between the handle head 14 and body 22 of the valve unit 10. The head 14 has integral radial projections 23 having axial opening 20 for accommodating bolts 24 which thread into suitable openings 25 in the valve body 22 to attach the handle 8 to the valve unit 10. As shown in FIGURE 1, the valve body 22 has a pair of axially aligned chambers 26 and 27 separated by a transverse wall 28. The center portion of the wall 28 has a cylindrical boss 29 projected into the chamber 26. An axial bore 31 extends through the boss 29 and slidably accommodates a control rod 32 which projects into the chamber 26 and through the chamber 27. The top portion of the body 22 has an axial passage 33 open to the elongated outlet 18 of the handle passage 16. The opposite end or outlet of the passage 33 opens to the forward portion of the chamber 26. The lower portion of the outlet 18 is open to the chamber 27 so that both chambers 26 and 27 are in fluid communication with the liquid supplied to the handle 8.

The forward end of the body 22 has a step bore 34 open to the chamber 26. The bore 34 is defined by an annular recess 35 and a pair of axially spaced annular ribs 36 and 37. Positioned in the bore 34 is a tubular coupling 38 carrying a ring 39. The forward end of the ring 39 is press fitted into the coupling 38. The mid-section of the coupling 38 is in press fiit and sealing engagement with the annular rib 36 and the periphery of the ring 39 is in press fiit and sealing engagement with the annular rib 37.

The ring 39 has an axial bore 41 open to the chamber 26. The rear side of the ring 39 has a flat face 42 and the forward side thereof has a beveled face 43 engageable with a check valve 44 having a beveled peripheral surface and an annular recess 46 receiving a coil spring 47. The opposite end of the spring 47 engages a bridge 48 extended transversely across the tubular coupling 38. The spring 47 biases the check valve 44 into engagement with the ring 39 closing the bore 41. The opposite or forward end of the coupling 38 is open and is provided with internal threads 49 which cooperate with threads on the nozzzle 11 to attach the nozzle to the coupling.

A valve member 51 having a ring 52 of plastic material is secured to the forward end of the control rod 32. The ring 52 has a diameter which is greater than the diameter of the bore 41. The valve member 51 is maintained in axial alignment with the bore 41 by the control rod 32 and positions the ring 52 in sealing engagement with the flat annular face 42. Spring 53 positioned about the rod 32 engages the valve member 51 and the transverse wall

28 and biases the valve member 51 to a closed position wherein the ring 52 engages the flat annular face 42.

The opposite end of the control rod 32 projects through a hole 54 in the handle head 14 and is coupled to the mid-section of the lever 9 by an annular cap 55 positioned in a recess 56 in the mid-section of the lever 9. The rod 32 projects through a hole 57 open to the recess 56 with the cap 56 attached to the end of the rod 32 so that on movement of the lever 9 from the head 14 the rod 52 is carried axially in a rearward direction opening the valve member 51 as shown by broken lines. The top end of the lever 9 is bifurcated and pivotally attached by pins 58 to the opposite sides of the back 12. The opposite end of the lever 9 has a recess 59 for receiving a spring biased ball 61 positioned in a bore 62. The forward end of the bore 62 has an inwardly directed lip 63 for holding the ball 61 in the bore 62. The opposite end of the bore 62 is threaded and closed with a plug 64. A spring 66 positioned in the bore 62 biases the ball 61 into engagement with the lip 63. When the lever 9 is pivoted toward the back 12 the ball 61 moves into the recess 59 to releasably lock the lever 9 in the open position, shown in broken lines. Upon movement of the lever 9 to the open position control rod 32 carries the valve member 51 to the open position shown in broken lines to permit the flow of liquid from the chamber 26 into the bore 41. The liquid being under pressure in the chamber 26 opens the check valve 44 and flows through the bore 41 around the bridge 48 into the nozzle 11 and is discharged therefrom into the tank. The valve member 51 remains in the open position by the holding action of the ball 61. As soon as the lever 9 is released from the holding action of the ball 61 the valve member 51 is moved by the spring 53 to the closed position.

