United States Patent [19]

Young

[11] **3,734,339**

[45] **May 22, 1973**

[54] **GASOLINE DISPENSING NOZZLE**

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[73] Assignee: **Sun Oil Company of Pennsylvania**, Philadelphia, Pa.

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[21] Appl. No.: **182,410**

[52] **U.S. Cl.** **222/56**, 222/505

[51] **Int. Cl.** **B67d 5/08**

[58] **Field of Search**....................222/59, 64, 65, 505, 222/57, 74, 14, 17, 20, 28, 25, 56, 509, 550, 320, 322, 503, 55; 141/206–211, 220, 223–226; 251/245, 246, 232; 74/804

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Primary Examiner—Robert B. Reeves
Assistant Examiner—James M. Slattery
Attorney—George L. Church, Donald R. Johnson, Wilmer E. McCorquodale et al.

[57] **ABSTRACT**

A gasoline dispensing nozzle has a poppet-type shutoff valve which is operated by means of a rotary shaft sealed into the nozzle housing, the rotary shaft being rotated through a mechanical linkage which is coupled between the said shaft and a manual operating handle. Automatic shutoff of the gasoline flow is effected by means of a diaphragm which is mechanically coupled to the aforementioned linkage and which moves in response to a pressure differential produced when a tank into which the gasoline is being dispensed becomes "full."

8 Claims, 10 Drawing Figures

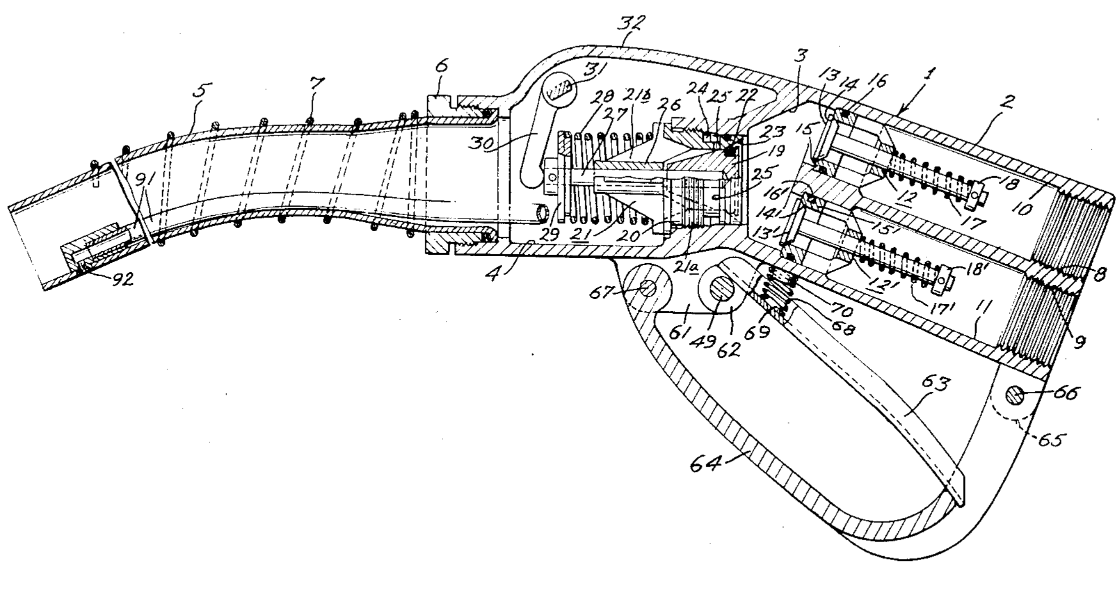


FIG.2.

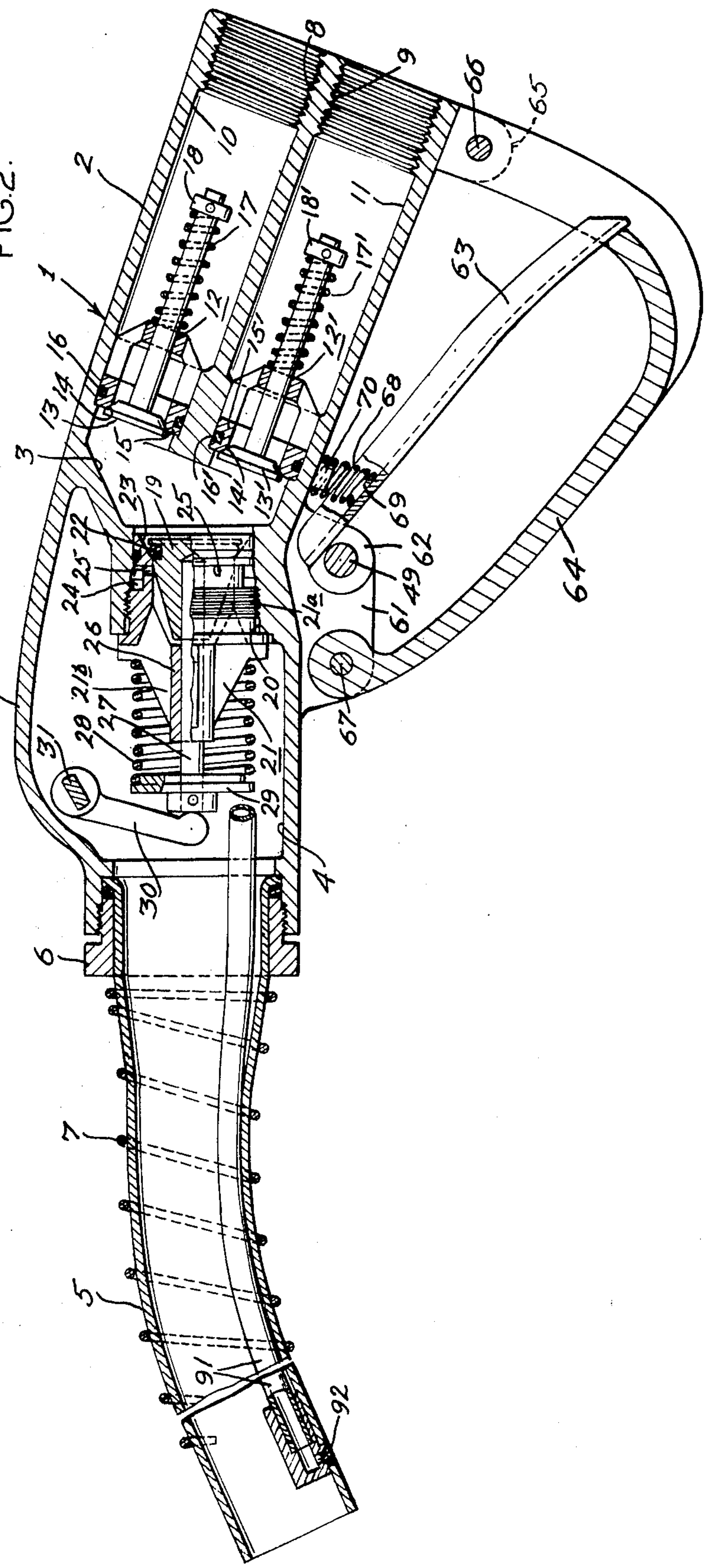


FIG.1.

