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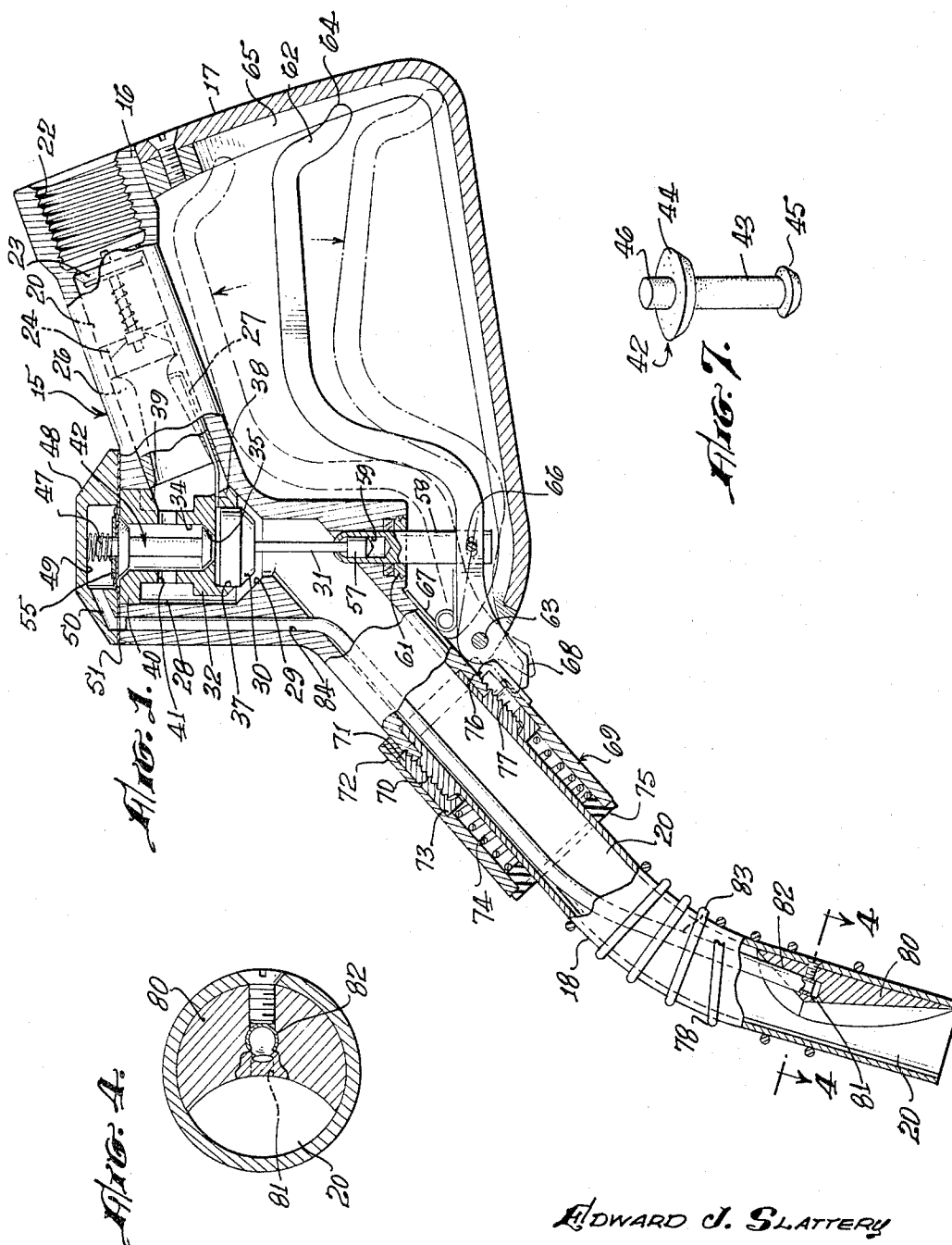
E. J. SLATTERY

3,276,486

STANDARD AUTOMATIC SHUT-OFF FUEL SERVICING NOZZLE

Filed March 29, 1963

3 Sheets-Sheet 1



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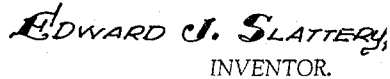
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3 Sheets-Sheet 2



