July 13, 1943. H. M. GROOMES 2,324,150

LIQUID DISPENSING NOZZLE

Filed Oct. 21, 1940

Fig. 1.

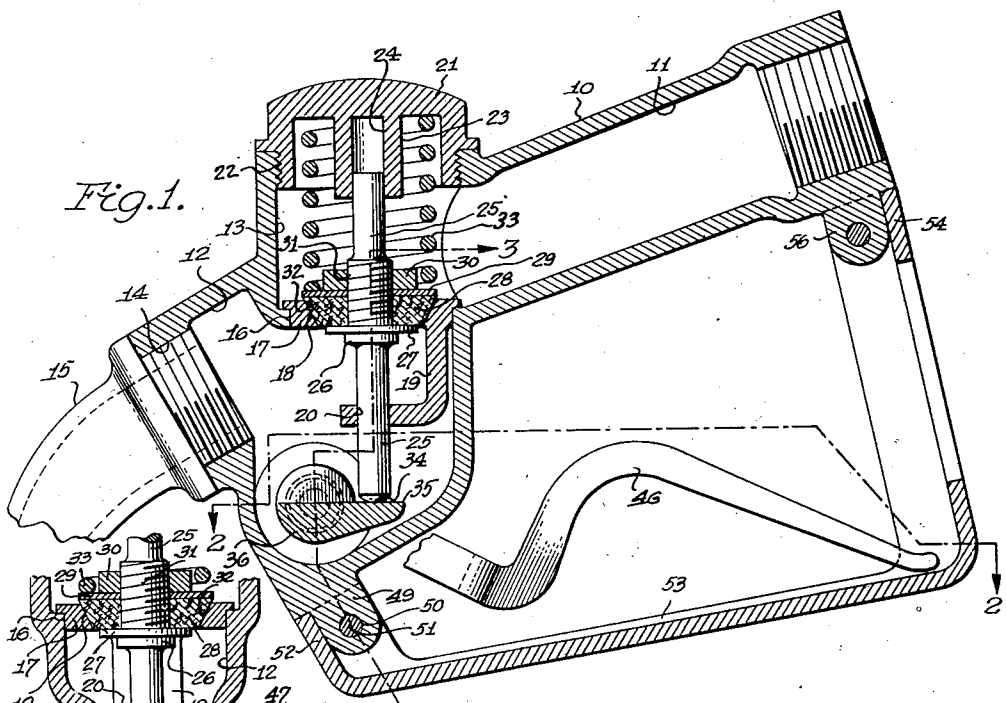


Fig. 3.

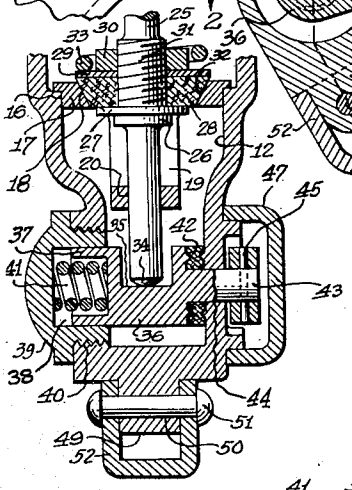


Fig. 4.

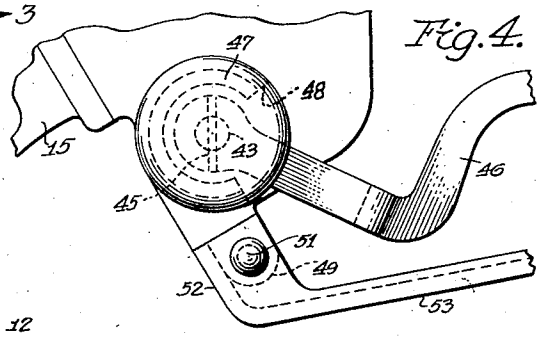
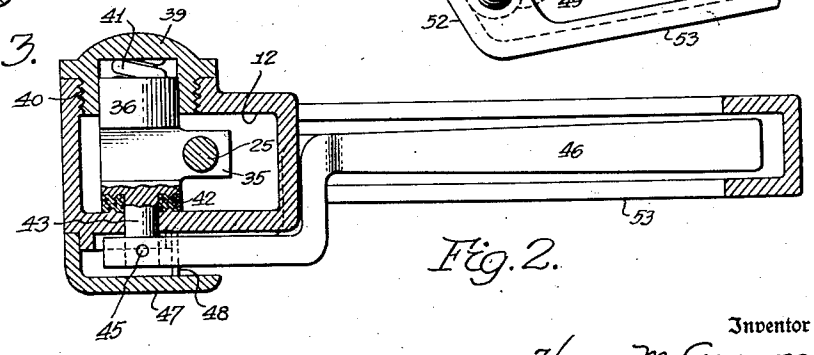