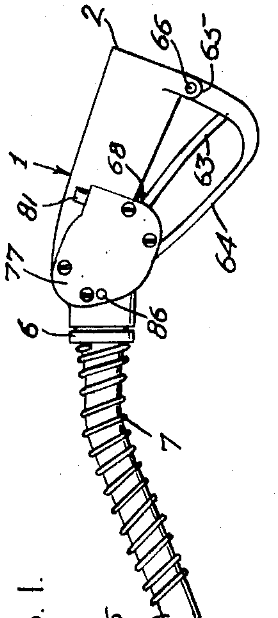
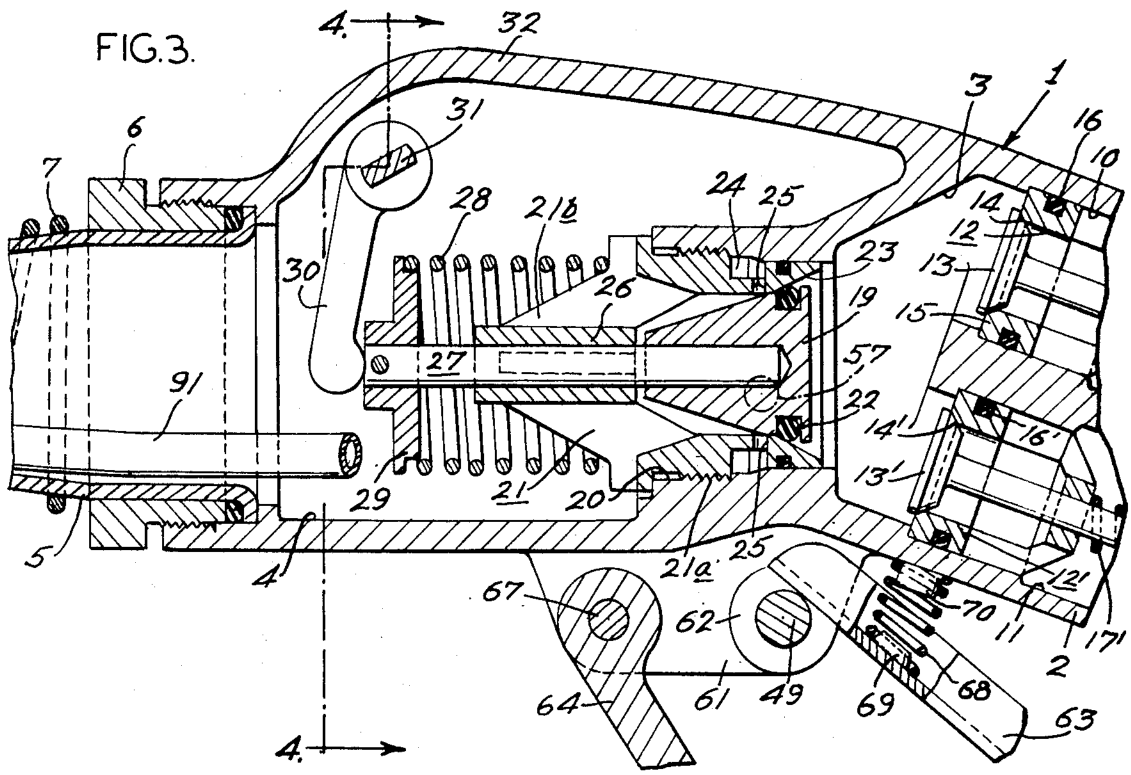


FIG.3.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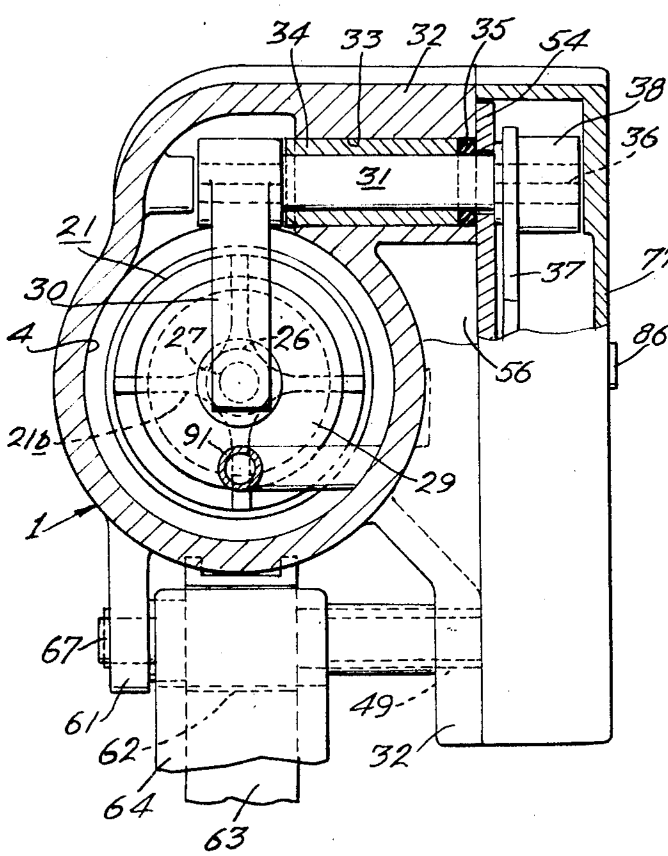
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FIG.4.

FIG. 5.

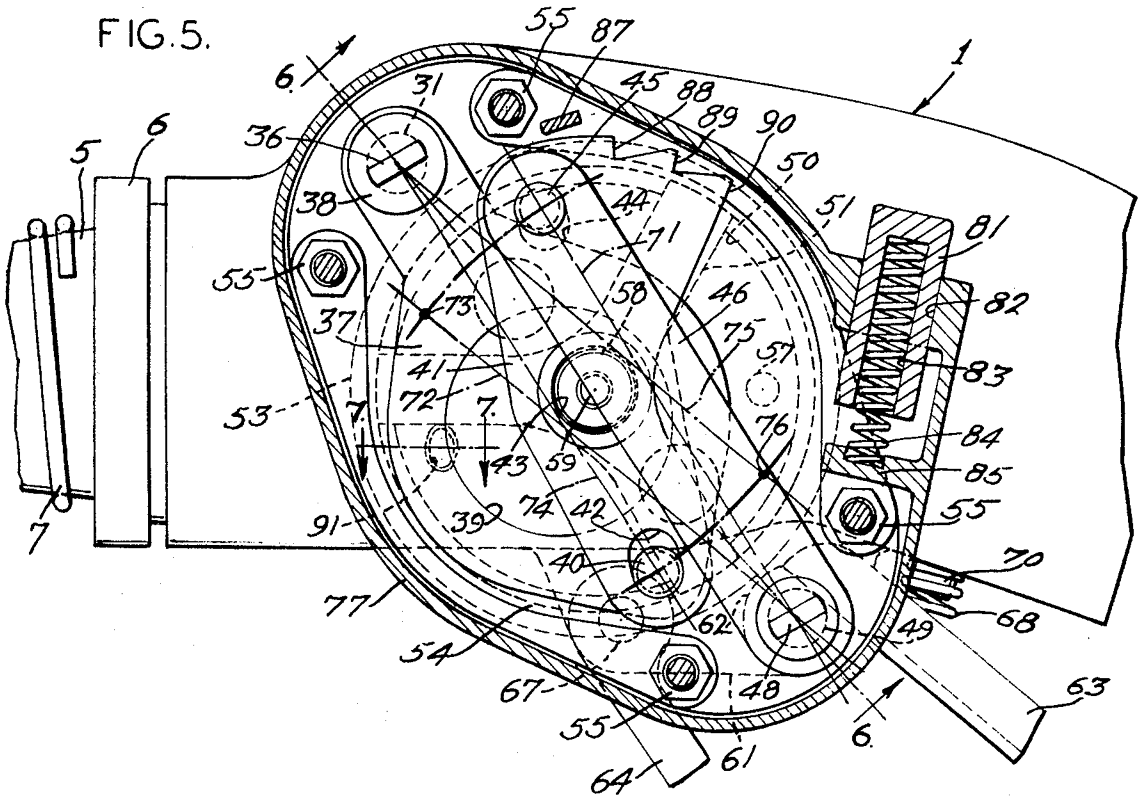

FIG. 6.

