Feb. 12, 1963 R. T. HEARN 3,077,212

AUTOMATIC SHUTOFF DEVICE

Filed May 31, 1960 3 Sheets-Sheet 1

Fig. 1.

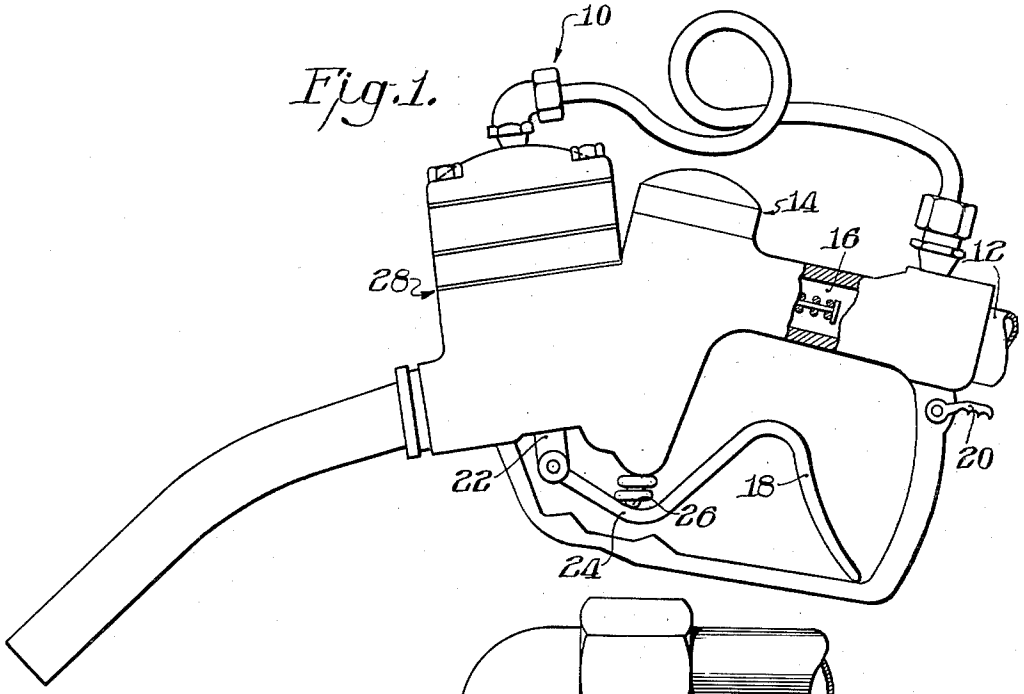

Fig. 5.

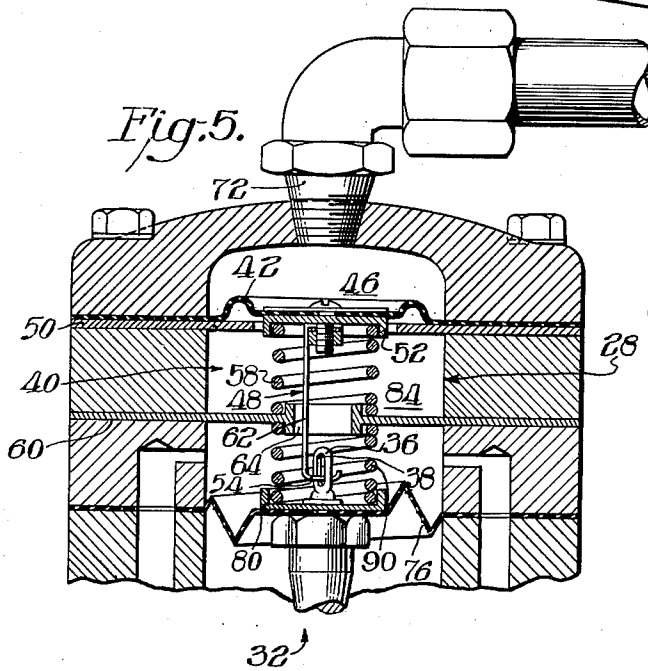

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Fig. 2.