Fig. 2.



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Patented July 13, 1943

2,324,150

UNITED STATES PATENT OFFICE

2,324,150

LIQUID DISPENSING NOZZLE

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Application October 21, 1940, Serial No. 362,014

5 Claims. (Cl. 251—134)

This invention relates to nozzles and in particular to liquid dispensing nozzles, such as for the dispensing of fuels.

One object of this invention is to provide a liquid dispensing nozzle having the valve mechanism wholly internal, without the necessity for external protruding valve stems, and therefore eliminating external packing and consequent friction and binding.

Another object is to provide a liquid dispensing nozzle having a positive actuation of the valve stem substantially without lost motion, thereby giving a positive control over the "tapering off" of the flow as the container into which the liquid is being dispensed becomes full.

Another object is to provide a liquid dispensing nozzle wherein the inlet and outlet conduits are substantially in line with the valve aperture, thereby giving a substantially straight line flow to the liquid and reducing eddy currents and other interferences with free flow.

Another object is to provide a liquid dispensing nozzle wherein the valve stem is actuated by a cam mechanism directly and positively connected to the control handle, so that lost motion is substantially absent.

Another object is to provide a liquid dispensing nozzle wherein the valve stem is guided positively on opposite sides of the valve seat and wherein the valve stem is free from the necessity of engaging packings, so that when the control handle is released by the operator, the valve stem follows it immediately without sticking or binding due to packing friction, and consequently without the pressure "kick" common in nozzles requiring packings around the valve stems.

Another object is to provide a liquid dispensing nozzle composed of easily manufactured parts and adapted to be assembled and disassembled with speed and facility.

In the drawing:

Figure 1 is a central longitudinal section through a preferred embodiment of the liquid dispensing nozzle of this invention.

Figure 2 is an irregular but substantially longitudinal section taken along the irregular line 2—2 in Figure 1.

Figure 3 is a cross section taken along the irregular line 3—3 in Figure 1.

Figure 4 is the right-hand side elevation of the portion of the nozzle shown in Figure 3.

Hitherto, liquid dispensing nozzles, particularly for gasoline, have been provided with valve stems protruding from the casing through packings, these valve stems being actuated by control handles through lost motion or double pivoting connections. The necessity for these external packings around the valve stem, however, has caused the valve stem to bind and to delay its return to its seat when the control handle was released.

As a consequence, due to this delay, followed by a sudden closing of the valve, a pressure "kick" arose as the result of the pressure in the line being suddenly cut off. Furthermore, in such prior art nozzles, it has been very difficult for the operator to "taper off" the flow gradually as the tank which he is filling becomes full. Moreover, in order to overcome the friction in the external packing around the valve stem of a prior art nozzle, it has been necessary to provide a very heavy spring to overcome this friction. The sudden release of this spring has been a large factor in causing this pressure "kick."

In the nozzle of the present invention, the valve stem lies entirely within the nozzle and is engaged by the valve lifting mechanism within the nozzle. As a consequence, the valve stem does not stick because there are no packings through which the valve stem reciprocates. A light spring is all that is necessary for returning the valve to its closed position. The valve stem is lifted by a rotary cam mechanism within the nozzle, hence a direct actuation without lost motion is accomplished. The only packing necessary is a packing around the rotatable shaft but the rotary friction is of little consequence and has no effect upon the return of the valve stem as compared with the heavy friction drag of a packing around a reciprocating valve stem. Consequently, the operator can accurately control the tapering off of the liquid flow by gradually releasing the handle because the valve stem immediately and accurately follows the motion of the cam, due to the substantial absence of friction in the valve stem, which is guided or piloted above and below the valve seat. The intake and outlet portions of the nozzle are substantially in a straight line with the valve seat aperture, hence a substantially straight line flow of the liquid is accomplished, thus reducing eddy currents and other influences interfering with the free flow of the liquid.