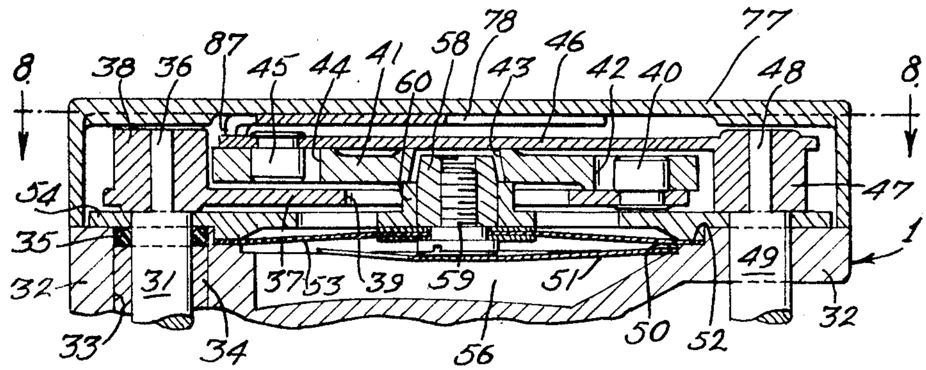

FIG. 7.

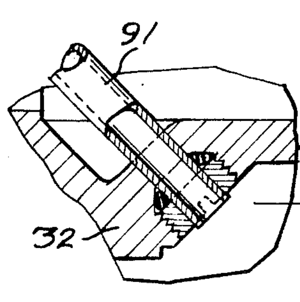

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FIG. 8.

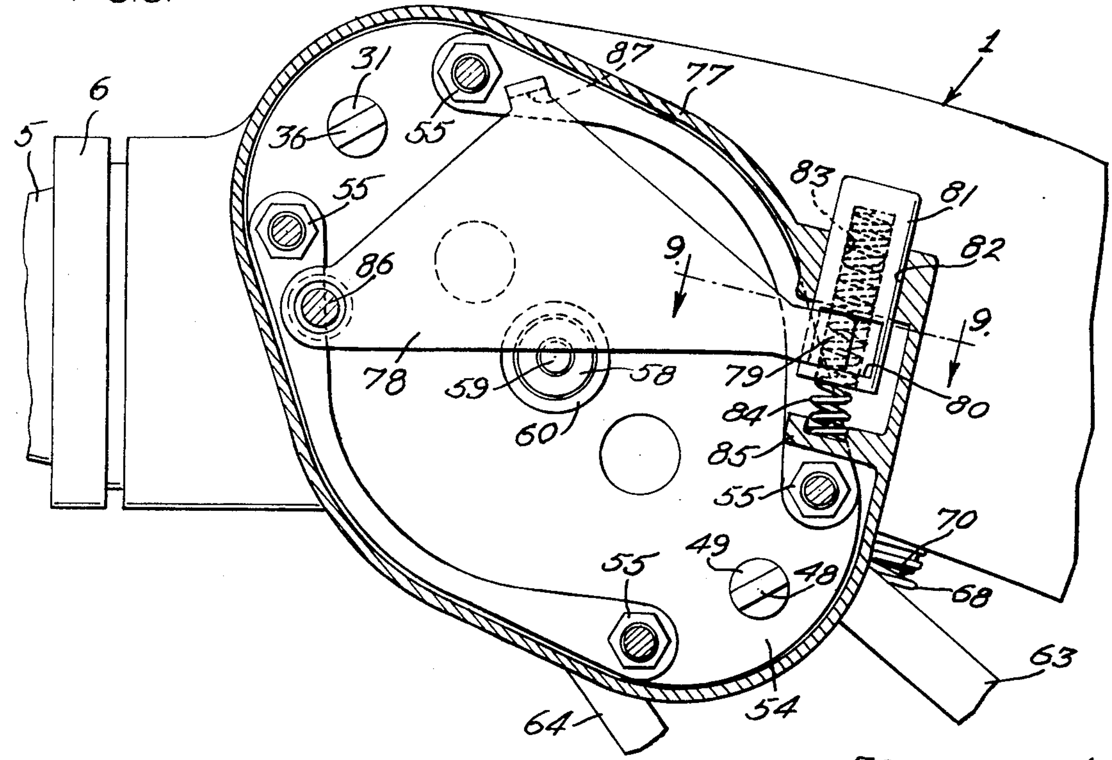

FIG. 9.