The rate of flow of liquid from the nozzle 11 is controlled by a manually operated restrictor valve indicated generally at 67 positioned in the passage 33. As shown in FIGURE 4, valve 67 has a cylindrical valve member 68 positioned in a transverse bore 69. The cylindrical member 68 has a semi-circular section 71 crossing the passage 33 which functions as a baffle or wall to limit the flow of liquid through the passage 33. As shown in FIGURE 1, the bore 69 is below the top wall of the passage 33 so that the semi-circular section 71 merely limits the flow of liquid through the passage 33 rather than blocking the passage 33. Outwardly from the semi-circular section 71 the cylindrical member 68 has a first annular groove 72 holding a sealing ring 73 and a second annular groove 74 receiving the end of a set screw 76 threaded into the body 22. The set screw 76 holds the cylindrical member 68 in the bore 69 and permits rotation of the member 68 to limit the flow of liquid in the passage 33. The outer end of the cylindrical member 68 is enlarged into a cylindrical control knob 77 which is readily accessible to the operator of the valve and nozzle assembly 7.

In use, the rate of flow of liquid from the nozzle 11 may be changed by rotating the knob 77 to either increase or decrease the flow capacity of the passage 33. The restricted flow capacity of the liquid in the passage 33 caused by the semi-circular section 71 produces a liquid pressure differential between the pressure of the liquid in the passage 16 and the chamber 26. The greater the restriction imposed on the flow of liquid in the passage 33 the greater the pressure differential between the chamber 26 and the handle passage 16. It is this pressure differential which is utilized by the control system to automatically close the valve member 51 when the level of the dispensed liquid rises above the position of the discharge end of the nozzle 11.

The control system comprises a piston 78 slidably mounted on the control rod 32 for axial movement in the chamber 27. A pin 79 projected through a suitable hole in the control rod 32 limits the movement of the piston 78 toward the valve member 51. The piston 78 has a small bleed hole 81 and a diameter which is slightly smaller than the diameter of the chamber 27 so that liquid supplied to the chamber 27 will flow on opposite sides of the piston 78. The liquid flows past the piston 78 until the liquid pressures on opposite sides of the piston 78 are substantially equal. During the filling of the tank liquid is stored in chamber 27 on opposite sides of the piston 78.

The base end of the chamber 27 is coupled in a fluid relation with the chamber 26 by passages 82 and 83 in the body 22. A cylindrical valve 84 having a stem 86 is slidably disposed in passage 83 and movable to open and closed positions with respect to the passage 82. The valve 84 controls the flow of liquid from the base end of the chamber 27 to the chamber 26.

The position of the valve 84 is controlled by a flexible diaphragm 87 which separates an air chamber 88 from a vacuum chamber 89. The air chamber 88 is formed by a recess 91 in the bottom of the body 22 and is in fluid communication with the atmosphere through a small hole 92. The vacuum chamber 89 is formed by a cup-shaped cap 93 fastened to the body 22 by screws 94 as shown in FIGURE 3. The stem 86 of the valve 84 is attached to the center portion of the diaphragm 87 by a nut and bolt assembly 96 so that movement of the diaphragm 87 displaces the valve 84 between its open and closed positions. A spring 97 seated in an annular recess 98 in the base of the cup 93 engages the nut and bolt assembly 96 and biases the diaphragm 97 into the air chamber 88 positioning the valve 84 adjacent the passage 82 thus blocking the flow of fluid from the chamber 27 to the chamber 26.

The valve 84 is moved into an open position in response to a vacuum pressure in the vacuum chamber 89. This vacuum pressure is established by the flow of liquid through the ring 39 past the check valve 44. As shown in FIGURE 1, the ring 39 has a plurality of passages 99 open at their inner ends on the surface 43 and open at the outer ends to the bore 34. Passage 101 in the body 22 and passage 102 in the cap 93 provide fluid communication between the recess 35 and the vacuum chamber 89.

The bore 34 is connected to the atmosphere. This is accomplished with passages 103 and 104 in the bridge 48 open to a central bore 106. A tube 107 extends into the bore 106 and projects into the nozzle 11. The outer end of the tube 107 has a right angle bend and is attached to a screw 108 mounted in the discharge end of the nozzle 11. The screw 108 has a bore 109 open to the atmosphere providing a passage into the tube 107.