Referring to the drawing, in detail, Figure 1 shows a preferred embodiment of the liquid dispensing nozzle of the invention as consisting of a nozzle casing 10 having an inlet chamber 11, an outlet chamber 12, and a valve chamber 13 disposed therebetween. Threaded as at 14 into the outlet chamber 12 is a nozzle extension 15 customarily inserted into the gasoline tank of the

automobile or other container for the liquid being dispensed.

The valve chamber 13 has its axis somewhat at an angle to the axes of the inlet and outlet chambers 11 and 12 and is provided at its lower end with an aperture 16 into which is inserted a valve seat member 17, preferably of bronze or other suitable material. The valve seat member 17 is provided with a substantially conical valve seat 18 and a downwardly extending bracket portion 19 having a bore 20 at the lower end thereof. The upper end of the valve chamber 13 is closed by a hollow cap 21 or "bull nut" threaded therein as at 22 and containing an internally extending boss 23 having a bore 24 therein aligned with the bore 20.

Reciprocably mounted within the bores 20 and 24 is a valve stem 25 provided with an enlargement 26 and a washer 27 upon which is supported a valve head 28, backed by a washer 29 and a nut 30 threaded upon the threaded portion 31 of the valve stem 25. The valve head 28 is provided with a conical annular surface 32 mating with the conical valve seat 18 and is urged into engagement therewith by the coil spring 33 extending between the valve head washer 29 and the hollow cap 21.

The lower or inner end of the valve stem 25 is rounded as at 34 and is engaged by a cam portion 35 upon a cam shaft 36. The latter has a hollow tubular portion 37 at one end (Figure 3) rotatable in a bore 38 within a hollow cap 39 threaded as at 40 into the walls of the outlet chamber 12. A coil spring 41 extending between the end of the cam shaft 36 and the inner end wall of the cap 39 urges the cam shaft 36 to the right (Figure 3) against a packing 42, the opposite side of which engages the inner wall of the outlet chamber 12, and is seated by annular cutting ridges maintained at a constant pressure by the spring 41.

The cam shaft 36 terminates in a stem 43, which passes outward through a bore 44 in the outlet chamber 12 immediately adjacent the packing 42. Secured to the outer end of the stem 43, as by the pin 45, is a control handle 46 in the form of a bent arm. To protect this connection, the casing 10 is provided with a shield portion 47 extending thereover and provided with an arcuate aperture 48 (Figure 4) for the play of the control handle 46 as it is moved to and fro by the operator.

The nozzle casing 10 is provided with an extension 49 having a bore 50. Secured to this extension, as by the rivet 51 passing through the bore 50, is the lower end 52 of a handle guard 53, the upper end 54 of which is similarly secured to the upper casing extension 56. This construction enables the easy replacement of a guard 53, such guards being frequently broken when the nozzle is dropped.

In the operation of the nozzle to discharge liquid, the operator pulls the handle 46 upward, rotating the cam shaft 36 and swinging the cam portion 35 and the valve stem 25 upward. This positively forces the valve head 28 off the valve seat 18 and permits liquid to flow directly from the inlet chamber 11 into the outlet chamber 12 and thence through the nozzle extension 15 into the tank.

As the tank becomes full, the operator gradually releases the handle 46, swinging the cam portion 35 downward and permitting the spring 33 to urge the valve head 28 toward its seat 18. The guide bores 20 and 24 serve to guide the valve stem and to reduce the danger of binding. The absence of packings around the valve stem substantially frees it from friction, so that the valve stem follows the release of the handle 46 without lag or delay. This immediate follow-up of the valve stem with the control handle 46 eliminates the pressure "kick" in prior valves where it was necessary to provide a packing around the valve stem.

