

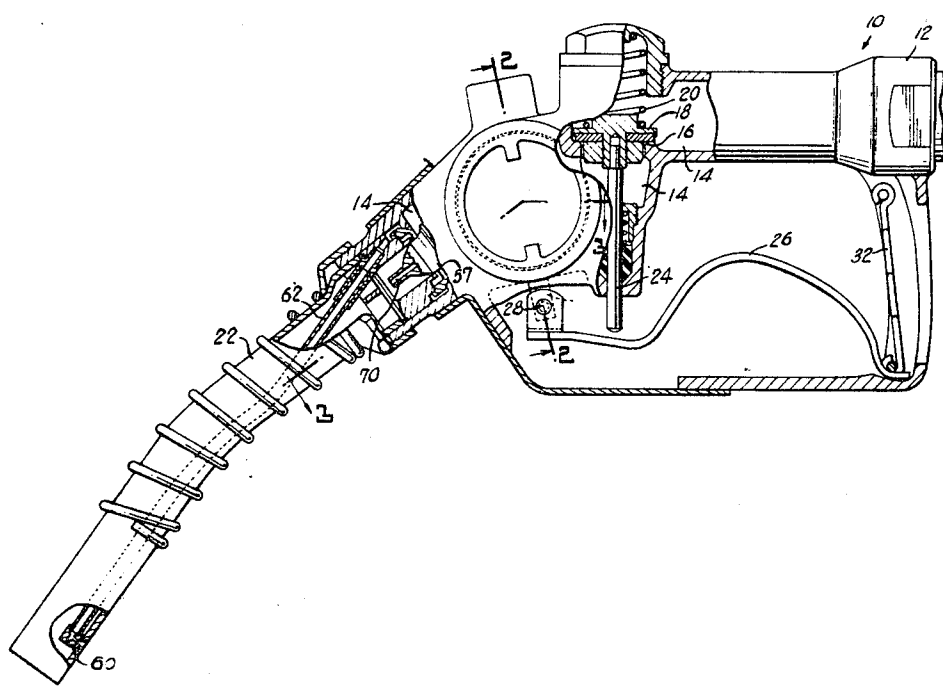
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[45] Patented June 22, 1971
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[54] AUTOMATIC DISPENSING NOZZLE
5 Claims, 7 Drawing Figs.
[52] U.S. Cl..... 141/128,
141/225
[51] Int. Cl..... B65b 3/26
[50] Field of Search..... 141/192-
—229, 128

ABSTRACT: An automatic dispensing nozzle for liquid fuel of the type in which a main valve control lever is mounted on a fulcrum held in place by a quick release latch, responsive to a vacuum signal, wherein the latching device releases the fulcrum successively in two stages, in the first of which the main valve is closed to the point where flow is quite restricted, and in the final stage wherein the plunger is released to permit complete closure of the valve.