In use, the handle 8 is connected to a hose coupled to a source of liquid under pressure. The hose supplies the handle passage 16 with liquid under substantially constant pressure. To dispense liquid into a tank the operator of the combination valve and nozzle 7 inserts the nozzle 11 into the top of the tank or its inlet spout and then applies an upward force on the lever 9. Pivotal movement of the lever 9 carries the control rod 32 linearly in a rearward direction opening the valve member 51. The control rod 32 is held in the open position by the locking action of the spring biased ball 61 seated in the recess 59 in the end lever 9. The holding force of the ball 61 is greater than the force of the spring 53 acting on the valve member 51 so that the valve member 51 is releasably locked in the open position as indicated in broken lines.

When the valve member 51 is moved from the ring 39 the bore 41 is in fluid communication with the chamber 26 thus allowing the liquid to flow through the passage 33 into the chamber 26 and through the bore 41. The pressure of the liquid in chamber 26 opens the check valve 44 moving it forward against the force of the spring 47 so that liquid flows around the check valve 44 over the beveled face 43 of the ring 39. The space between the periphery of the check valve 44 and the beveled face 43 is a restricted annular passage and may be viewed as an annular venturi passage. The flow of liquid through this passage draws air from the passages 99 open to the beveled surface 43. Normally this air is supplied from

the atmosphere and flows through the bore **109**, the tube **107**, passages **103** and **104** in the bridge **48** and the annular recess **35**.

The valve element member **51** will remain open as long as the discharge end of the nozzle **11** is exposed to air. As the level of the liquid in the tank raises the discharge end of the nozzle **11** will eventually be submerged in the liquid at which time the bore **109** is no longer exposed to the atmosphere thereby eliminating flow of air in the tube **107**. Normally, the tank would be filled or substantially filled with liquid depending upon the position of the discharge end of the nozzle **11**, in the tank.

When the flow of air from the bore **109** is blocked the air in the vacuum chamber **39** flows through passages **101** and **103** creating subatmospheric pressure in the vacuum chamber **89**. With a reduction of pressure in the vacuum chamber **89** flexible diaphragm **87** moves outwardly against the compression force of the spring **97** carrying the valve **89** outwardly opening the passage **82** thereby fluidly connecting the base end of the chamber **27** with the chamber **26**. Liquid in the base end of the chamber **27** flows through the passages **82** and **83** into the chamber **26** with the result that the pressure in the chamber **27** adjacent the forward surface of the piston **78** is less than the pressure on the opposite side of the piston **78**. This pressure differential moves the piston **78** in a forward direction against the pin **79** thereby moving the control rod **32** toward the ring **39** seating the ring **52** of the valve member **51** on the flat annular face **42** of the ring **39**. The force on the piston **78** is sufficient to release the lever **9** from the holding action of the spring baised ball **61**. As soon as the lever **9** moves from the ball **61** the valve member **51** will automatically close under the influence of the spring **53**. When valve member **51** is closed the check valve **44** moves to a closed position under the baising action of the spring **47** so as to prevent accumulation of liquid into the annular recess **35**. With the check valve **44** closed the pressure in the vacuum chamber **39** returns to substantially atmospheric pressure. The spring **97** biases the flexible diaphragm **87** into the air chamber **88** thereby closing the valve **84**.

In terms of a method of controlling the dispensing of liquid into a tank the combination valve and nozzle **7** receives liquid under pressure from a source and divides this input flow of liquid into first and second paths. The liquid in the first path flows past a restricted opening into a first chamber **26**. The liquid in the first chamber **26** is selectively blocked and allowed to flow into a nozzle **11** for discharge into a tank. Normally, the valve member **51** is biased to a closed position to block the flow of liquid from chamber **26**. The valve member **51** is releasably locked in an open position by the holding action of ball **61** on lever **9**. The flow of liquid in the first path is adjustably controlled by a restriction valve **67** having a semicircular section **71**. The liquid in the second path flows into a second chamber **27** and is selectively blocked and allowed to flow into the first chamber by a valve **84**.

A source of vacuum pressure is created in response to the flow of liquid from the second chamber into the nozzle. Normally, the vacuum pressure established by the flow of liquid from the first chamber is vented to the atmosphere through an opening **109** in the discharge end of the nozzle **11**. When the liquid level in the tank blocks the venting opening or bore **109** the vacuum pressure is utilized to open valve **84** and permit the flow of liquid from the second chamber into the first chamber. A differential pressure force is created on opposite sides of piston **78** as a result of the flow of liquid in the second path to the first chamber **26**. This force is sufficient to release the lock holding the lever **9**. The spring **53** biases the valve member **51** to the closed position thereby blocking the flow of liquid from the first chamber **26** into the nozzle **11**. With the flow of liquid from the first chamber **26** terminated the nozle **11** no longer discharges liquid into the tank.