Before the operator completely releases the control handle 46, the valve head 28 moves completely into engagement with the valve seat 18 and entirely cuts off communication between the inlet chamber 11 and the outlet chamber 12. The liquid, such as gasoline, immediately stops flowing and dispensing ceases. Since the inlet chamber 11, outlet chamber 12, and nozzle extension 15 are subsantially in line with the aperture or port formed by the valve seat 18, the liquid flows through the nozzle in substantially a straight line, thereby greatly reducing eddy currents and other interference with the flow of the liquid. The handle 46 accurately controls the motion of the valve stem 25 throughout the opening and closing operations because there is no lost motion between these members. A light spring 33 is sufficient to close the valve because of the absence of packings around the valve stem and because the valve stem is wholly internal rather than extending through the wall of the casing, as in prior art nozzles.

While a specific embodiment of the invention has been described and illustrated, it will be understood that various modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

What I claim is:

1. In a liquid dispensing nozzle, a nozzle casing structure having a valve chamber with a valve port therein, a valve stem reciprocable within said valve chamber, a valve mounted on said valve stem and engageable with said valve port, a cam shaft structure having a cam thereon engageable with said valve stem, a packing disposed between said cam shaft structure and said casing structure, and yielding means for urging said cam shaft structure against said packing at a substantially constant pressure, at least one of said structures having a ridge thereon projecting into said packing whereby to prevent leakage past said packing.

2. In a valved liquid-dispensing nozzle, a nozzle casing having an aligned inlet chamber and an outlet chamber, defining a liquid flow chamber, a valve chamber having a valve port diagonally disposed relative to the inlet and outlet chambers, a removable valve seat located in said valve port, a valve stem reciprocably mounted in the valve chamber, a valve carried by the valve stem for closing said valve port, a valve stem guide mounted in one end of the valve chamber, a valve stem guide dependent from said valve seat for the opposite end of said valve stem, a cam for operating the valve stem mounted in one end of said valve chamber, said dependent valve stem guide and cam being offset with respect to the liquid flow chamber and out of the path of liquid flow therein.

3. In a liquid dispensing nozzle, a casing having an inlet chamber defining a liquid flow channel, an outlet chamber and a valve chamber therebetween with a valve port therein, a valve stem reciprocable within said valve chamber and having its opposite ends terminating within said nozzle casing, a valve mounted on said valve stem

between its ends and engageable with said valve port, valve stem guides disposed on opposite sides of said valve port and out of said liquid flow channel for guiding said valve stem in its reciprocation, cam means within said casing also removed from said liquid flow channel for reciprocating said valve stem and an external cam operating lever for the cam means.

4. In a liquid dispensing nozzle, a casing having an inlet chamber defining a liquid flow channel, an outlet chamber and a valve chamber therebetween with a valve port wall having a valve port therein, said valve chamber having a pair of recesses extending laterally outward relatively to said inlet chamber on opposite sides thereof, a valve stem reciprocable within said valve chamber and having its opposite ends terminating within said casing, a valve mounted on said valve stem between its ends and engageable with said valve port, a pair of valve stem guides disposed on opposite sides of said valve port, a pair of valve stem guides disposed on opposite sides of said valve port for guiding said valve stem in its reciprocation, one of said valve stem guides being disposed in one of said recesses for receiving one of the valve stem ends, and the other valve stem guide being disposed in the other recess for receiving the opposite end of the valve stem whereby said valve stem guides are out of said liquid flow channel, one of said guides depending from said valve port wall and means for reciprocating said valve stem.

5. In a liquid-dispensing nozzle, a nozzle casing having an inlet chamber and an outlet chamber defining a liquid flow chamber, a valve chamber having a valve port between the inlet and outlet chambers, a removable valve seat located in the valve port, a valve stem guide depending from the valve seat, a spring-loaded valve for said valve seat, a valve stem carried by the valve and supported at one end by the guide, a cam operator beneath said valve stem guide and within said casing for operating said valve stem, said valve stem guide and cam operator being offset from the liquid flow chamber and out of the path of liquid flow therein.

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