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LIQUID DISPENSING NOZZLE

Original Filed March 18, 1939

FIG. 3

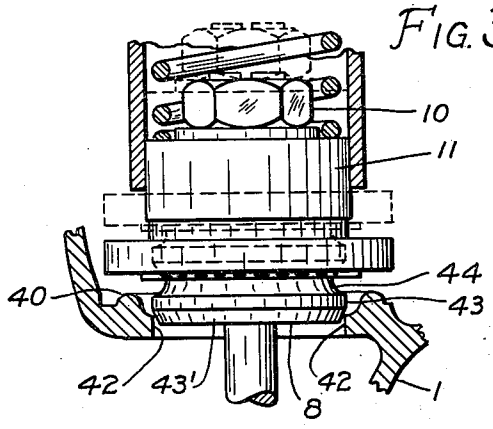

FIG. 2

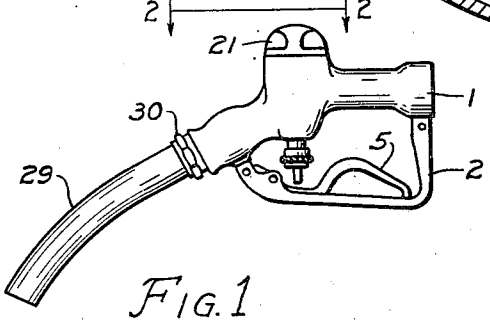

FIG. 1

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LIQUID DISPENSING NOZZLE

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16 Claims. (Cl. 251—143)

This invention relates to nozzle constructions for motor fuel dispensing equipment.

At the present time, motor fuel is dispensed from equipment generally consisting of a reservoir adapted to hold a relatively large quantity of fuel such as gasoline, from which the fuel is drawn by means such as a service station pump comprising a dispensing line which includes a motor driven pump, a meter, and a flexible hose terminating generally in a nozzle having a flow controlling valve. When the valve of the nozzle is open, the pump causes the fuel to flow through the dispensing line, through the meter, through the flexible hose and out of the nozzle into the tank to be filled. These modern nozzles generally include two valves, one a hand-operated valve normally spring pressed to closed position and adapted to be opened to provide full delivery or slow delivery. This valve controls the dispensing flow. In addition, each nozzle generally has a second valve, normally spring pressed to closed position but which spring is adapted to be opened by the normal forcing pressure of the pump when the main flow control valve is manually opened. This latter valve is utilized to prevent draining of the flexible hose and nozzle when the pump has stopped. It is referred to generally as a non-drain valve or bleeder valve.

Among the objects of the present invention are to provide in combination with a manually operable flow controlling valve for a fuel dispensing apparatus a vacuum operating dash-pot providing smoother action of the valve, gradual and slower closure thereof and eliminating the building up of quick excessive pressures in the flow line; to provide in connection with a manually operable flow controlling valve a dash-pot device or its equivalent wherein a constantly open port is provided connecting the interior of the dash-pot with the flow line for equalizing the pressures therein and wherein there is also provided a one-way acting valve adapted to permit the discharge of liquid relatively quickly from the interior of the dash-pot device into the nozzle when the manually operable valve is opened but which acts to prevent the ingress of liquid into the dash-pot and thereby providing sufficient vacuum within the dash-pot to prevent quick closing of the valve under the influence of the valve spring when the manual actuator of the valve is released whereby slowly to close the valve; to provide the nozzle valve dash-pot with a constantly open restricted equalizing valve to equalize pressures within and without the dash-pot in combination with a spring-pressed one-way valve; to provide the nozzle valve dash-pot cylinder as a replaceable unit and to provide means associated with the nozzle for quickly assembling the dash-pot; to provide means associated with the nozzle body for centering the dash-pot cylinder; to provide means for preventing injury and/or to prevent binding of the valve with respect to the dash-pot cylinder in case the nozzle becomes dented or is otherwise injured; to provide means for sealing the rear end of the dash-pot cylinder from the liquid pressure within the nozzle whereby to prevent the nozzle pressure acting against the rear wall of the dash-pot; to provide these and other objects of invention as will be evident from an inspection of the following specification when taken in connection with the accompanying drawing, wherein:

Fig. 1 is a perspective view of the improved nozzle;

Fig. 2 is a section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary view of the valve and its seat, showing various positions of the valve.