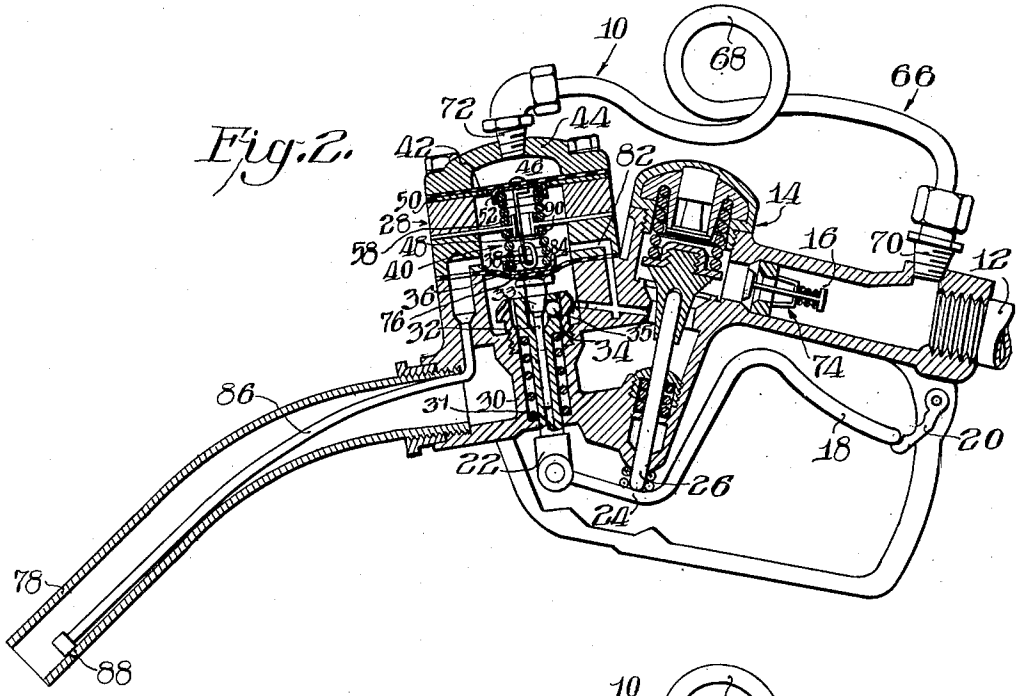
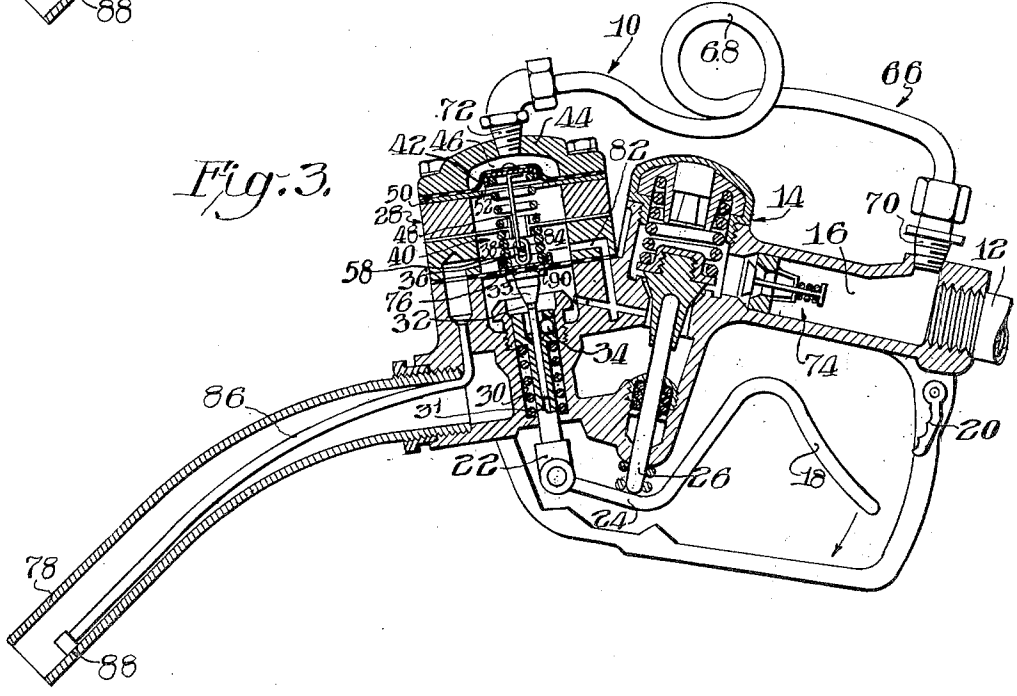