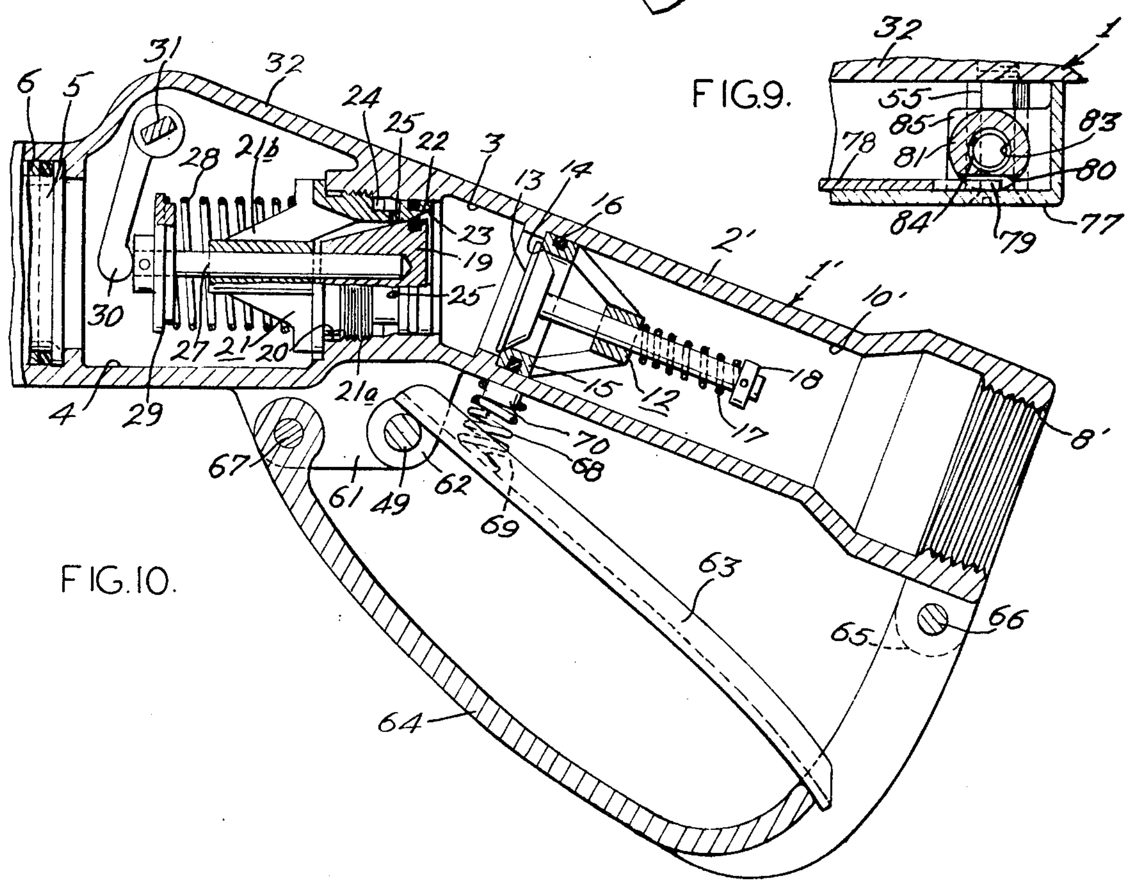

FIG. 10.

GASOLINE DISPENSING NOZZLE

This invention relates to an improved gasoline dispensing nozzle.

The nozzles which are conventionally used at the present time (at service stations) for the dispensing of gasoline into the fuel tanks of automobiles involve several drawbacks, from the standpoints of convenience and ease of operation. These drawbacks or disadvantages become particularly acute when a self-service type of operation is being considered, one wherein the customer or motorist himself must operate the dispensing apparatus.

In the first place, conventional nozzles are rather large or bulky and quite heavy. As a consequence of their size, a person with small hands has some difficulty in spanning the considerable distance between the inlet portion of the nozzle casing and the valve operating lever, as is necessary in order to manually operate the nozzle shutoff valve; also, since some levers are curved, a pinching effect is produced on the fingers when such a lever is operated. The appreciable weight of the nozzle also adds to the inconvenience.

Moreover, conventional nozzles utilize a pivoted lever which when operated causes the stem of the poppet-type shutoff valve to reciprocate or slide back and forth (that is, to move longitudinally) through a stuffing box or stuffing gland type of seal in the nozzle casing. A sliding stem seal of this type involves considerable friction between the relatively moving parts. This frictional force, plus the force of the heavy (strong) valve return spring employed (which latter force must be overcome to open the valve), adds up to a rather substantial value, which means that a considerable pull (about **15** pounds, by way of example, when taking into account the mechanical advantage offered by the lever) must be exerted on the lever in order to open the valve. If grease is applied to the valve stem in order to reduce the sliding friction, the problem will not really be solved, since in this case dirt will be captured by the grease and, due to the sliding action of the stem, will be drawn into the stuffing box, with damaging effects on the packing therein.

An object of this invention is to provide a novel gasoline dispensing nozzle.

Another object is to provide a gasoline dispensing nozzle which is smaller and lighter in weight than conventional nozzles, and which requires a much smaller manual force for actuation.

A further object is to provide a novel gasoline dispensing nozzle which does not utilize a sliding (reciprocating) seal for the stem of the nozzle shutoff valve.

A still further object is to provide a novel gasoline dispensing nozzle with a shutoff valve which is actuated by means of a rotary shaft sealed into the valve body.

Yet another object is to provide a novel type of automatic shutoff or self-tripping mechanism for gasoline dispensing nozzles.

The objects of this invention are accomplished, briefly, in the following manner: A gasoline dispensing nozzle has therein a poppet-type main shutoff valve which is actuated by means of an arm fastened to a rotatable shaft which is sealed through the nozzle casing. This shaft is coupled through a mechanical linkage to another shaft to which is secured an operating handle, for rotation of the latter shaft. The mechanical linkage acts in a certain direction and manner when the operating handle is pulled, to cause opening of the nozzle shutoff valve. A diaphragm, which moves in a predetermined direction in response to a pressure differential developed upon filling of a container (tank) into which gasoline is being dispensed, is mechanically coupled to the aforementioned mechanical linkage in such a way that, when the diaphragm moves in said direction, the mechanical linkage is in effect rendered inactive, thereby to allow the shutoff valve to close.

A detailed description of the invention follows, taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a side elevation of a complete, fully assembled nozzle according to this invention;

FIG. **2** is a longitudinal vertical sectional view showing the internal or liquid-flow parts of the nozzle of FIG. **1**;

FIG. **3** is a partial view generally similar to FIG. **2**, but on an enlarged scale;

FIG. **4** is a transverse vertical sectional view taken along line **4—4** of FIG. **3**;

FIG. **5** is a vertical sectional view showing the external parts of the nozzle mechanism;

FIG. **6** is a cross-section taken along line **6—6** of FIG. **5**;

FIG. **7** is a fragmentary cross-section taken along line **7—7** of FIG. **5**;

FIG. **8** is a cross-sectional view taken along line **8—8** of FIG. **6**, but omitting parts of the operating mechanism;

FIG. **9** is a fragmentary sectional view taken along line **9—9** of FIG. **8**; and

FIG. **10** is a partial sectional view similar to FIG. **2**, but showing a single-product nozzle.

By way of example, the invention will be described first as a so-called two-product nozzle, which is required for use with a gasoline dispensing apparatus of the type disclosed in my U.S. Pat. No. 2,880,908; in an apparatus of this type, any one of a number of blends of two gasoline components of different octane ratings may be selected for dispensing, and in addition, either component may be dispensed separately. However, the invention is not limited to this type of nozzle, as will be explained more in detail hereinafter, and may be utilized as a single-product nozzle, for dispensing only a single product.

Referring now to the drawings, the liquid dispensing nozzle (gasoline dispensing nozzle) of this invention comprises a nozzle casing or housing **1** (which may be in the form of a casting, suitably machined) having an inlet portion **2**, a valve chamber **3** communicating therewith, an outlet chamber **4**, and a nozzle spout **5** threaded into the latter, as by means of a surrounding retaining nut **6** which threads into the housing **1** and bears against a lip at the inner end of spout **5**. The spout lip engages in turn a shoulder formed in housing **1**. A spring **7** is preferably mounted about the spout **5** in a conventional manner, to provide friction for holding the spout in the filling opening of a container (for example, in the fillpipe of an automobile gasoline tank), and also to assist in making electrical contact between the container and the nozzle housing.

The inlet portion **2** of housing **1** has a pair of vertically-spaced threaded inlet fittings **8** and **9** to which respective dispensing hoses can be attached. The fittings **8** and **9** are located, respectively, at the outer ends of two vertically-spaced, parallel, cylindrical bores or conduits **10** and **11** provided in the nozzle housing **1**.

It is pointed out that, throughout the present specification, such terms as "vertical" and "horizontal" are used with respect to the normal, upright, or dispensing position of the nozzle, illustrated in FIG. 2. The conduits **10** and **11** are intended to carry, separately, the two "products" (e.g., two gasoline components of different octane ratings), as supplied to the nozzle inlet through respective dispensing hoses, to the valve chamber **3**; however, the two products are brought together, for mixing, in chamber **3**.