Referring now to the invention in detail, for purposes of exemplification the nozzle is shown as attached to the conventional service station motor fuel dispensing pump wherein the dispensing line is connected to the usual fuel reservoir and also connected to the usual type of motor driven pump for forcing the liquid through the meter and thence through the flexible tube, the end of which connects with the nozzle having the construction shown in the drawing. This flexible hose is attached to the nozzle body 1.

The nozzle body is provided with a detachable lever guard 2. The body is preferably cast metal and is machined to accommodate the various parts. The detachable lever guard supports a pin 3 projecting through a slot 4 of a valve lever 5 for manual operation of the valve stem 6 of the main flow controlling valve. The stem 6 passes through a conventional type of packing gland 7. The supper end of the valve stem telescopes within a bore of a throttling skirt 8 of the main flow control valve. The throttling skirt is provided with an upwardly extending core 9 which is preferably threaded to receive a nut 10 which clamps the main valve body 11 against a shoulder on the skirt 8.

The main flow control valve 11 is shown as a disk valve comprising a metal backing washer 12, a washer of sealing yieldable material and a metal retaining washer 39. The material of the sealing washer 13 may be as desired but preferably it is a synthetic rubber-like material known

as Thiokol which is impervious to gasoline. This washer makes a sealing contact with the main valve seat 40 which is of preferably semicircular cross section or of such cross section to provide a substantially narrow, restricted annular contact with the yieldable flat face of the main valve.

The body of the nozzle at the main valve seat is provided with an inwardly extending ring 41 providing a concentrically located throat providing a throttling port 42. This throttling port or throat 42 is formed as a true cylinder. The extension skirt 8 is provided with a corresponding cylindrical surface 43 adapted to be positioned concentrically within the throttling throat to provide an adjustably controlled throttle for the slow flow or restricted delivery of the liquid or motor fuel. The surface 43 of the throttling skirt is machined to between one and one-half and three one-thousandths of an inch smaller in diameter than its cooperating throat cylindrical surface 42. Preferably, below this cylindrical surface 43, the skirt is formed conically in shape so as to facilitate passage of the liquid during throttled or restricted flow.

The main valve and the throttling valve are arranged in spaced apart relation so that when the throttling valve is in operation and the liquid is restrictedly flowing therethrough, the main valve will be positioned relatively remote from the throat of the throttling valve through which the slow flow is taking place. By this arrangement any tendency of foreign matter to accumulate at the throttling seat and/or to back up around that portion of the main valve seat against which the yieldable face of the main valve contacts is eliminated, and inasmuch as the throttling passage is entirely metallic no possibility is present that such accumulated foreign matter or dirt can be impressed into the face of the throttling valve.

In addition, the valve structure is provided with means for preventing leakage of the main valve due to the impressing of foreign matter into the face of the yieldable material thereof. To accomplish this, the wall structure adjacent the valve is provided with relieved portions into which any foreign matter may wash during delivery and these relieved portions are disposed remote or relatively remote from the yieldable or sealing face of the main valve so as to preclude any possible impressing of the accumulation into the face of the rubber-like sealing material when the main valve closes against its metallic seat. To this end, the part of the nozzle body wall between the main valve seat and the throttling throat is relieved as at 41. In addition, the wall portion of the main valve and the throttle valve skirt is relieved as at 44 whereby to provide the annular channel, pocket or space 45 into which dirt and foreign matter tending to accumulate during slow flow will be deposited, and from which pocket such accumulation will be washed out during full delivery.

The subject matter of the foregoing combination is claimed in our pending application, Serial No. 262,596, filed March 18, 1939, of which application the present is a division.

The body of the main valve 11 is provided with a bore disposed substantially parallel to its axis, in which is located a one-way valve, herein shown as a ball valve 14, and its spring 15 which constantly urges the valve onto its seat but which spring gives when the main valve is manually opened from its seat. This yielding of the valve spring 15 is due to the pressure of the liquid in the dash-pot hereinafter described. An inlet passage 16 to said bore leads to the inside of the dash-pot while an outlet opening 17 is shown as connecting the bore with the nozzle passage through which liquid flow takes place and at the liquid flow pressure of the pump.