Fig. 3.



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AUTOMATIC SHUTOFF DEVICE

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Fig. 4.

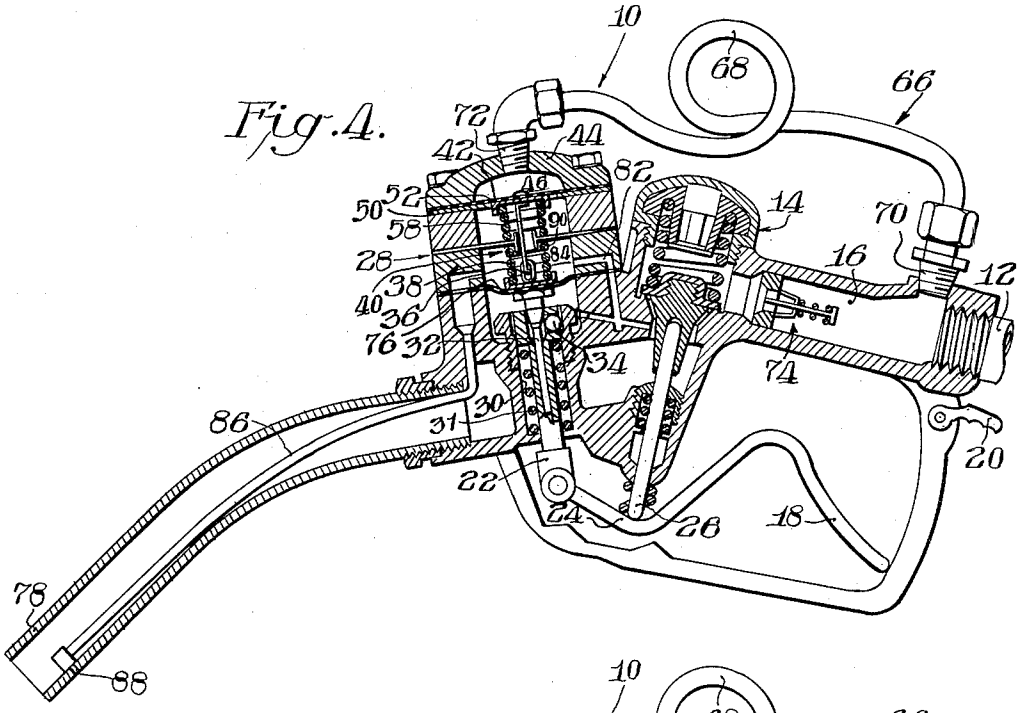
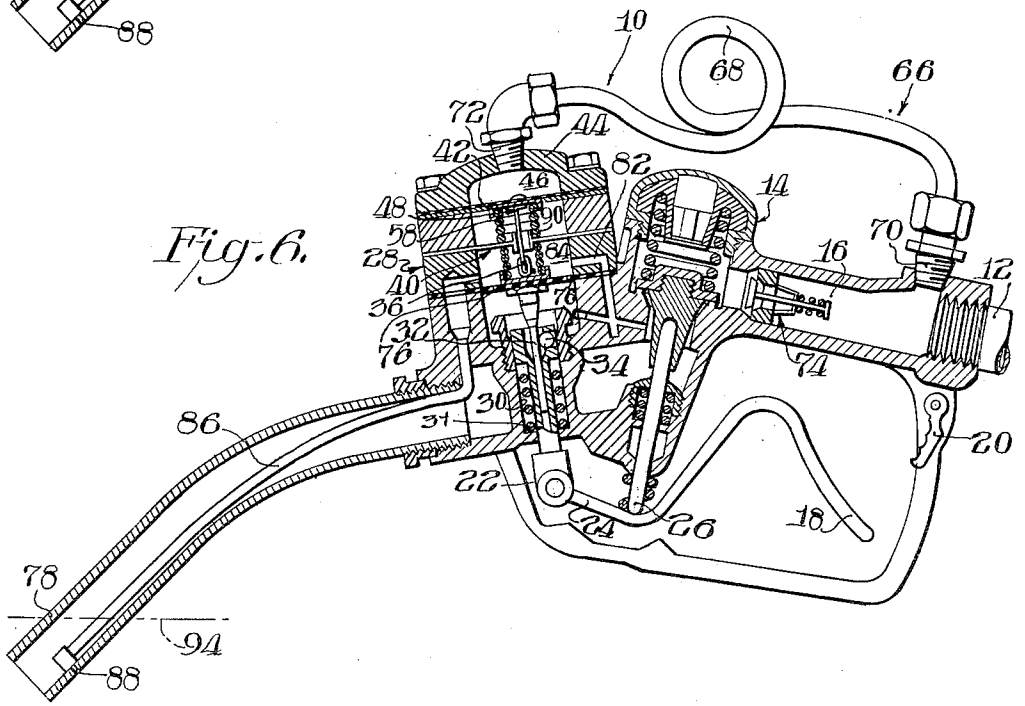