Under conditions when the liquid supply pump is clogged so as to discharge only a nominal supply of liquid at a low pressure to the passage **16**, the flow rate valve **67** is ineffective to maintain a substantial pressure difference between the passage **16** and chamber **26**. The check valve **44** being biased to a closed position operates to increase the pressure in the chamber **26** up to the value of the pressure of the liquid in the passage **16**. Thus, the pressure differential between the passage **16** and chamber **26** is only nominal and does not effectively operate the control system for the shut-off valve **51**.

To avoid small differences in the pressure of the liquid in the passage **16** and the chamber **26** a check valve **111** is inserted in the inlet of the passage **33**. The check valve **111** is optional structure used to maintain the pressure of the liquid in the chamber **26** at a value which is substantially below the pressure of the liquid in the passage **16**. When the check valve **111** is used this pressure differential exists to operate the control system for the shut-off valve **51** when there is a small flow rate of liquid at low pressure through the valve and nozzle assembly **7**.

As shown in FIGURE 1, the check valve **111** has a tapered peripheral face engageable with a complementary surface on an annular seat **112** inserted with a press fit into the inlet end of the passage **33**. The check valve **111** is biased to a closed position by a coil spring **113** having one end in engagement with the check valve **111** and the opposite end abutting a pin **114** projected transversely of the passage **33**. The pressure of the liquid in passage **16** moves valve **111** to the open position shown in broken lines. The spring **113** has a compression strength which is greater than the compression strength of the spring **47** biasing the valve **44** to a closed position. This insures the closing of the valve **44** when the check valve **111** is closed and establishes a substantial pressure differential between the passage **16** and chamber **26** when the valves **44** and **111** are open.

In summary, the combination valve and nozzle **7** of this invention has a valve member **51** mechanically held in an open position by releasable lock means **61**. When the valve member **51** is in the open position liquid continuously flows into a tank or similar container. The rate of flow is regulated by a restrictor valve **67** which is manually adjustable to increase or decrease the flow of liquid in the passage **33**. When the container is substantially full of liquid the valve member **51** will automatically close through the operation of a control system which releases the locking action of the ball **61** on the lever **9** thereby permitting the valve member **51** to move to its closed position.

The control system has a vacuum operated valve **84** which controls the flow of liquid from a second chamber **27** to first chamber **26**. A piston **78** positioned in the chamber **27** is drivably connected to the control rod **32** for the valve member **51**. On flow of liquid from the chamber **27** to the chamber **26** piston **78** is forced in a forward direction moving the valve member **51** to a closed position.

The valve **84** controls the flow of liquid between the chambers **26** and **27** and is actuated by vacuum pressure acting on a flexible diaphragm **87**. The vacuum pressure is established by the flow of liquid from the chamber **26**, past the passages **99** in the ring **39**. Normally, the passages **99** are in fluid communication with the atmosphere such that the vacuum force is not applied to the flexible diaphragm **87**. Under these conditions the valve **84** remains in a closed position. When the bore **109** which supplies the passages **99** with air are blocked or closed vacuum pressure is established adjacent the flexible diaphragm **87**. This causes the diaphragm to move to open the valve **84** thereby providing fluid communication between the chambers **26** and **27**. The flow of liquid from the chamber **27** to the chamber **26** creates unequal pressures on the opposite sides of the piston **78** such that the piston **78** drives the valve member **51** to its closed

position thereby terminating the flow of liquid from the valve nozzle 7.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only, and the invention is limited only by the terms of the appended claims.