A dash-pot is provided for the main valve to prevent too quick closing of this valve under the action of its spring whereby to stop dispensing flow. The valve body 11 has a sliding fit with a cylinder 18. Compressed within the cylinder between the valve body 11 and the upper closed end of the cylinder 18 is a compression spring 19 for closing the main valve when pressure is released on the valve lever 5. At the closed end of the cylinder 18 is located a small constantly open orifice 20 which functions to bypass liquid into or out of the cylinder 18.

Means is provided for adjustably centering the cylinder with respect to the main valve whereby to prevent binding of the valve with respect to the cylinder, for sealing the closed end of the cylinder from the pressure within the nozzle, and for spacing the cylinder away from the body of the nozzle and the nozzle cap. To this end the nozzle body is threaded as at 22 and to these threads is secured the nozzle cap 21. The cap 21 has in its upper end a short bore 23 for guiding a boss 24 which is concentrically disposed as an integral part of the cylinder 18. In addition, an annular ridge or ring 25, substantially V-shaped in cross section, is disposed on the cap 21 for impressing into sealing material 26 under the action of the valve spring 19 and thereby sealing off the chamber 27 formed in the end of the cap, from the rest of the nozzle delivery chamber. This construction prevents the pressure within the nozzle due to the force of the liquid pumping means from acting upon the end of the cylinder 18.

The nozzle is provided with a non-drain or bleeder valve which is disposed in the flow channel on the discharge side of the main and throttle valves. As shown, the non-drain valve 28 is adapted to seat against the direction of flow of the dispensing liquid. This non-drain valve is arranged to preclude the opening of the main valve and the draining of the hose when the pump is not operating. The valve 28 and its supporting spring 33 are assembled before the nozzle tube 29 is screwed into place. The valve 28 is first inserted in its operative position by sliding its stem 34 into the guiding lug 35 forming a part of the nozzle body. The last coil 36 of the spring 33 of the non-drain valve is formed relatively larger in its free state than it is in its assembled position. The spring is positioned with its smaller end coiled about the nut of the non-drain valve and its larger end is compressed and forced into the body of the nozzle into its final operative position. When so placed, the final larger coil will thus expand. To assemble this spring 33 the coils are wound smaller by exerting a twisting action on the looped end 37 which allows the spring to be passed through the threaded portion of the nozzle body proper into its containing chamber where it is then allowed to expand and is thereby prevented from pushing out by the small shoulder 38 in the nozzle body 1. The free end of the spring provides a looped handle to permit of the twisting action and when the spring is properly positioned this loop or end 37 of the spring extends outwardly into the end of the

nozzle body 1 where it can be used to remove the spring when desired.

Means is provided for securing the customary nozzle tube 29 to the nozzle body 1. This tube 29 and the body 1 are threaded together and, in addition, a lock nut 30 having conically shaped external wall 31 is provided for wedgingly engaging within the cooperative conical walls 32 of the nozzle body 1. Hence, with this construction the curved nozzle tube 29 can be screwed into the nozzle body to the proper distance and then the nut 30 can be tightened to lock the nozzle in such set position without disturbing the predetermined relation of the curve in the nozzle tube 29 with respect to the nozzle body 1.

A herein unclaimed aspect of the present invention resides in providing the valve lever 5 with two fulcrum points for variable leverages. The lever 5 has a bearing pad 46' of special wearing material which makes contact with the stem 6 when the lever is manually raised. The two fulcrum points are pin 3 and upwardly turned boss 46 formed integral with the nozzle body and located within the lever guard 2. These fulcra are located so that upon upward movement of the lever 5 it first fulcrums on pin 3 thereby giving a short leverage and raising stem 6 which in turn raises the main valve assembly. When the lever 5 and stem 6 have raised the main valve to that position shown in solid lines in Fig. 3, the extended end 48 of the lever 5 has just made contact with the boss 46 and the two cylindrical surfaces 42 and 43 of the main valve are just separating. Any further movement of lever 5 causes increased delivery through the valve passage 42 and longer leverage by fulcruming on boss 46. The slot 4 will just pass idly by the pin 3. When the lever 5 and stem 6 are raised to their highest positions, the main dispensing valve will be in position as shown by dotted lines in Fig. 3, giving maximum area for liquid flow.