Fig. 6.



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3,077,212

AUTOMATIC SHUTOFF DEVICE

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8 Claims. (Cl. 141—209)

This invention relates to an automatic shutoff device for a dispensing nozzle, and more particularly relates to such a device for use in conjunction with a gasoline dispenser.

Automatic shutoff devices have been used in conjunction with gasoline dispensing nozzles for shutting off the flow of gasoline when the level in the tank rises above a certain point in the nozzle. However, these existing shutoff devices permit the nozzle to remain open whenever the fluid supply is suddenly cut off, for example, by closure of a preset control valve after a preselected quantity is dispensed or by supply failure for any reason. Under these circumstances, the nozzle might be put away in a latched open position causing fluid to be discharged through it as soon as the supply is restored. This might be wasteful as well as dangerous because attendants might easily forget to manually close the nozzle before the flow of gasoline starts once more.

An object of this invention is, therefore, to provide an automatic shutoff device for a fluid dispensing nozzle which seals the nozzle whenever the fluid supply drops below a predetermined minimum;

Another object is to provide such a device which can be simply and economically combined with existing nozzles; and

Still another object is to provide such a device which also seals the nozzle whenever the tip of the nozzle is submerged.

In accordance with this invention an automatic shutoff device for a dispensing nozzle includes a reciprocating support rod for the operating lever and a latching bar for locking it in the inserted position. This latching bar extends into a chamber which is mounted upon the nozzle downstream of the main flow valve. A flexible diaphragm forms a sealed space within this chamber, and a link couples this diaphragm to the latching bar to allow movement of the diaphragm to release the latching bar from the support rod. A conduit connects a portion of the nozzle passageway upstream of the main flow valve with the sealed space in the chamber to force the diaphragm, the link and the latching bar toward the support rod against an oppositely directed resilient bias when fluid is supplied through the passageway at a predetermined pressure thereby latching the support rod in the inserted dispensing positions and permitting the end of the lever to be held in the open position by a latching clip to maintain the main flow valve open as long as this predetermined minimum fluid pressure is maintained.