I claim:

1. A combination valve and nozzle assembly for transferring liquid from a supply source to a tank comprising

(a) a handle having a passage for receiving liquid from a supply source,

(b) a valve unit secured to said handle, said valve unit having a first passage, a first chamber, and a second chamber, said first passage and second chamber open to the passage in the handle to receive liquid therefrom, said first passage open to said first chamber for discharge of liquid thereto, and a second passage providing fluid communication between the first and second chambers,

(c) restrictor means for regulating the flow of liquid in said first passage,

(d) coupling means having a ring member formed with a bore open to said first chamber, and a check valve preventing flow of liquid into the first chamber,

(e) nozzle means having a discharge end, said nozzle means connected to said coupling means for receiving a flow of liquid therefrom and discharging the liquid into a tank,

(f) a first valve positioned in said first chamber and engageable with said ring member to close the bore therein and movable away from said member to open the bore,

(g) rod means secured to said first valve and projected axially through said first and second chambers, said rod means being movable to open said first valve,

(h) means biasing said first valve to a closed position in engagement with said member,

(i) piston means positioned in said second chamber and mounted on said rod, said piston means having a loose fit with respect to the wall of the second chamber to permit limited flow of liquid past said piston means,

(j) means for limiting the movement of said piston means on said rod means toward said first valve,

(k) second valve member positioned in said second passage for opening and closing said second passage to control the flow of liquid from the second chamber to the first chamber,

(l) a control system operable to control the position of said second valve including

(1) means to bias the second valve to a closed position,

(2) diaphragm means connected to said second valve,

(3) cap means secured to said valve unit for attaching the diaphragm means thereto, said cap means providing a vacuum chamber,

(4) first passage means having one end open to the bore in said member of the coupling means and the opposite end open to said vacuum chamber whereby a vacuum pressure is established in the first passage means when liquid flows through said bore, and past said check valve,

(5) second passage means open at one end to said first passage means and open at the opposite end to the atmosphere, said opposite end being located adjacent the discharge end of the nozzle means to provide an intake opening for air to maintain the vacuum pressure at a nominal value, said intake opening being blocked with liquid when the level of the liquid raises above the discharge end of the nozzle means whereby the vacuum pressure in the first passage and vacuum chamber is increased moving the diaphragm to open the second valve member thereby permitting flow of liquid from the second chamber to the first chamber reducing the pressure of the liquid on one side of the piston means so that the pressure of the liquid on the opposite side of the piston means forces the first valve into engagement with the member thereby terminating the flow of liquid into the nozzle means.

2. The valve and nozzle assembly defined in claim 1 including

(a) lever means pivotally mounted on said handle and connected to said rod means whereby upon movement of the lever to a first position the rod means is moved carrying the first valve away from said member, and

(b) releasable lock means for holding the lever means in the first position.

3. A combination valve and nozzle assembly for transferring liquid from a supply source to a tank comprising

(a) a handle having a passage for receiving liquid from a supply source,

(b) a valve unit secured to said handle, said valve unit having a first chamber and a second chamber open to said passage for receiving liquid,

(c) coupling means having a ring member formed with a bore open to said first chamber,

(d) nozzle means having a discharge end, said nozzle means connected to said coupling means for receiving a flow of liquid therefrom and discharging the liquid into a tank,

(e) first valve means located in said first chamber and engageable with said ring member to close the bore therein and movable away from said member to open the bore,

(f) means biasing said first valve means to a closed position,

(g) control means secured to said first valve means and operable to move the first valve means to an open position,

(h) piston means positioned in said second chamber and mounted on said control means for movement therewith, said piston means having a loose fit with respect to the wall of the second chamber to permit limited flow of liquid past said piston means,

(i) second valve means movable to an open position and closed position to control the flow of liquid from the second chamber to the first chamber, and

(j) a control system operable to control the position of said second valve means including

(1) means for establishing a source of vacuum pressure,

(2) passage means coupling said vacuum pressure in fluid communication with the atmosphere, said passage means having one end positioned adjacent the discharge end of the nozzle means,

(3) vacuum pressure operated diaphragm means connected to said second valve means and said passage means,

(4) said diaphragm means operable by the vacuum pressure to move the second valve means to the open position when the level of the liquid raises above the discharge end of the nozzle means thereby permitting flow of liquid from the second chamber to the first chamber reducing the pressure of the liquid on one side of the piston means so that the pressure of the liquid on the opposite side of the piston means forces the first valve means into engagement

with the ring member thereby terminating the flow of liquid into the nozzle means.