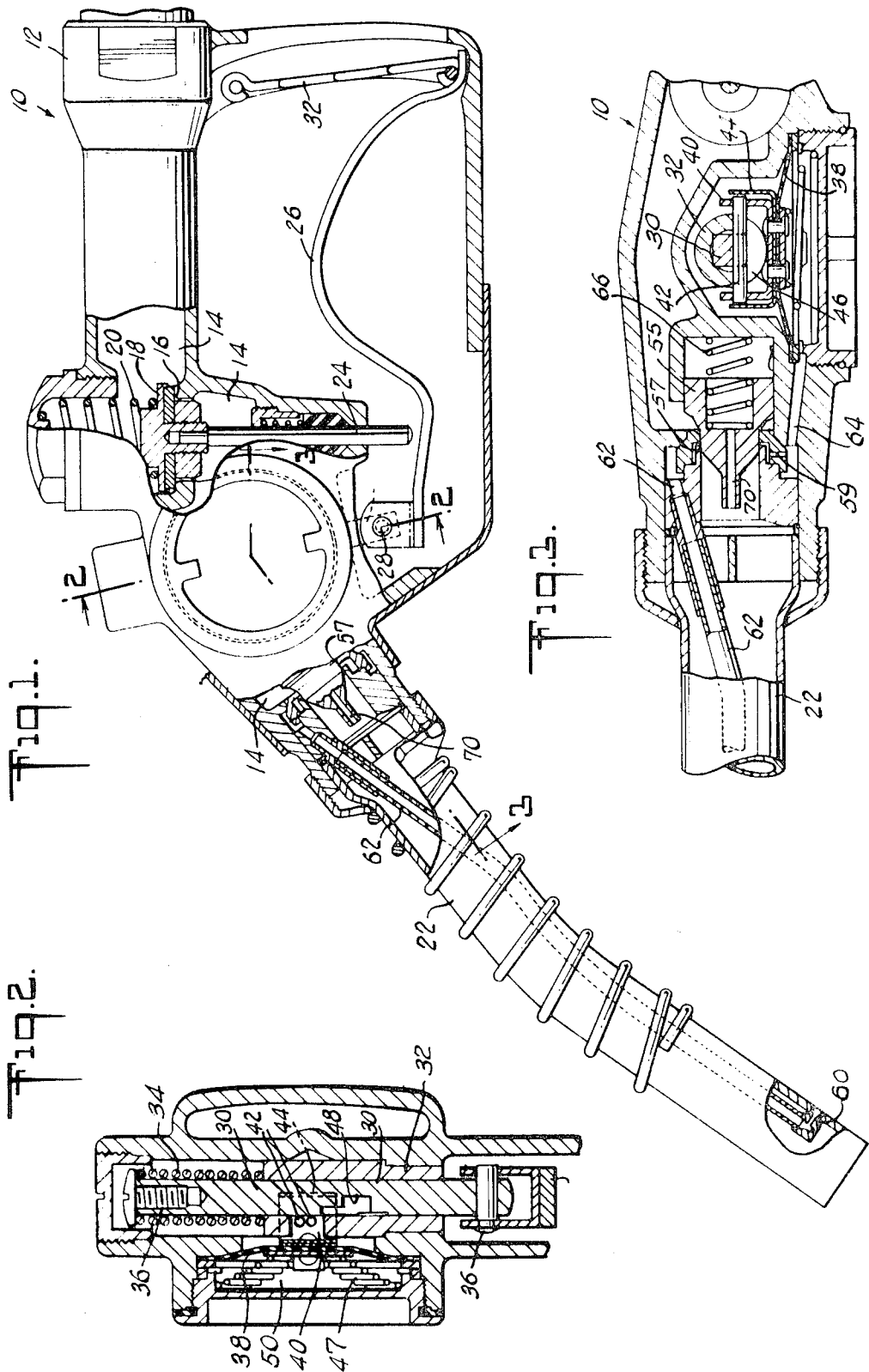


Fig. 4.

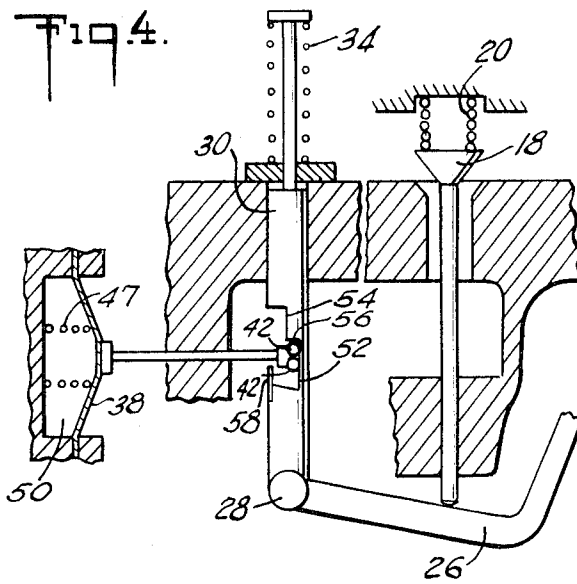


Fig. 5.

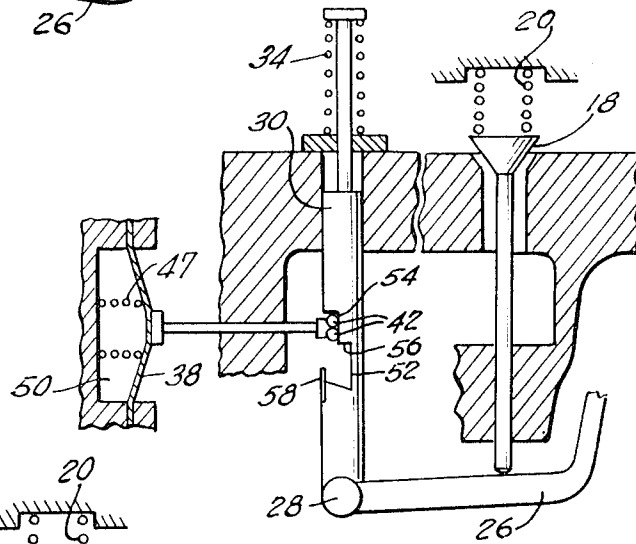


Fig. 6.