This device may be conveniently combined with a shutoff device which seals the nozzle whenever its tip is submerged by incorporating another diaphragm referred to herein as an inner diaphragm within the chamber. This inner diaphragm is also connected to the latching bar, and the link connecting the outer diaphragm to the latching bar is coupled to the inner diaphragm through a slotted member which permits the latching bar and inner diaphragm to move together a predetermined distance independently away from the outer diaphragm. A venturi passageway connects a portion of the chamber between the diaphragms to the flow passageway through the nozzle, and an open-ended conduit connects an outer surface of the tip of the nozzle with this same portion of the chamber to allow a reduced pressure between the diaphragms to be created when the open end of the conduit

is submerged. This reduced pressure moves the latching bar in a direction which disengages it from the support rod which causes the main flow valve to close whenever the nozzle tip becomes submerged. The slotted means connecting the outer diaphragm to the support rod, therefore, permits the main flow valve to be closed either by submerging the nozzle tip, or whenever insufficient pressure exists in the nozzle passageway to maintain the outer diaphragm depressed toward the support rod.

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is a side view in elevation of one embodiment of this invention;

FIGS. 2–4 and 6 are cross-sectional views in elevation of the embodiment shown in FIG. 1 in various phases of operation; and

FIG. 5 is an enlarged cross-sectional view in elevation of a portion of this embodiment in the phase shown in FIG. 4.

In FIG. 1 is shown a dispensing nozzle **10** of the type used for dispensing gasoline from a dispensing pump (not shown) from which it is supplied through a flexible hose **12**. Nozzle **10** as shown in FIG. 1 includes a main flow valve **14** which controls the flow of fluid through passageway **16** and an operating lever or handle **18** which is detachably maintainable in the open position by a latching clip **20**. This operating lever **18** is pivoted to a movable support rod **22**, and it has a portion **24**, which is disposed relatively close to the support rod, engaged with the operating stem **26** of main flow valve **14**.

Referring to FIGS. 1–4 and FIG. 2 in particular, nozzle **10** also includes a chamber **28** attached to the nozzle downstream of main flow valve **14**, and support rod **22** is movably mounted to slide within a cylindrical cavity **30** disposed adjacent this chamber. A latching bar **32** maintains support rod **22** latched in the inserted position by the displacement of locking balls **34** by cone-shaped portion **33** of latching bar **32** over outer stationary shoulder **35**. Connecting member **36** includes an elongated slot **38** extending into the hollow interior **40** of chamber **28**. A flexible diaphragm **42** is also mounted within chamber **28**, for example, by securing it under cap **44** to form a sealed space **46** between cap **44** and diaphragm **42**. A link **48** couples the center portion of diaphragm **42** secured between disc **50** and dish **52** to connector **36** by extension of its horizontal arm **54** through slot **38** as is more clearly shown in FIG. 5. A resilient means **58**, which is for example a compression spring of the coil type, reacts against diaphragm **42** through the inside of dish **52** in a direction to move latching bar **22** in a direction to disengage it from support rod **22**. Coil spring **58** accordingly reacts against wall **60** secured within chamber **28**. The vertical portion **62** of link **48** extends through a flanged opening **64** in wall **60**.

A conduit **66** connects a portion of passageway **16** upstream of valve **14** with the space **46** in chamber **28**; and it, for example, incorporates a tube **68** respectively connected to passageway **16** and space **46** by adapters **70** and **72**. It is also possible to incorporate conduit **66** within the structure of nozzle **10** by casting suitable recesses.

The characteristics of coil spring **58** are chosen to allow the pressure applied to space **46** under normal flow conditions to overcome its force and permit support rod **22** to be retained by latching bar **32** in the open condition as long as a predetermined normal minimum fluid pressure supply is maintained. A differential check valve **74** is mounted between the point in passageway **16** to which conduit **66** is connected and main flow valve **14** to trap fluid within hose **12** when the fluid supply pres-

sure is cut off or reaches a certain minimum with a diminished flow rate.