A spring-loaded check valve subassembly **12**, which can also serve as an anti-drain valve, is mounted in passageway or conduit **10**, at the inner end of this conduit. The poppet **13** of subassembly **12** seats on a continuous valve seat **14** at the inner end of a web member or spider member **15** mounted in conduit **10**, the outer cylindrical surface of member **15** (adjacent seat **14**) being sealed into passageway **10** by means of an O-ring **16** fitting within a circumferential groove in member **15**. One end of a coiled compression spring **17** bears against the central portion of web member **15**, and the other end of this spring bears against a sleeve **18** pinned to one end of a rod whose other end is fastened to poppet **13**; spring **17** thus biases the poppet **13** toward closed position. The subassembly **12** functions as a check valve, permitting flow of liquid through passageway **10** only from right to left in FIG. 2—that is, only in the direction from the dispensing hose (at fitting **8**) toward the valve chamber **3**.

An exactly similar check valve subassembly **12'** is mounted in passageway **11**, at the inner end of this latter passageway. Subassembly **12'** will not be described in detail; parts of subassembly **12'** which are similar to those of subassembly **12** are denoted by the same reference numerals, but carrying prime designations. Subassembly **12'** functions similarly to subassembly **12**.

Assuming both poppets **13** and **13'** are opened by the flow of the liquids being pumped respectively through conduits **10** and **11** from right to left, the two liquids will mix in valve chamber **3**. The poppet **19** of the main nozzle shutoff valve is mounted in valve chamber **3**, as close as possible to poppets **13** and **13'**, it being necessary only to provide sufficient clearance for proper operation (movement) of the three poppets. The "residual volume" of the space between poppets **13** and **13'**, on the one hand, and poppet **19**, on the other hand, is thus made very small, on the order to 7 to 8 cc, for example.

A substantially cylindrical valve bore **20**, carrying female threads near its downstream end, is provided in housing casting **1**, and mounted in this bore is a valve seat and valve-stem-supporting member **21** having a threaded sleeve portion **21*a*** which engages the threads in bore **20** and also having a spider-like stem-supporting portion **21*b***. Poppet **19** is frusto-conical in shape, and carries at its right-hand end (as seen in FIG. 2) an O-ring **22** which seals against a frusto-conical valve seat **23** formed at the right-hand end of sleeve portion **21*a*** of member **21**; the remainder of sleeve portion **21*a*** has a straight cylindrical inner wall.

A continuous circumferential groove is provided in sleeve portion **21*a*** of member **21**, at the right-hand end (in FIG. 2) of the straight cylindrical part of this sleeve, thereby forming (with the surrounding portion of housing **1**, at bore **20**) an annular chamber **24**. A plurality of small holes **25** (six in number, spaced at equal intervals around the circumference of sleeve **21*a***) are drilled entirely through the cylindrical wall of sleeve **21*a***, in a direction at right angles to the longitudinal axis of this sleeve, into the annular chamber **24**. Items **24** and **25** will be referred to further hereinafter.

The stem-supporting portion **21*b*** of member **21** comprises four supporting spokes which extend from the radially-outer edge of sleeve portion **21*a*** toward the longitudinal axis of this sleeve portion, and support at their common center an integral sleeve **26** which supports and provides a bearing for a valve stem **27** one end of which is secured to poppet **19**; the stem **27** and the sleeve **26** are both centered on the center line of sleeve portion **21*a*** (and also of poppet **19**), and the sleeve **26** supports the stem **27** for reciprocating movement of the stem and poppet within housing **1**. In FIG. 2, the poppet **19** is illustrated in its closed or sealed position; movement of the poppet toward the right in this figure moves the O-ring **22** away from its seat **23** and results in opening of the main nozzle shutoff valve.

The poppet **19** is normally held seated on the valve seat **23** (i.e., the valve is normally closed) by means of a valve return spring **28** one end of which bears against the radially-outer ends of the spokes of stem support **21*b*** and the opposite end of which bears against an abutment member **29** which is pinned to stem **27**. The spring **28** may be much weaker than the main valve springs used in conventional nozzles (the latter may exert a force of around thirty pounds, by way of example), since in the instant invention there is not present the high friction inherent in a sliding stem seal, through a stuffing gland.

One end of an operating arm **30**, which swings in an arc about the center of a rotatable valve shaft **31** to the inner end of which the other end of arm **30** is fastened, bears against the left-hand (in FIG. 2) end of stem **27** and/or the left-hand face of member **29**. The fastening of arm **30** to the inner end of shaft **31** may be effected by means of a tang on this shaft end which extends through a substantially rectangular opening in arm **30**. It may be observed that rotation of shaft **31** in the counterclockwise direction in FIGS. 2 and 3 causes valve stem **27** and poppet **19** to be pushed toward the right by arm **30**, opening the shutoff valve against the bias of spring **28**, while rotation of shaft **31** in the clockwise direction (from its "valve open" position) allows the poppet **19** to move toward its closing or sealing position, under the urging of return spring **28**.

The nozzle casing **1** has an integral wall **32** of approximately elliptical outer configuration, which extends outwardly at 90° with respect to the main portion of casing **1**, previously described. Near the inner end of this wall **32**, the space within said wall is closed off by a partition which in effect forms a portion of the side wall of housing **1**. The partition just described separates what may be termed the internal parts of the nozzle mechanism (the various poppets, etc. previously described) from what may be termed the external parts of the nozzle mechanism (now to be described).

The shaft **31** extends outwardly (laterally) from the arm **30**, through a bore **33** formed in wall **32**, near one edge of the latter. A sleeve bearing is provided for shaft **31** by means of a bronze bushing **34** which surrounds this shaft, within bore **33**. A seal is provided for valve shaft **31** by means of an O-ring **35** which surrounds this shaft and engages the wall of bore **33**, near the outer end of wall **32**; this arrangement seals the rotatable valve shaft through the wall of nozzle casing **1** and prevents leakage of gasoline out of this casing. It may be noted at this point that the only moving element sealed through the wall of nozzle casing 1 is the rotatable shaft 31, sealed by O-ring 35; the friction or drag of such a rotatable seal is negligible compared to that of an external packing upon a reciprocable valve stem passing through the wall of the casing, as in conventional nozzles.

The valve shaft 31 extends outwardly (sideways or laterally, in the normal upright position of the nozzle) beyond the O-ring 35 and beyond the outer end of wall 32 a suitable distance, and the outer end of this shaft (opposite to the inner end thereof, to which latter end arm 30 is fastened, as previously described) is provided with a tang 36.

A valve arm 37, which extends generally in a direction at right angles to the axis of shaft 31, has at one end thereof an integral hub 38 having a substantially rectangular opening which fits over tank 36; this fastens arm 37 to shaft 31 so that rotation of valve arm 37 will rotate the valve shaft 31. Valve arm 37 is somewhat banjo-shaped, having a large substantially central opening 39, and at its other end (opposite to hub 38) this arm has an integral pin 40 which extends outwardly from the plane of the main portion of the arm.

A rocker arm 41, which is considerably thicker than valve arm 37, has at one end an elongated slot 42 which receives the outwardly-extending portion of pin 40, to provide a pin-and-slot pivotal connection between valve arm 37 and rocker arm 41. Rocker arm 41 has a substantially central circular hole 43 for receiving a fulcrum pin 58 (to be later described), and has at its other end an elongated slot 44 which receives the inwardly-extending portion of an outstanding pin 45 which is integrally located at one end of a handle arm 46. This latter provides a pin-and-slot pivotal connection between rocker arm 41 and handle arm 46.