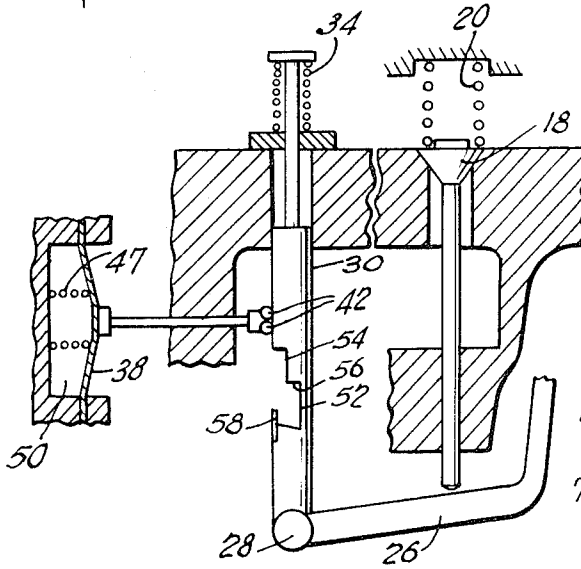
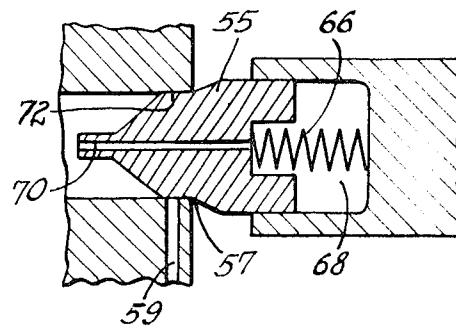


Fig. 7.



AUTOMATIC DISPENSING NOZZLE

The present invention relates to an automatic fuel dispensing nozzle and more particularly to such a nozzle which is automated to the extent of controlling both the filling and topping operations, so that the tank is properly topped off and filled at the time of the ultimate shutoff of the nozzle.

As explained in copending Pat. application, Ser. No. 821,366 filed May 2, 1969 (D070,771) the typical fuel tank filling operation calls for a reasonably fast flow of fuel to enable prompt service. Typically however, as the filling reaches within 1 or 2 gallons of completion, a tendency towards constriction in the internal space of the tank or filler pipe produces a characteristic back surge of liquid in the filler pipe. With the conventional type of automatic dispensing nozzle this back surge of liquid actuates means to shut off the main valve and thus terminate the flow.

Subsequent topping-off is usually conducted by the operator, a job which may be onerous under certain conditions and frequently may entail spillage.

The present invention provides a nozzle effective to conduct this series of operations automatically.

More specifically the present invention is concerned with the automatic shutoff nozzle of the type wherein the main control valve in the conduit extending through the nozzle is actuated through a suitable stem by the means of a lever. The valve is self-closing so that the lever must force the valve to open position in which it can be locked by a suitable latch.

The lever, in turn, operates on a fulcrum or pivot which is disposed and mounted upon a lockout plunger, the position of which is normally fixed by a suitable quick-release locking means. In the conventional device the rise of fluid about the tip of the nozzle creates a signal, such for example as a vacuum impulse which releases the aforesaid locking mechanism and accordingly the lockout fulcrum, which is driven down by the inherent closing force of the valve. This releases the lever and closes the valve.

In accordance with the present invention it is proposed to so construct and arrange the lockout fulcrum that the control signals which ordinarily control the release of the lockout mechanism do so in two successive stages. In the first of these stages the lockout plunger is released through a predetermined, restricted path of motion so that the lever fulcrum moves only a small distance just sufficient to permit the lever to partially close the main valve down to a predetermined relatively low flow position at which the rate of fuel flow through the nozzle is substantially less than the ordinary filling rates. Partial closure of the valve takes place without releasing the latch holding the lever. It therefore enables the subsequent topping-off operation to be conducted at a relative trickle of fuel so that when the final vacuum signal, for example, is transmitted to the release mechanism for the lockout plunger this latter member is now completely released so that the lever collapses and the main valve finally closes.