4. A dispenser for transferring liquid from a supply source to a tank comprising

(a) a handle having a passage for receiving liquid from a supply,

(b) a body secured to said handle, said body having a first chamber, a second chamber open to the handle passage, and a passage means providing fluid communication between the handle passage and the first chamber,

(c) a valve seat having a bore open to the first chamber

(d) a first valve positioned in said first chamber and engageable with said seat to block the flow of liquid through the bore and movable away from said seat to permit the flow of liquid through the bore,

(e) a rod secured at one end thereof to said first valve and projected through said first and second chambers,

(f) a piston positioned in said second chamber with liquid under pressure on opposite sides thereof, said piston being mounted on said rod,

(g) a second valve movable to an open position to permit the flow of liquid from the second chamber to the first chamber and movable to a closed position to block said flow of liquid, and

(h) control means operable in response to flow of liquid through said bore to move the second valve to the open position whereby liquid flows from the second chamber to the first chamber with the result that the piston is urged by a difference of liquid pressure on opposite sides thereof to move the first valve in engagement with the seat thereby terminating the discharge of liquid from the dispenser.

5. The dispenser defined in claim 4 including

(a) a lever pivotally mounted on said handle and connected to said rod whereby upon movement of the lever to a first position the rod is moved carrying the first valve away from said seat, and

(b) releasable lock means for holding the lever in the first position.

6. The dispenser defined in claim 4 including

(a) means for restricting the rate of flow of liquid in the passage means of the body.

7. The dispenser defined in claim 4 including

(a) a check valve engageable with said valve seat to close the bore therein to prevent flow of liquid into said first chamber.

8. The dispenser defined in claim 4 wherein said control means includes

(a) means to bias the second valve to a closed position,

(b) diaphragm means operably connected to said second valve,

(c) means surrounding said diaphragm means forming a vacuum chamber,

(d) first passage means having one end open to the bore in said valve seat and an opposite end open to the vacuum chamber whereby on movement of liquid through said bore a vacuum pressure is established in the first passage means, and

(e) second passage means open to the first passage means and the atmosphere to provide an intake opening for air to maintain the vacuum pressure at a nominal value, when said intake opening is blocked the vacuum pressure increases in the vacuum chamber moving the diaphragm to open the second valve member thereby permitting the flow of liquid from the second chamber to the first chamber and reducing the pressure of the liquid on one side of the piston so that the pressure of the liquid on the opposite side thereof permits the first valve to move into engagement with the seat thereby terminating the discharge of liquid from the dispenser.

9. A valve unit for a liquid dispenser comprising

(a) a body having a first chamber, a second chamber open at one end to a supply of liquid under pressure, and a passage providing fluid communication between the supply of liquid and the first chamber,

(b) a valve seat having a bore open to the first chamber providing a passage for the discharge of liquid from the first chamber,

(c) a first valve means positioned in said first chamber and engageable with said seat to block the flow of liquid through the bore and movable away from said valve seat to permit the flow of liquid through said bore,

(d) means connected to said first valve for moving the first valve toward and away from said valve seat to close and open the bore therein,

(e) piston means operably connected to said means and positioned in said second chamber, with liquid under pressure on opposite sides thereof,

(f) a second valve means actuatable to an open position to permit the flow of liquid from the second chamber to the first chamber and actuatable to a closed position to block said flow of liquid, and

(g) control system means for actuating said second valve means to the open position whereby liquid flows from the second chamber to the first chamber with the result that the piston means is urged by differential liquid pressure on the opposite sides thereof to close the first valve means.

10. The valve unit defined in claim 9 wherein said control system means includes

(a) a flexible diaphragm connected to the second valve means and extended over a vacuum chamber,

(b) passage means fluidly connecting the vacuum chamber with the bore in the valve seat whereby liquid flowing through said bore establishes a source of vacuum pressure which acts on the diaphragm to move the second valve to the open position.

11. A valve unit for a liquid dispenser comprising

(a) a body having a first chamber and a second chamber, each chamber being open to a supply of liquid under pressure,

(b) a valve seat having a bore open to the first chamber providing a passage for the discharge of liquid from the first chamber,

(c) valve means positioned in said first chamber and engageable with said seat to block the flow of liquid through the bore and movable away from said valve seat to permit the flow of liquid through said bore,

(d) means connected to said valve means for moving the valve means toward and away from said valve seat to close and open the bore therein,

(e) piston means operable connected to said means and positioned in said second chamber, with liquid under pressure on opposite sides thereof, and

(f) control system means operable to selectively permit the flow of liquid from the second chamber to the first chamber with the result that the piston means is urged by differential liquid pressure on the opposite sides thereof to close the valve means.