It will be noticed from the above construction that there is provided a clearance space, as at 45, for foreign matter to wash into and later to be washed out, thereby never packing it between the main valve seat, the sealing disk of yieldable material, and the throttling valve skirt. Also, by forming both the surfaces 42 of the throttling throat and the surface 43 of the throttling valve cylindrical and closely fitted there is obtained even at slow delivery a construction requiring the valve to be raised to the position shown in solid lines in Fig. 3. This construction maintains the throttling action between the two metal surfaces 42 and 43. The synthetic rubber disk 13 is entirely clear of its seat 40 so as not to detain any foreign matter in position to later be pressed into it when the disk closes against its seat.

It will be further appreciated that with the described construction of dash-pot a smoother acting valve is provided. In prior nozzles not involving the present construction, the attendant would generally hold the nozzle wide open until the tank was full or he had delivered the desired amount of fuel, whereupon he would instantly release the valve lever 5 which would snap instantly closed due to the pressure of the liquid on top of the valve in addition to the force of its closing spring. The result was that the inertia of the liquid in the system surging forward caused an extreme rise in pressure in the system. Normally in these systems there is maintained a pressure in the sight glass of approximately 22 pounds, but under the above described conditions the pressure would rise to 65 pounds. This presented a very injurious condition to the pumping system as a whole because it in time caused leaks at gaskets and was especially hard on the bearings. Also, without the dash-pot construction herein disclosed, it was difficult to hold the valve only slightly open for the presure built up on top of the valve and caused a hammering or pounding action. These undesirable features have been overcome in the present construction wherein normally when the nozzle valve is in closed position as that shown in Fig. 2, the ball valve 14 is held against its seat by the spring 15 and the pressure within the cylinder 18 is balanced or equal with that within the nozzle body 1 because of the small, constantly open orifice 20 which allows equalized pressure. Upon opening the main valve 11 by the lever 5, liquid in the cylinder 18 is displaced, some passing out through the small orifice 20 but most passing through the port controlled by the ball valve 14 due to the fact that this offers least resistance to a quick displacement of a volume of liquid. The spring 19 will be compressed but that is practically all the resistance encountered in opening the valve.

The clearance maintained between the inner wall of the cylinder 18 and the valve body 11 is between one and one-half and three one-thousandths of an inch on the diameters and therefore practically no liquid will by-pass here. The main valve may be opened to the position shown in dotted lines in Fig. 3 but irrespective of the position to which it is opened, when the lever 5 is quickly released the spring tends to force the valve assembly down and acts as a piston in the cylinder 18. Upon quick downward movement of the valve, vacuum is incurred within the cylinder because the liquid can not pass by the ball valve 14 into the cylinder and because the small orifice 20 is only thirty-seven one-thousandths of an inch in diameter and therefore prevents a quick inlet of liquid. Therefore, a cushioning action is effected on the valve, preventing it from snapping shut instantaneously, thereby giving the liquid in the hose and system a chance to slow down more gradually and preventing the creation of high pressures. This construction also eliminates the undesirable hammering or pounding action.

By forming the cylinder separate from the cap and spacing the cap on all sides away from the cylinder body, any possible binding action between the valve and the cylinder is eliminated. The advantage of this lies in the fact that nozzles become abused, many times being dropped on the concrete driveway and consequently the bodies become dented. If the cylinder were a part of the body 1 or cap 21 and these latter became dented or distorted in the slightest way, the valve body 11 would bind and the nozzle would become inoperative. No such action can take place with the present construction.

Instead of bolting or threading the cylinder 18 within the cap 21, which would require that all parts be extremely accurately machined to insure that the valve body 11 would not bind in the cylinder 18 due to misalignment, the method of assembly heretofore described is utilized whereby these parts are free to adjust themselves into alignment without requiring extremely accurate machining.

The invention is hereby claimed as follows:

1. A nozzle for a liquid dispenser comprising a body having a valve seat, a valve adapted to close upon said seat, said valve having a piston, a cylinder for said piston having a closed end, means for floatingly mounting said cylinder within the body to prevent binding between said cylinder and the piston, and self-centering means for sealing the closed end of said cylinder from the hydraulic pressure within the valve body.