Handle arm 46 lies substantially parallel to valve arm 37 (and also to rocker arm 41). At the end of arm 46 opposite to pin 45, this arm has an integral hub 47 with a substantially rectangular opening which fits over a tang 48 provided on one end of a handle shaft 49.

The side wall 32 of casing 1 has an outwardly-facing annular shoulder 50 which supports the outer ends of the three legs of a three-legged phosphor bronze leaf spring 51. Spring 51 is generally Y-shaped, having three legs (spaced at 120°) extending radially outwardly from a central hub area. Spring 51 is normally bowed slightly outwardly at its center (i.e., upwardly in FIG. 6).

Side wall 32 of the casing also has an outwardly-facing annular shoulder 52 (of larger diameter than shoulder 50) for mounting the outer periphery of a flexible impervious diaphragm 53. Diaphragm 53 is made from a suitable material (for example, Neoprene) which is substantially unaffected by gasoline. Diaphragm 53 is sealingly held in position against shoulder 52 by means of a diaphragm mounting or clamping plate 54 a portion of which overlies the outer edge of the diaphragm and which is secured to wall 32 by means of four bolts 55 (see FIG. 5), located beyond the edge of the diaphragm; the bolts 55 pass through holes in plate 54 and thread into tapped apertures in wall 32. Between the inner face of the diaphragm 53 and the inner partition which closes off the space within wall 32 there is thus formed an enclosed space 56 (actually, a volume) which may be termed a low pressure chamber. A small hole 57 (diameter ⅛ inch) is drilled through the aforementioned partition into the annular chamber 24 (see FIG. 3, wherein the location of this hole is indicated in phantom), to provide communication between annular chamber 24 and low pressure chamber 56.

An outwardly-projecting fulcrum pin 58, which is tapered at its outer end and whose outer end is normally positioned within hole 43 in the rocker arm 41, is attached to diaphragm 53, for movement thereby, by means of a bolt 59 which passes sealingly through a central hole in diaphragm 53 and which threads into a tapped hole in fulcrum pin 58. The head at the inner end of bolt 59 bears against the central hub area of spring 51. The fulcrum pin 58 is mounted for sliding movement (in the direction of its length) in a rigid support (capable of resisting lateral forces) provided by a sleeve 60 integral with the fixed diaphragm mounting plate 54.

By means of the tang 48, the hub 47 of handle arm 46 is fastened to handle shaft 49 so that rotation of shaft 49 will rotate hub 47 and handle arm 46. The handle shaft 49 passes horizontally through, and is journaled for rotation in, a pair of spaced parallel ears 61 integrally formed on nozzle casing 1 and extending outwardly therefrom. Mounted upon the end of handle shaft 49 opposite to tank 48 is a collar 62 which is pinned to the shaft. An operating handle or control member 63 is welded to or made integral with collar 62. The operating handle or control member 63 is protected by a guard 64 secured at its respective opposite ends to a pair of aligned bosses 65 on the nozzle casing (by means of a pin 66) and to the ears 61 previously mentioned (by means of a threaded member 67). See FIG. 2.

A coiled compression spring 68 serves as a handle return spring, biasing handle 63 downwardly to the "valve closed" position illustrated in FIG. 2. One end of spring 68 surrounds an integral boss 69 on the handle and bears against the handle, while the other end of this spring surrounds an integral boss 70 on casing 1 and bears against this casing.

In FIGS. 2 and 5, the various elements are illustrated for the "valve closed" condition. In FIG. 2, when handle 63 is pulled upwardly (toward the inlet portion 2 of the housing 1), the handle shaft 49 is rotated in the counterclockwise direction. In FIG. 5, the various elements 46, 41, 37, etc. make up a mechanical linkage which couples the handle shaft 49 to the valve shaft 31. The center line 71 (FIG. 5) of handle arm 46 indicates the position of this arm for the "valve closed" condition, while the center line 72 indicates the position of this same arm for the "valve fully open" condition. When the operating handle 63 is pulled upwardly (as viewed in FIG. 2) to actuate the shutoff valve toward the "fully open" position, handle shaft 49 rotates in the counterclockwise direction (as viewed in FIG. 5), causing handle arm 46 to rotate counterclockwise about its fixed pivot at the center of shaft 49. The pin 45 end of arm 46 then moves counterclockwise in an arcuate path, until at the "fully open" position the center of this pin arrives at point 73 (on the center line 72).

As pin 45 begins to rotate in the counterclockwise direction, the engagement of this pin with slot 44 of rocker arm 41 causes this latter arm to rotate counterclockwise, about its central pivot provided by fulcrum pin 58 (it being assumed that fulcrum pin 58 is then located in hole 43 of arm 41). This causes the slot 42 of arm 41 to rotate in the counterclockwise direction, carrying pin 40 of valve arm 37 along with it.

The center line 74 of valve arm 37 indicates the position of this arm for the "valve closed" condition, while the center line 75 indicates the position of this same arm for the "valve fully open" condition. When the "valve opening" action being described is taking place, the pin 40 end of valve arm 37 is thus caused to move counterclockwise in an arcuate path, about its fixed pivot at the center of valve shaft 31. At the "fully open" position, the center of pin 40 arrives at point 76 (on the center line 75).

The counterclockwise rotation of valve arm 37 rotates valve shaft 31 in the counterclockwise direction, which through the valve operating arm 30 moves poppet 19 to an "open" position.

From the "valve fully open" position, or from any intermediate "valve open" position, the release of handle 63 allows this handle to move downwardly (as viewed in FIG. 2), under the urging of the return spring 68; this rotates handle shaft 49 in the clockwise direction. Then, handle arm 46 rotates clockwise (toward its "closed" center line position 71), rotating (through pin 45 and slot 44) rocker arm 41 clockwise about its pivot 58. This in turn (through slot 42 and pin 40) rotates valve arm 37 clockwise about its pivot (center of shaft 31), rotating the operating arm 30 clockwise and allowing poppet 19 to move to its "closed" position, under the urging of return spring 28.

In order to explain the automatic shutoff or self-tripping action of the nozzle valve of this invention, let us assume for ease in explanation that the operating handle 63 is being held in the "valve fully open" position. It may be noted that a similar explanation will be applicable to any intermediate "valve open" position. When the container into which gasoline is being dispensed becomes "full," for example when gasoline comes up into the fillpipe into which the nozzle spout 5 is inserted, the diaphragm 53 is caused to move in such a way (downwardly in FIG. 6) as to withdraw its attached fulcrum pin 58 from the hole 43 in rocker arm 41, specifically to move the free end of pin 58 below the lower face of the rocker arm. (How this movement of the diaphragm 53 and pin 58 is produced in response to a "full" condition of the container, will be explained hereinafter.)