Nozzle 10 also includes an inner diaphragm 76 mounted within chamber 28 for closing valve 14 when the tip 78 of nozzle 10 is submerged. This heretofore existing type of shutoff is combined in nozzle 10 in an unexpected simple and economical manner with the aforementioned low supply shutoff as is now described in detail. Inner diaphragm 76 is also secured to latching bar 32 by an inverted dish 80, and the slot 38 in connector 36 permits latching bar 32 to move a predetermined distance independently away from outer diaphragm 42. A venturi passageway 82 connects space 84 of chamber 28 disposed between diaphragms 42 and 76 with a portion of fluid passageway 16 downstream of valve 14, and an open-ended conduit 86 connects the outer surface of nozzle tip 78 with space 84 to cause a reduced pressure to be created in space 84 when the open end 88 of conduit 86 is submerged. This reduced pressure acting against the force of spring 90, which reacts between wall 60 and inverted dish 80, moves latching bar 32 in a direction to allow locking balls 34 to disengage from shoulder 35 thereby releasing support rod 22 and allowing the main flow valve 14 to close. Slotted connector 36, therefore, permits main flow valve 14 to be closed either by submerging tip 78 of nozzle 10 or whenever the supply of fluid pressure drops below a predetermined minimum.

Operation

FIG. 2 shows nozzle 10 in the condition which exists when lever 18 engages valve 14 and is maintained in the open position by latching bar 32 and latching clip 20 under normal conditions of fluid flow. The fluid pressure in passageway 16 provided by the pump (not shown) is transmitted through conduit 66 into space 46 thereby forcing diaphragm 42 downwardly towards restraining wall 50. This wall 50 prevents diaphragm 42 from being strained beyond its elastic limit. In the downward position of diaphragm 42 latching bar 32 can be fully inserted within support rod 22 to cause cone 33 to displace balls 34 over shoulder 35 and maintain it latched in the dispensing condition shown in FIG. 2 in conjunction with latching clip 20 which engages the end of lever 18. As long as the opening 88 upon tip 78 remains open to atmosphere, air can be drawn through conduit 86, space 84 and venturi passageway 82 to prevent a reduced pressure from being created in space 84 and also maintaining inner diaphragm 76 down to permit main flow valve 14 to remain open to continue dispensing fluid.

FIG. 3 shows what occurs when the fluid supply pressure in passageway 16 drops below a predetermined minimum to reduce the pressure in space 46 thereby allowing the force of spring 58 to force diaphragm 42 upward and away from support rod 22 and act through link 48 and connector 36 to latching bar 32 from support rod 22 and balls 34 allowing the end of lever 18 to jump out of latching clip 20 and resiliently biased main flow valve 14 to close. Spring 58, and space 46 may, for example, be selected to cause upward movement of diaphragm 42 when the pressure in passageway 16 drops, for example, to two or three p.s.i. Differential check valve 74 can be set to subsequently close at even lower differential pressures. Main flow valve 14, therefore, closes at any time that the fluid supply drops below a predetermined minimum to prevent accidental discharge through the nozzle if the supply should be restored.

FIG. 4 shows the condition that exists when the valve is in the shutoff position before it is opened by an operator into, for example, the dispensing condition shown in FIG. 2. In this closed or shutoff position, main flow valve 14 normally traps sufficient pressure in passageway 16 when it closes to maintain diaphragm 42 in the position shown in FIG. 4 to maintain nozzle 10 in readiness for immediate opening as long as full supply pressure is maintained in passageway 16. Spring 31 maintains support rod 22 moved toward latching bar 32 to engage balls 34 with cone 33 and lock them and support rod 22 over shoulders 35. However, should the pressure in passageway 16 fall below the predetermined minimum because of a supply failure, spring 58 forces diaphragm 42 upwardly to release latching bar 32 from support rod 22 and prevent opening of valve 14.

In FIG. 6 is shown the condition that exists when liquid level 94 rises above opening 88 in the tip 78 of nozzle 10. This prevents air from entering suction conduit 86 and causes a reduced pressure or vacuum to be created in space 84 as a result of the removal of air through venturi passageway 82. This reduced pressure moves diaphragm 76 upwardly from the dispensing condition shown in FIG. 2 to that shown in FIG. 6 thereby pulling latching bar 32 upwardly which allows balls 34 to disengage from shoulder 35 to allow support rod 22 to be forced down by resiliently braced main flow valve 14 to trip handle or lever 18 out of engagement with latching clip 20 and allow valve 14 to close. This illustrates how nozzle 10 automatically closes whenever the liquid level in a tank being filled thereby rises above the tip of nozzle 10.