2. A nozzle for a liquid dispenser comprising a body having a valve seat, a valve adapted to close upon said seat, said valve having a piston, a cylinder for said piston having a closed end and being freely movable in a direction longitudinally of the central longitudinal axis of the cylinder, means for mounting the cylinder within the body solely at the closed end of the cylinder, the annular side walls of the cylinder being spaced from the body, and sealing means between said closed end of the cylinder and said body.

3. A nozzle for a liquid dispenser comprising a body having a valve seat and a valve adapted to close thereon, said body having an opening axially of said valve, a cap closing said opening, said cap having a bore axially of said valve and provided with a concentrically disposed outstanding sealing means, a cylinder within said body and having a boss freely slidable within said bore, yieldable means disposed between the end of the cap and the closed end of said cylinder and engaged by said sealing means, and a spring for said valve disposed in said cylinder and adapted to hold said cylinder in yieldably centered position with respect to said cap.

4. A nozzle for a dispenser comprising a body having a valve seat, a valve adapted to close upon said seat, said valve having a piston portion, a dash-pot cylinder for said piston having a closed end, said cylinder being shiftably and floatably mounted upon and relatively to said body and being spaced from the body at all points except at said shiftable connection, and shockproof cushioning means between said body and the end of said cylinder.

5. A nozzle for a liquid dispenser comprising a body having a valve seat and a valve adapted to close thereon, said valve having a piston, a dash-pot cylinder slidably connected to the body so as to be shiftable axially of the line of movement of the valve, means yieldably urging the closed end of the cylinder against the body and the valve to its seat, means for sealing the outer wall of the closed end of the cylinder from the pressure of the liquid within the nozzle, the remainder of the outer wall of the cylinder being exposed to such pressure, and means acting during the movement of the piston in a direction out of the cylinder for preventing substantial movement of liquid into the interior of the cylinder whereby to cushion the closing movement of the valve onto its seat.

6. In a valve structure, the combination of a casing having a liquid inlet, a liquid outlet, and a connecting valve seat, a cylinder mounted in said casing, said cylinder having a closed head mounted in said casing, and an open end directly opposite said seat, a combined valve and piston disposed in said casing and having a valve for seating on said seat and with the piston slidably fitting in said cylinder, said piston having a central bore, an elongated plug mounted in said bore, said plug having a shoulder engaging the underside of said valve and having a cylindrical body passing through and projecting beyond said central bore, a nut threaded upon said cylindrical body, a spring coiled within said cylinder between the closed end thereof and said piston, said cylindrical body having a central bore and a valve operating stem passing through a packing in said casing and lying freely in said last mentioned central bore.

7. In a valve structure, the combination of a casing having a barrel formed with a relatively large lateral opening, a head detachably mounted in said opening and formed with a cylindrical bore, a cylinder having a closed end and an opposite open end, means mounting said cylinder end in said head, the side walls of said cylinder being spaced from the inner wall of said head, said casing being formed with an internal partition having a valve seat directly opposite the open end of said cylinder, said casing having a liquid inlet and an outlet on opposite sides of said partition, a combined piston and valve operable in said casing so that the valve closes on said seat and the piston slides in the cylinder, said combined piston and valve having an internal passage connecting the interior of said cylinder with the liquid inlet, a spring-pressed valve in said passage normally closing said passage but yieldable to permit liquid to pass from within said cylinder to said inlet, a spring within said cylinder one end pressing against said cylinder head and the other against the piston, and a restricted passage through the side wall of said cylinder connecting the interior thereof with the inlet passage.

8. A nozzle for a liquid dispenser having a main casing formed with a valve seat, a head detachable from said casing, a manually actuatable valve mounted within said casing and closing upon said valve seat, said valve including a piston, a cylinder in which said piston reciprocates mounted solely in said head, said cylinder having a closed end which is mounted adjacent said head, and a yieldable, resilient packing disposed between said head and said cylinder end.

9. A nozzle for a liquid dispenser having a casing formed with a valve seat, a manually actuatable valve adapted to close thereon, said valve including a piston, a cylinder within which said piston is adapted to operate, said cylinder being closed at one end, and resilient shockproof packing disposed between the closed end of said cylinder and said casing, said cylinder being freely movable in a direction longitudinally of the central longitudinal axis of the cylinder.