An important feature of the present invention follows from the fact that the foregoing mechanism acts cooperatively with the check valve or so-called restrictor plug, which normally operates to keep the nozzle full of fuel, in such a manner as to effect a brief, but highly desirable, time delay between the full flow position and the topping-off operation. That is to say, the sudden change in the inertia of the flowing stream as the flow is reduced, causes the restrictor valve to close momentarily. Therefore simply by heightening the inherent dashpot effect it is possible to delay the topping-off operation for the period of time which is necessary to enable the initial surge of liquid in the fill pipe to subside preparatory to the topping-off operation.

In order to illustrate the present invention more specifically in terms of one particular embodiment thereof, reference is made to the figures of the attached drawing. This embodiment is a modification, improvement and reconstruction of the specific automatic dispensing nozzle illustrated for example in U.S. Pat. No. 3,196,908, which patent is referred to for a more detailed description and understanding of the basic parts of the nozzle upon which the present invention is developed.

In the drawing, FIG. 1 is a side elevation of the nozzle with major portions broken away to expose the interior in section,

FIG. 2 is a more detailed enlarged vertical section taken on the line 2-2 of FIG. 1,

FIG. 3 is a vertical side elevation taken on the line 3-3 of FIG. 1,

FIGS. 4, 5 and 6 are diagrammatic representations illustrating the specific operation of the lockout mechanism as it affects the lockout fulcrum plunger and the control lever and main valve which are associated therewith,

more specifically, FIG. 4 diagrammatically represents the parts during normal filling operation with the main valve in full open position,

FIG. 5 discloses the arrangement of the parts after the initial surge of fluid about the nozzle and with the fulcrum dropped to lower the main valve to constricted or low-flow position,

FIG. 6 shows the parts after the final release of the lockout plunger with the lever released and the valve fully closed,

FIG. 7 is a diagrammatic vertical sectional detail through the check or restrictor valve illustrating its function in causing a predetermined, momentary delay of the changeover operation.

The nozzle shown in FIGS. 1, 2 and 3 comprises a cast housing 10 with an inlet fitting 12 and an internal flow passage 14 controlled by a valve 18 urged to closed position on seat 16 by relatively heavy spring 20. Passage 14 continues through spout 22 which is inserted into the fill pipe of the tank.

The valve member 18 includes a valve pin or rod 24 which extends through the body and can be contacted by lever 26. The lever 26 is manually operated and is pivoted at fulcrum 28 which is, in turn, mounted on the lockout rod or plunger 30.

The opposite extremity of lever 26 is engageable in known ways with latch member 32 having, as indicated, a plurality of notches which are adapted to engage the end of the lever.

The rod or plunger 30, as is shown more clearly in FIGS. 2 and 3, moves vertically in sleeve 32 which is mounted within the body of the nozzle.

Compression spring 34 between the upper end of sleeve 32 and the head of screw 36 threaded in the upper end of the plunger 32, tends to urge the plunger 30 to its upper position, where it is retained by a releasable locking mechanism comprising a diaphragm 38 to which is attached a forked roller carrier 40. A pair of rollers 42 are mounted on the roller carrier and are retained in position by a spring clip 44.

The sleeve 32 is relieved as at 46 to admit rollers 42 for entry into a notch 48 in the plunger or rod 30. A spring 47 acts upon the diaphragm, normally urging the rollers into the notch 48 in the plunger 30, as best shown in FIG. 2, positively locking the plunger against downward movement and thus fixing the fulcrum of the control lever 26 in normal operating position.

Therefore, in response to a vacuum signal in the chamber 50 opposite the diaphragm 38, the rollers 42 are withdrawn so that the plunger is unlatched and therefore permitted to snap downwardly in response to the overriding force of spring 20.

The present invention to be now described involves a modification of the plunger rod 30 as diagrammatically represented in FIGS. 4, 5 and 6. Therein the notch which has been indicated by the reference numeral 48, in actuality comprises two sections, a relatively deep section 52 and a relatively shallow section 54, separated by a shoulder 56. In the normal position of the mechanism as shown in FIG. 1, the fulcrum lockout plunger 30 takes the position shown diagrammatically in FIG. 4, with the lockout rollers in the deeper recess 52 and against shoulder 56. Therefore, lever 26 can be actuated upwardly about fulcrum 28 to open the valve 18 as shown to normal full flow position, with the fulcrum 28 meanwhile locked in the position shown.