12. An automatic shut-off gasoline dispensing nozzle and valve comprising

(a) a valve body having means at one end for securing to a supply line of gasoline under pressure and spout means for discharge of gasoline from the body,

(b) a gasoline flow passage extending from the supply line end of the body to the spout discharge means,

(c) a shut-off valving means in said flow passage adjacent the discharge means,

(d) a piston chamber within said body open at one end to the supply line end of said gasoline flow passage and normally closed at the other end,

(e) sliding shaft means extending into the normally closed end of said piston chamber and movable to actuate said shut-off valving means;

(f) a piston engaging said shaft means and movable in said chamber in response to pressure differentials on opposite sides of said piston,

(g) said piston when moved in a direction toward the discharge from the valve body upon release of pressure from the piston chamber being operative with said shaft means to actuate said shut-off valving means,

(h) a pressure release passage in the normally closed end of said piston chamber and communicating with said gasoline flow passage,

(i) valve means controlling flow from said pressure release passage,

(j) a diaphragm chamber associated with said valve body and having a flexible diaphragm, said valve means controlling flow from said pressure release passage being operative in response to pressure differentials on opposite sides of said diaphragm,

(k) venturi means in said gasoline flow passage in communication with the atmosphere through the discharge end of said spout means, and with said diaphragm chamber,

(l) said venturi means being operative to actuate said diaphragm to operate said valve in said pressure release passage to permit flow from said piston chamber to actuate said shut-off valving means upon submergence of the diaphragm end of said spout means in gasoline, and

(m) releasably lockable lever means for manually retracting said sliding shaft means to open said shut-off valving means.

13. The dispenser defined in claim 4 including

(a) check valve means in said passage means of the body for controlling the flow of low pressure liquid into the first chamber.

14. The dispenser defined in claim 4 including

(a) a first check valve means engageable with said valve seat to close the bore therein to prevent flow of liquid from said first chamber,

(b) first means for biasing the first check valve means to a closed position,

(c) a second check valve means in said passage means of the body for controlling the flow of liquid into the first chamber, and

(d) second means for biasing the second check valve means to a closed position, said second means having a biasing force which is greater than the biasing force of the first means whereby the pressure of the liquid in the handle passage is always substantially greater than the pressure of the liquid in the first chamber.

15. A dispenser for transferring liquid from a supply source to a tank comprising

(a) a handle having a passage for receiving liquid from a supply,

(b) a body secured to said handle, said body having a first chamber, a second chamber, and a passage means providing fluid communication between the handle passage and the first chamber,

(c) a valve seat having a bore open to the first chamber,

(d) a first valve positioned in said first chamber and engageable with said seat to block the flow of liquid through the bore and movable away from said seat to permit the flow of liquid through the bore,

(e) a slidable means secured to said first valve and projected through said first and second chambers,

(f) a piston positioned in said second chamber and mounted on said slidable means,

(g) a second valve movable to an open position to permit the flow of liquid through the second chamber and movable to a closed position to block said flow of liquid, and

(h) control means operable in response to flow of liquid through said bore to move the second valve to the open position whereby liquid flows through the second chamber with the result that the piston is urged by liquid pressure to move the first valve in engagement with the seat thereby terminating the discharge of liquid from the dispenser.

16. A valve unit for a liquid dispenser comprising

(a) a body having a first chamber and a second chamber, each chamber being adapted to receive a supply of liquid under pressure,

(b) a valve seat having a bore open to the first chamber providing a passage for the discharge of liquid from the first chamber,

(c) valve means positioned in said first chamber and engageable with said seat to block the flow of liquid through the bore and movable away from said seat to permit the flow of liquid through said bore,

(d) means connected to said valve means for moving the valve means toward and away from said valve seat to close and open the bore therein,

(e) piston means operably connected to said means and positioned in said second chamber, and

(f) control system operable to selectively permit the flow of liquid through the second chamber with the result that the piston means is urged by liquid pressure to close said valve means thereby terminating the flow of liquid through the bore in the valve seat.

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