10. A nozzle for a liquid dispenser having a liquid inlet and a liquid outlet and an intermediate internal partition having an opening providing a valve seat, a valve adapted to close upon said seat, a piston movable with said valve, said nozzle opposite said valve seat having an opening larger than said valve, a cylinder adapted to be inserted through said second opening to receive said piston, said cylinder having a closed end, and a cap detachably closing the second mentioned opening, said cap and the closed end portion only of the cylinder being formed with relatively shiftable interacting portions forming an adjustable mounting for centralizing the cylinder relatively to the movable piston, the remaining walls of said cylinder being spaced from said cap and nozzle body whereby to permit said cylinder shiftably to adjust itself relatively to said piston.

11. A valve structure comprising a casing having a liquid inlet, a liquid outlet and an intermediate partition having an opening and a pair

of associated spaced apart valve seats, a valve member comprising a piston having a central bore and a basal, laterally extending flange, a cylinder adapted to receive said piston, a plug of circular cross-section seated in said bore, the upper end of said plug being threaded, the opposite end of said plug having a laterally extending flange adapted to close upon one of said seats, a valve facing for said basal flange disposed between said flange and said laterally extending flange of said plug, and a nut threadedly engaging the threads of said plug to clamp said facing to said piston flange.

12. A valve structure comprising a casing having a liquid inlet, a liquid outlet and an intermediate partition having an opening and a pair of associated spaced apart valve seats, a valve member comprising a piston having a central bore and a basal, laterally extending flange, a cylinder adapted to receive said piston, a plug of circular cross-section seated in said bore, the upper end of said plug being threaded, the opposite end of said plug having a laterally extending flange adapted to close upon one of said seats, a valve facing for said basal flange disposed between said flange and said laterally extending flange of said plug, and a nut threadedly engaging the threads of said plug to clamp said facing to said piston flange, said piston having a longitudinally extending smaller bore opening at one end into said cylinder to provide a valve seat and at the other end opening onto said valve facing, a valve in said smaller bore and a spring in said smaller bore pressing said valve to its seat.

13. A nozzle valve for a liquid dispensing device comprising a valve body having inlet and outlet flow passages through which liquid is adapted to be passed, said valve body having an annular portion forming a main valve seat and an annular portion forming a throttling valve seat spaced from the main valve seat in a direction toward the outlet passage, and a valve member movable to open position toward the inlet side of the valve, said valve member having an annular main valve of resilient material adapted for cooperation with said main valve seat, and an annular metallic throttling valve adapted for cooperation with said throttling valve seat, said throttling valve being brought into throttling position on the closing movement of the valve member before the closing of the main valve, and said valve body and valve member being cooperatively shaped so as to provide an annular recess between the main valve and throttling valve into which dirt and foreign particles may be swept from the main valve seat upon the closing of the valve member, and means for operating said valve member comprising a manually operable control handle for moving the valve member to open position and a spring for moving the valve member to closed position, and means comprising a fluid-controlled dashpot structure for retarding the rate of closing of said valve member by said spring.

14. A nozzle valve as defined in claim 13, wherein the annular portion of the valve body forming the main valve seat is of curved shape in radial cross-section, and wherein the annular resilient material portion of the valve member cooperating therewith is of flat disc-like shape, thereby providing a narrow band of contact between the main valve parts.

15. A nozzle valve as defined in claim 13, wherein the annular portion of the valve body forming the throttling valve seat and the annular portion of the valve member cooperating therewith are formed as coaxial cylindrical surfaces providing substantially closed contact for an appreciable distance of movement of the valve member.

16. A nozzle valve as defined in claim 13, wherein the annular portion of the valve body forming the main valve seat is of curved shape in radial cross-section, the annular resilient material portion of the valve member cooperating therewith being of flat disc-like shape, thereby providing a narrow band of contact between the main valve parts, and wherein the cooperating annular portions of the valve body and valve member forming the throttling valve are formed as coaxial cylindrical surfaces providing substantially closed throttling valve relationship during an appreciable movement of the valve member.

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