What is claimed is:

1. An automatic shutoff device for a fluid dispensing nozzle incorporating a main flow valve which controls the flow through the nozzle passageway and an operating lever which can be detachably held open by a latching clip mounted upon said nozzle, said shutoff device comprising a chamber attached to said nozzle downstream of said main flow valve, a support rod movably mounted upon said nozzle adjacent said chamber, a latching means for said support rod extending into said chamber, said operating lever being pivoted to said support rod and having a portion relatively close to said support rod engaged with said main flow valve, an outer flexible diaphragm mounted within said chamber to form a sealed space, a link coupling said outer diaphragm to said latching means for moving said latching means in response to movement of said outer diaphragm, said main flow valve being resiliently biased to force said support rod away from said latching means, a conduit connecting a portion of said passageway upstream of said main flow valve with said sealed space of said chamber for forcing said outer diaphragm and said link in a direction to maintain said latching means engaged with said support rod when fluid is supplied through said passageway at a predetermined pressure high enough to overcome the force of said resilient means whereby said lever is permitted to be retained by said latching clip in the open position for holding said main flow valve open as long as said predetermined fluid pressure is maintained, an inner diaphragm being disposed within said chamber which is also attached to said latching means, said link being connected to said latching means by a slotted member which permits said latching means to move a predetermined distance independently away from said outer diaphragm, a venturi passageway connecting the portion of said chamber disposed between said diaphragms to a portion of said passageway downstream of said main flow valve, an open-ended conduit connecting an outer surface of the tip of said nozzle with said portion of said chamber to create a reduced pressure between said diaphragms when the open end of said conduit is submerged thereby moving said latching means in a direction to disengage said nozzle lever from said latching means and causing said main flow valve to close, and said slotted connecting member permitting said main flow valve to be closed by either submerging said nozzle tip or by absence of sufficient pressure in said passageway to actuate said outer diaphragm.

2. A device as set forth in claim 1 wherein a differential pressure check valve is disposed between said main flow valve and the portion of said passageway to which said conduit is connected for sealing said main flow valve from said portion when the pressure therein drops below a predetermined minimum pressure.

3. A device as set forth in claim 1 wherein said latching means is constructed and arranged to release said support rod when it is moved away from it, said slotted member includes a vertical slot, said link is a vertical rod attached to said outer diaphragm which has a horizontally disposed arm extending through the lower end of said slot when said outer diaphragm is pressure-actuated towards said latching bar thereby permitting said outer diaphragm to substantially immediately unlatch said support rod upon a lowering of pressure in said space.