Now therefore when, with the arrival of the first control signal, namely the vacuum impulse within the chamber 50 opposite the diaphragm 38, the rollers will be snapped to the left, out of the deep notch 52. Since projecting bumper or deflector 58 prevents withdrawal of the roller completely out of the

recess, the rollers 42 just pass shoulder 56 so that the fulcrum plunger 30 is driven downwardly by the overriding force of spring 20 to the position shown in FIG. 5, namely with the rollers 40 now residing against the upper shoulder of the relatively shallow notch 54 and the plunger 30 locked in the intermediate position.

In this position as indicated in FIG. 5, the valve 18 is now in an almost closed position, that is to say, it admits of only a relatively restricted flow as compared with normal filling rates, predetermined at, for example, a rate of say 1—2 gallons per minute instead of the normal filling rate of 8—12 gallons.

Therefore this relatively low flow or trickle enables the final gallon or so of fuel to be entered into the tank without an objectionable surge.

Hence when the final rise of fluid occurs about the tip of the nozzle, the resulting vacuum signal again draws the diaphragm 38 to the left as viewed in FIG. 5, snapping the rollers out of the shallow notch 54, into the position shown in FIG. 6 so that the rod 30 is firmly driven down by the transmitted force of spring 20, and the valve 18 comes to rest in closed position.

Since the impact of the release also dislodges the lever 26 from the latch 32, the fulcrum plunger is now automatically returned to its original position by spring 34. And with the plunger returned to the position shown in FIG. 4, the rollers 42 again are seated into the deep notch 52 by the action of the diaphragm spring 47.

The vacuum signal which actuates the release mechanism for the lockout plunger originates at a venturi located in the seat of the check valve previously referred to and shown in FIGS. 3 and 7.

Specifically the check valve or restrictor plug 55 of FIG. 3 bears against seat 57, in which is arranged the venturi passage 59. The suction in venturi is normally vented through aperture 60 at the tip of the nozzle via line 62.

The venturi, in turn, communicates by means of conduit 64 with the interior of the chamber 50 opposite the diaphragm 38 so that when fluid rises around vent 60, a sudden surge of vacuum in the chamber 50 retracts the latching rollers 42 from the plunger 30.

Also referring specifically to FIG. 7, the check valve or restrictor plug 55 is normally urged into closed position by spring 66 in chamber 68. Chamber 68 is, in turn, vented to the downstream side of the check valve by duct or conduit 70.

In well known ways, the check valve therefore normally opens against spring 66 in response to the opening of the main flow control valve, the degree of opening being determined by the extent to which the main valve is opened.

It has been observed however, that, as an important feature of the present invention, this valve functions in a completely novel and effective manner to produce the necessary time delay between the normal filling and the subsequent automatic topping-off operations.

More specifically with the retraction of the locking rollers 42 from the deeper notch in the lockout plunger 30 there is a sharp reduction in flow rate at the main valve 18. The dynamic inertial effect however of the flowing fuel tends to momentarily evacuate the space downstream of the main valve 18 so that the check valve also momentarily closes. This closing permits the fuel in the fill pipe of the fuel tank to drop below the vent 60 at the tip of the spout 22 and at the same time releases the vacuum in the diaphragm chamber 50.

While applicants do not wish to be bound by statements of theory advanced above simply to assist comprehension of the invention, it is nevertheless a fact that in practice the initial retracting force exerted by the diaphragm on the rollers 42 is relieved before the rollers can be dislodged from the shallow notch 54 in the plunger 30. Also, there is a finite delay of a second or two between this action and the reinstitution of the flow of fuel at the predetermined, low topping-off rate, determined by the throttling position of valve 18.

This effect is heightened and can be controlled by modification of the typical shape of the check valve plunger by use of

annular shoulder 72, the length of which can be predetermined to control the duration of the delay preceding topping-off.

Also it will be obvious that the dimension of the passageway 70 may likewise contribute and be used to control the period of delay by constricting the release of pressure within the chamber 68. In other words, spring chamber 68 may be designed to function as a dashpot.