As previously stated, the valve return spring 28 biases the shutoff valve toward "closed" position, which means that (assuming arm 30 to be in contact with stem 27, as it must be if handle 63 is being held in the "valve fully open" position) a biasing force is present which tends to rotate valve shaft 31 clockwise, and also to rotate valve arm 37 clockwise from its "fully open" position. When the shutoff valve is held in its "fully open" position by means of handle 63, the center of pin 45 is forcibly held at point 73. Then, when fulcrum pin 58 is withdrawn from its operative relationship with rocker arm 41, the force tending to rotate valve arm 37 clockwise (and also tending to rotate the pin 40 end of this arm clockwise, from point 76) will be free to rotate rocker arm 41 (by means of pin 40, in slot 42) clockwise about a (now fixed) pivot point established at 73. Hence, under these conditions rocker arm 41 and valve arm 37 will rotate together—valve arm 37 rotating clockwise about its fixed pivot at the center of shaft 31 and rocker arm 41 rotating clockwise about a pivot point held fixed at 73. The rotation of valve arm 37 clockwise, from its center line position 75 to its original center line position 74, rotates valve shaft 31 and internal operating arm 30 in the clockwise direction, allowing stem 27 and poppet 19 to move to the left (viewed in FIG. 3), so that the shutoff valve closes. This movement of the stem and poppet toward the left is of course effected by the return spring 28.

Resetting of the mechanical linkage to its normal position (i.e., with fulcrum pin 58 properly located or positioned within hole 43 of rocker arm 41) occurs upon the release of handle 63, after the pressure differential which caused diaphragm 53 to move has been removed or dissipated. When this pressure differential has been dissipated, the fulcrum pin 58 (as well as the diaphragm 53) is urged upwardly in FIG. 6 (from its previous lower position) by leaf spring 51. Then, when handle 63 is released, it moves downwardly (viewed in FIG. 2) under the action of its return spring 68, rotating the handle shaft 49 clockwise. This rotates handle arm 46 clockwise (from center line 72 toward its original center line 71), moving the center of pin 45 away from point 73 toward its original location. Rocker arm 41 (as a result of the engagement of pin 45 in slot 44) now rotates clockwise, about a fixed pivot established at pin 40 (which has been returned to its original, illustrated position by the action previously described), moving the hole 43 in arm 41 toward the fixed longitudinal axis of pin 58, until the fulcrum pin 58 snaps into position in hole 43. When this action is complete, all of the elements are again in the positions illustrated in FIg. 5, with handle arm 46 along the original center line 71.

Refer now particularly to FIGS. 8 and 9. A pan-shaped cover 77, having an outer configuration matching that of the wall 32, surrounds and covers the external parts of the nozzle mechanism. The four bolts 55 previously referred to have elongated hexagonal heads, and tapped holes are formed longitudinally in these heads; cover 77 is mounted in place (with its side wall in contact with the outer face of wall 32, at the outer edge of the latter) by means of four mounting screws (visible in FIG. 1) which extend through respective holes in cover 77 and into the tapped holes provided in the heads of the respective bolts 55.

A substantially triangular latching plate 78 is mounted pivotally at one of its corners on the inside face of cover 77, as by journaling on an inwardly-projecting rivet 86 secured to the cover. The plate 78 is capable of rotation in a plane parallel to the inside face of cover 77.

At a second of its three corners, plate 78 has a tab 79 which extends into a transverse substantially rectangular groove 80 cut in the wall of a cylindrical button 81. Button 81 is mounted for longitudinal sliding movement within a bore 82 provided in the side wall of cover 77, and has a longitudinal cavity 83 in which is positioned a return spring 84. One end of spring 84 bears against a fixed interior abutment 85 integrally formed on the side wall of the cover, and the other end of this spring bears against the bottom of cavity 83. Spring 84 biases button 81 outwardly, and also biases plate 78 toward the position illustrated in FIG. 8. It should be apparent that when button 81 is pushed inwardly with respect to the cover against the bias of spring 84, the latching plate 78 will be rotated clockwise (viewed in FIG. 8), about its fixed pivot 86.

The button 81 is so located (see FIG. 1) that it may be pushed inwardly with the thumb of the same hand that is being used to manually pull the operating handle **63.** The rivet **86** is so located that, even though it necessarily extends inwardly a little distance from latching plate **78**, appropriate clearance is provided for the movement of handle arm **46**, when the latter rotates to the "valve fully open" position (as at point **73**, for example).

At its third corner, latching plate **78** has an integral pawl **87** which extends inwardly with respect to the cover, at right angles to the plane of the cover face and also to the plane of plate **78.** When button **81** is pushed inwardly to rotate latching plate **78**, this plate rotates about its pivot **86** to cause pawl **87** to move in a direction which is downwardly and toward the right, as viewed in FIG. **5.**

Rocker arm **41** has, on the end thereof adjacent slot **44** and in a location such as to be engaged by pawl **87** (when the latter moves downwardly and to the right, as viewed in FIG. **5**, as a result of the rotation of plate **78** by the pushing of button **81**), three integral friction surfaces **88, 89,** and **90.** When handle or control member **63** is operated to open the shutoff valve, the pin **44** end (and also the friction surface end) of rocker arm **41** rotates counterclockwise, as previously described; when this takes place, button **81** may be pushed inwardly (with the thumb) to engage pawl **87** with any one of the three surfaces **88–90**, thereby to latch the main shutoff valve open by latching rocker arm **41** in an "open" position. Pressure of the valve spring **28** (exerted through items **30, 31, 37, 40,** and **42** on rocker arm **41**, and tending to rotate this latter arm clockwise about its pivot pin **58**) creates sufficient friction between the pawl **87** and the friction surfaces **88–90** to prevent return spring **84** from moving pawl **87** so long as valve spring **28** is compressed. Button **81** then remains in its inward position. Also, the latching of rocker arm **41** in an "open" position (through items **44–49** and **62**) prevents return spring **68** from moving handle **63** toward "closed" position under these conditions. The previously-described structure thus comprises a latching means, for latching the main shutoff valve "open".

As previously described, the withdrawal of fulcrum pin **58** from its operative relationship with rocker arm **41** (under "tripping" or "container full" conditions) results in the rotation of rocker arm **41** clockwise about a pivot point established at **73** (or a similar pivot point when the shutoff valve is only partially open). This rotation of the rocker arm moves the friction surfaces **88–90** away from pawl **87**, allowing this pawl to return to its original position under the urging of return spring **84.** As pawl **87** returns to its original position, due to rotation of latching plate **78** button **81** returns to its original position. The rotation of rocker arm **41** in the above-described manner results in closing of the shutoff valve, as previously described.

Also, the release of the latch from rocker arm **41** allows handle **63** to return to its original position, under the urging of return spring **68.** The return of handle **63** to its original position causes resetting of the mechanical linkage to its normal position in the manner above described (assuming that the pressure differential which caused diaphragm **53** to move has been dissipated, which will ordinarily be the case).

Manual control of the shutoff valve may be reestablished whenever desired during dispensing, even though the latching means **87–90**, etc. is in its operative position. To do this, the operator will momentarily manually operate handle **63** in the direction to open the shutoff valve wider. This causes rocker arm **41** to rotate counterclockwise about its central pivot at fulcrum pin **58**, removing the frictional force between pawl **87** and the surfaces **88–90**, and allowing pawl **87** (and also button **81**) to return to its original position (away from surfaces **88–90**) under the urging of return spring **84.** The shutoff valve will then be held open by the manual force being exerted on handle **63.**

Due to air leakage around the cover mounting bolts, at the edge of the cover **77**, etc., atmospheric pressure will be continuously present on the external side of diaphragm **53** (i.e., the upper side as viewed in FIG. **6**).