4. An automatic shutoff device for a fluid dispensing nozzle incorporating a main flow valve which controls the flow through the nozzle passageway and an operating lever which can be detachably held open by a latching clip mounted upon said nozzle, said shutoff device comprising a chamber attached to said nozzle downstream of said main flow valve, a support rod movably mounted upon said nozzle adjacent said chamber, a latching means for said support rod extending into said chamber, said operating lever being pivoted to said support rod and having a portion relatively close to said support rod engaged with said main flow valve, a flexible outer diaphragm mounted within said chamber to form a sealed space, a link coupling said diaphragm to said latching means for moving said latching means in response to movement of said diaphragm, said main flow valve being resiliently biased to force said support rod away from said latching means, a conduit connecting a portion of said passageway upstream of said main flow valve with said sealed space of said chamber for forcing said outer diaphragm and said link in a direction to maintain said latching means engaged with said support rod when fluid is supplied through said passageway at a predetermined pressure high enough to overcome the force of said resilient means whereby said lever is permitted to be retained by said latching clip in the open position for holding said main flow valve open as long as said predetermined fluid pressure is maintained, an inner diaphragm being disposed within said chamber which is also attached to said latching means, said link being connected to said latching means by a slotted member which permits said latching means to move a predetermined distance independently away from said outer diaphragm, a venturi passageway connecting the portion of said chamber disposed between said diaphragms to a portion of said passageway downstream of said main flow valve, an open-ended conduit connecting an outer surface of the tip of said nozzle with said portion of said chamber to create a reduced pressure between said diaphragms when the open end of said conduit is submerged thereby moving said latching means in a direction to disengage said operating lever from said latching means and causing said main flow valve to close, said slotted connecting member permitting said main flow valve to be closed by either submerging said nozzle tip or by absence of sufficient pressure in said passageway to actuate said outer diaphragm, said latching means being constructed and arranged to release said support rod when it is moved away from it, said slotted member including a vertical slot, said link being a vertical rod attached to said outer diaphragm which has a horizontally disposed arm extending through the lower end of said slot when said outer diaphragm is pressure-actuated towards said latching bar thereby permitting said outer diaphragm to substantially immediately unlatch said support rod upon a lowering of pressure in said space, a wall being provided in said chamber between said diaphragms, said link extending through an opening in said wall, and springs reacting between said wall and said diaphragms to force said outer diaphragms away from said support rod and said inner diaphragms toward it.

5. A device as set forth in claim 4 wherein said springs are compression springs of the coil type, and said link extends axially through them.

6. An automatic dispensing nozzle comprising a hollow body having an inlet means, a valve, manual operating means for opening said valve, means for latching said operating means in the valve-open position, and release means acting on said operating means to permit closure of the said valve, a chamber on said body, a pair of diaphragms in spaced concentric relationship in said chamber, a common connection between both of said diaphragms and said release means, means for producing a vacuum between said diaphragm whereby, due to the action of a sensing means, one of said diaphragms having a side open to atmospheric pressure may be moved to actuate said release means, and means in connection with the inlet means of said nozzle for imposing upon the second of said diaphragms the pressure of fluid ahead of said nozzle, whereby failure or substantial diminution of said pressure will actuate said second diaphragm to operate said release means.

7. In an automatic dispensing nozzle, a hollow body comprising fluid entrance means, a spring actuated main valve with a stem, a manual operating lever positioned to actuate said valve stem whereby to open said valve, latch means for engaging one end of said lever to hold it in valve-opening position, the other end of said lever being pivoted to a slidable plunger, locking means to prevent sliding movement of said plunger, said plunger being adapted, when said locking means is released, to move the pivot point of said lever to a position at which said main valve will close, a chamber on said body, a first diaphragm in said chamber having a side open to atmospheric presure, a second diaphragm in said chamber concentric with and spaced from the first diaphragm, a closure for the end of said chamber, means in connection with the flow of fluid through said nozzle for creating a vacuum in a space, means for connecting said space with the space between the two diaphragms, a sensing means in connection with the space between said two diaphragms and acting normally to relieve the vacuum therebetween, means for applying the presure of fluid in the entrance means of said nozzle against the outer side of said second diaphragm, and a mechanical connection between said diaphragms and to the locking means for said plunger whereby movement of either diaphragm in a direction away from said plunger will release said locking means allowing movement of said plunger and consequent closure of said main valve.

8. In an automatic dispensing nozzle, a valved hollow body through which a fluid is to be dispensed, a chamber in connection with said body, a first diaphragm spanning the walls of said chamber, a ring surmounting said first diaphragm, a second diaphragm spanning said ring, and a closure cap for said chamber, said elements respectively defining a space within said chamber below said first diaphragm which space is at atmospheric pressure, a second space within said chamber between said diaphragms which space may be subjected to a vacuum for automatic shut-off purposes, and a space above said second diaphragm, which space has a fluid connection to the entrance side of said nozzle, means for opening the valve, means for holding the valve in open position, release means for said last mentioned means, and a connection between said release means and both of said diaphragms whereby movement of either diaphragm will be effective in operating said release means.

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