In operation therefore the attendant inserts the spout of the nozzle into the filler pipe of a gasoline tank, raises the lever 26 to a suitable full flow position, thus lifting valve 18 against spring 30. He then locks the lever 26 in open flow position by engaging it with a shoulder of the latch 32. The parts are, during this operation, arranged essentially as indicated diagrammatically in FIG. 4 with valve 18 open to full flow position and the lockout plunger fulcrum 28 locked in place by the action of rollers 42 positively prohibiting the shoulder 56 of the plunger, and therefore the plunger, from moving downward so that the fulcrum 28 cannot be lowered.

With the surge of fluid in the fuel pipe, vent 60 is covered, generating a vacuum surge or signal on the diaphragm 38 and retracting the rollers 42 from the deep notch 52. Retracting rollers strike the deflector 58 which prevents complete retraction. The rod 30 meanwhile is driven downwardly by the transmitted force of main valve spring 20 acting through lever 26, so that the rollers 42 lodge on the surface of shallow notch 54, the upper shoulder of which arrests the downward movement of the rod or plunger 30, the fulcrum 28, the lever 26 and accordingly the valve 18, causing it to come to rest in a partially opened, restricted, low-flow or topping-off position. As previously described, the dynamic effect of the sharp reduction in flow rate momentarily closes check valve 55, releasing the vacuum signal and permitting the fuel in the fill pipe to drop downwardly.

Thereafter the flow conditions through the nozzle are again resumed but at the lower rate at which the check valve again reaches a new equilibrium.

When the fuel level again rises in the fill pipe in response to conclusion of the topping-off operation it again covers the vent outlet so that a surge of vacuum is generated in the diaphragm chamber and the plunger fulcrum is fully released, permitting the valve 18 to close, and dislodging lever 26 from the latch 32. Furthermore, as previously disclosed, with the lever 26 released, the lockout plunger is automatically returned to its original lockout position by the action of springs 34 and 47.

We claim:

1. In an automatic dispensing nozzle for supplying liquid fuel and the like to the filler pipe of a fuel tank for automatically conducting the initial filling of said tank and the subsequent topping-off operation, said nozzle having a supply conduit therein for said fluid, terminating in a filler spout adapted to be received within the filler pipe of a fuel tank, a main spring closed, control valve in said conduit, a lever operating about a fulcrum for actuating said main control valve to open position, latching means for holding said lever in full flow open position, said lever fulcrum being mounted on fulcrum lockout plunger normally locked out in operative position, and means responsive to rise of fluid about the tip of said nozzle for creating a vacuum signal, the improvement which comprises,

means responsive to the initial vacuum signal following the latching of said operating lever in full-flow position to shift the fulcrum plunger longitudinally a predetermined distance to a fixed location permitting the main valve to move to a second predetermined, partially closed position at which flow of liquid is restricted to a relatively low-flow, topping-off rate, and

means responsive to a second vacuum signal for releasing said plunger to permit complete closure of the main valve.

2. An automatic dispensing nozzle as called for in claim 1 wherein said fulcrum lockout plunger is provided with con-

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tiguous notches of successively decreasing depth and where lockout of said plunger is effected by a locking member laterally urged into said notches,

the successive positioning of the plunger being effected by an axially extending notch having a relatively deep portion and a relatively shallow portion separated by a transversely extending shoulder,

said locking means normally engaging said relatively deep notch against said shoulder to positively hold said plunger in normal position,

said locking means engaging in said relatively shallow notch to hold said plunger in said second or low-flow position, and

means in response to said first vacuum signal to position said locking means in said relatively shallow portion of said notch.

3. An automatic dispensing nozzle as called for in claim 1 wherein said fulcrum lockout plunger is provided with longitudinally spaced notches of successively decreasing depth and where lockout of said plunger is effected by a locking member laterally engageable with said notches,

said locking member engaging a relatively deep notch when

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said lever and valve are in full-flow position, said locking member being laterally shiftable in response to an initial vacuum signal to engage a relatively shallow notch arranged to lock out said plunger in second or low-flow position,

said locking member being shiftable in response to a second vacuum signal to release said fulcrum plunger.

4. An automatic dispensing nozzle as called for in claim 3 wherein said internal conduit is provided downstream of said main control valve with a check valve opening in response to the flow of liquid therein,

said valve member being resiliently biased towards closed position whereby sharp decrease in the flow of liquid through said conduit causes said check valve momentarily to close, thereby to

effect a predetermined time interval of flow cessation between the period of normal flow and the relatively low topping-off rate of flow.

5. An automatic dispensing nozzle as called for in claim 4 wherein said check valve member is provided with a dashpot means for causing a predetermined delayed action.

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