A tube **91** has an open outer end **92** (FIG. **2**) adjacent the outer end of the spout **5** (i.e., adjacent the nozzle outlet). Tube **91**, from end **92**, extends within the spout **5** toward the nozzle casing **1**, and the inner end of this tube passes sealingly through the nozzle casing (see FIG. **7**) into the low pressure or vacuum chamber **56**, to terminate in this chamber. Thus, tube **91**, and also annular chamber **24** (via hole **57**), communicate with the chamber **56.** As previously described, when operating handle **63** is moved upwardly (viewed in FIG. **2**), poppet **19** is moved away from its seat **23.** Gasoline will now flow through the nozzle and in passing through the restricted area at holes **25** will create a subatmospheric pressure in the annular chamber **24**, due to the venturi effect; this pressure reaches chamber **56** by way of hole **57.** Due to the subatmospheric pressure created by the venturi, air will be drawn into vacuum chamber **56** through tube **91** and opening **92** at the end of the tube, so long as the liquid level in the gasoline tank (or in the tank fillpipe) remains below the opening **92.** This air passes from chamber **56** through hole **57**, chamber **24**, and holes **25** to the gasoline stream, passing out with this stream to the nozzle spout **5.** Under these conditions (discharge end of the spout **5** not submerged, it being recalled that atmospheric pressure is effective on the side of diaphragm **53** opposite to chamber **56**), the pressure in the low pressure chamber **56** is not reduced sufficiently to deflect the diaphragm (against the bias of spring **51**, which tends to keep the diaphragm in its upper position) downwardly to the tripping position of the latching mechanism. That is to say, the differential pressure across the diaphragm is then insufficient to deflect the diaphragm **53** downwardly to tripping position.

When the level of the liquid in the tank (or in the tank fillpipe) rises above opening **92** in spout **5**, flow of air through the tube **91** to vacuum chamber **56** will be interrupted. This creates a differential pressure across diaphragm **53**, causing this diaphragm to move inwardly (downwardly, viewed in FIG. **5**) under atmospheric pressure, drawing with it the fulcrum pin **58** which is attached thereto. When the outer or upper end of this pin moves below the lower face of rocker arm **41**, the poppet **19** will be permitted to seat (as previously described), even though the handle **63** is still held (or latched) in its upper valve opening position. Thus, the flow of gasoline will be automatically shut off immediately when the liquid in the gasoline tank fillpipe of the car being filled rises above opening **92.** Resetting of the parts occurs upon movement of handle **63** to the "valve closed" position at the end of the filling operation, as previously described.

Refer now to FIG. **10.** The nozzle construction of this invention is applicable to a so-called single-product nozzle, as illustrated in FIG. 10. In this latter figure, parts analogous to those previously described are denoted by the same reference numerals, but carrying prime designations.

In FIG. 10, the nozzle casing or housing 1′ has an inlet portion 2′ with a threaded inlet fitting 8′ at the outer end of a single cylindrical bore or conduit 10′. A spring-loaded check valve subassembly 12 is mounted in passageway or conduit 10′, this subassembly having parts 13–18 the same as those previously described. The inner end of conduit 10′ leads to valve chamber 3, as before. Internal parts the same as those previously described (refer also to FIGS. 2 and 3) are mounted in the valve chamber 3 and in the outlet chamber 4.

The reduced drag of the rotary shaft seal utilized in this invention, as compared with a sliding or reciprocating seal of the valve stem through a stuffing box, as commonly used heretofore, has been previously mentioned. Thus, the nozzle of this invention requires a much smaller manual force for working the operating handle 63.

The handle 63 is straight, rather than being curved, and so eliminates any finger-pinching effect. The nozzle of this invention is light in weight, and requires a smaller hand span for operation of the handle 63. Also, since the area of valve shaft 31 which is exposed to O-ring seal 35 is constant, there is no possibility for dirt to be drawn into the seal to damage the same, in sharp contrast to the situation with sliding or reciprocating valve stem seals commonly used heretofore.

The invention claimed is:

1. In a liquid dispensing nozzle, a nozzle casing having an elongated chamber with a valve port therein; a valve stem movable longitudinally of said chamber and having secured thereto a valve poppet movable into and out of engagement with said port; a control member shaft, a rockable control member mounted on said shaft outside said chamber, a second shaft extending into said chamber, the axis of said second shaft being spaced from the axis of the first-mentioned shaft; a plurality of arms pivotally interconnected to constitute a mechanical linkage which is connected at one end thereof to said first-mentioned shaft and at its other end to said second shaft, and means connected to said second shaft for moving said stem in response to the rocking motion of said member, transmitted through said first-mentioned shaft and said linkage to said second shaft.

2. Nozzle according to claim 1, wherein the longitudinal axes of said first-mentioned and second shafts extend parallel to each other and at substantially 90° to the longitudinal axis of said stem.

3. Nozzle according to claim 1, wherein each of the pivotal interconnections is a pin and slot connection.

4. In a liquid dispensing nozzle, a nozzle casing having an elongated chamber with a valve port therein; a valve stem movable longitudinally of said chamber and having secured thereto a valve poppet movable into and out of engagement with said port; a control member shaft, a control member mounted on said shaft outside said chamber, a first arm secured at one end thereof to said shaft, a second arm mounted for pivotal movement intermediate its ends and pivotally secured at one end thereof to the opposite end of said first arm, a third arm pivotally secured at one end thereof to the opposite end of said second arm, a second shaft extending into said chamber, the axis of said second shaft being spaced from the axis of the first-mentioned shaft; said third arm being secured at its opposite end to said second shaft, and means connected to said second shaft for moving said stem in response to the motion of said member, transmitted through said first-mentioned shaft and said arms to said second shaft.

5. Nozzle according to claim 4, wherein the pivotal connection between the first and second arms is a pin and slot connection, and wherein the pivotal connection between the second and third arms is a pin and slot connection.

6. In a liquid dispensing nozzle, a nozzle casing having an elongated chamber with a valve port therein; a valve stem movable longitudinally of said chamber and having secured thereto a valve poppet movable into and out of engagement with said port; a control member shaft, a control member mounted on said shaft outside said chamber, a second shaft extending into said chamber, a plurality of arms pivotally interconnected to constitute a mechanical linkage which is connected at one end thereof to the first-mentioned shaft and at its other end to said second shaft, means connected to said second shaft for moving said stem in response to the motion of said member, transmitted through said linkage, and manually-operable means for latching the arms of said mechanical linkage in a particular spatial relationship.

7. In a liquid dispensing nozzle, a nozzle casing having an elongated chamber with a valve port therein; a valve stem movable longitudinally of said chamber and having secured thereto a valve poppet movable into and out of engagement with said port; a control member shaft, a control member mounted on said shaft outside said chamber, a first arm secured at one end thereof to said shaft, a second arm mounted for pivotal movement intermediate its ends and pivotally secured at one end thereof to the opposite end of said first arm, a third arm pivotally secured at one end thereof to the opposite end of said second arm, a second shaft extending into said chamber, said third arm being secured at its opposite end to said second shaft, means connected to said second shaft for moving said stem in response to the motion of said member, transmitted through said arms, and manually-operable means for latching said second arm in a particular angular position.

8. Nozzle defined in claim 7, wherein the latching means includes a plurality of friction surfaces formed on said second arm, and a pawl adapted to be manually moved into engagement with a selected one of said surfaces.

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