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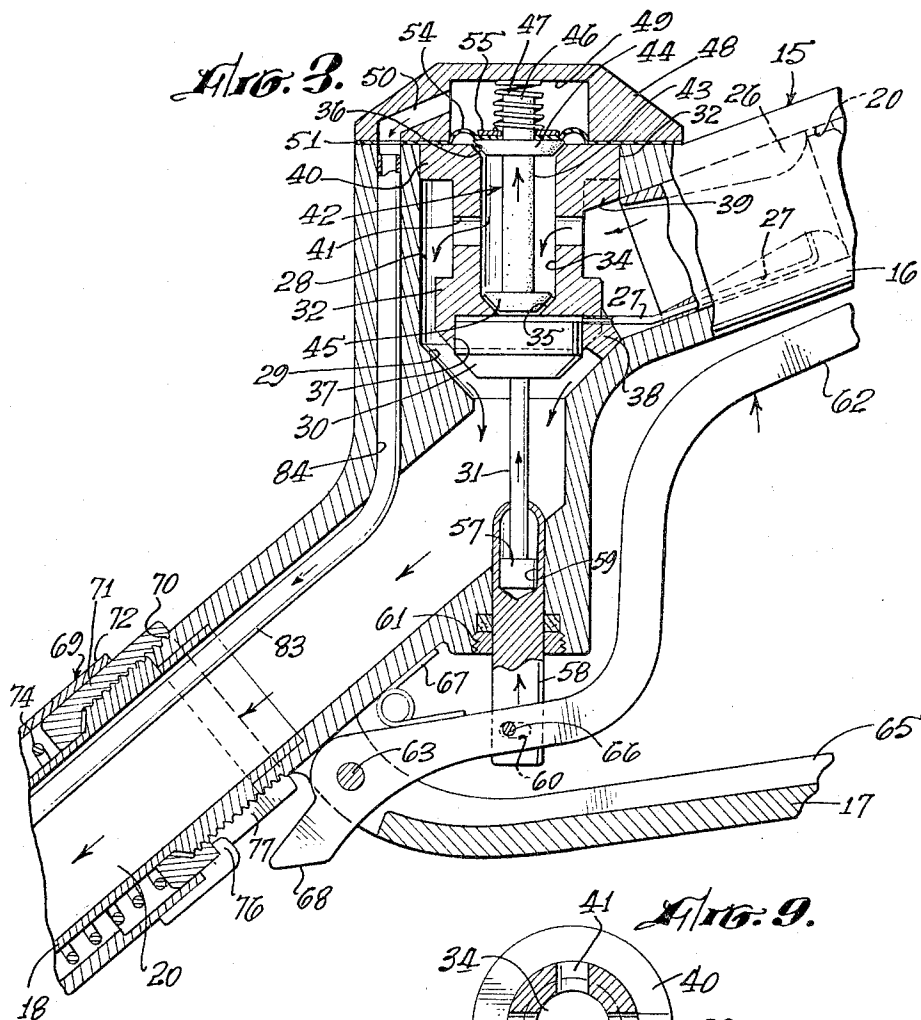
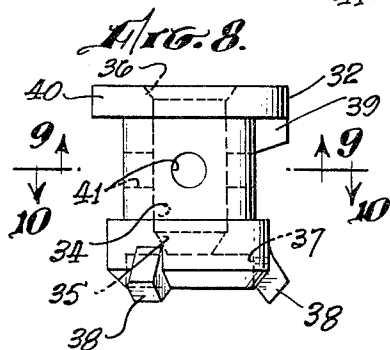
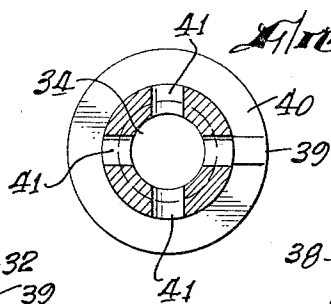
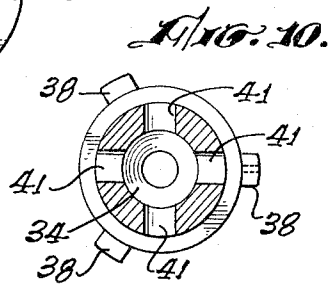
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STANDARD AUTOMATIC SHUT-OFF FUEL SERVICING NOZZLE

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3 Sheets-Sheet 3



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STANDARD AUTOMATIC SHUT-OFF FUEL SERVICING NOZZLE

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Filed Mar. 29, 1963, Ser. No. 269,213

8 Claims. (Cl. 141-208)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates in general to liquid dispensing nozzles or spouts, similar to those used for dispensing gasoline or other liquid hydrocarbon fuels and relates more specifically to a nozzle which will automatically cut off the flow of liquid when the receiving tank or container becomes full, or the level of the liquid therein reaches a predetermined height, or when the unattached nozzle becomes inadvertently displaced from the opening of the receiving tank or container.

The use of automatic closing nozzles for such purposes has become fairly common where the closure is limited to the filling of the tank or container. One type of such nozzle is disclosed in applicant's previously issued Patent No. 2,686,626. The improved nozzle here presented, however, has "fail safe" provisions which are not present in the prior art.

For maximum safety in use, the nozzle should be so constructed that it cannot operate in the automatic mode unless it is fully inserted into the opening of the receiving tank or container and is normally held in such position. If the nozzle is inadvertently removed from the tank by the vehicle suddenly and unexpectedly moving away or for some other untoward reason, the flow of gasoline or other inflammable liquid must be positively shut off for safety reasons as well as to prevent waste. None of these automatic provisions, however, should prevent the normal use of the nozzle while attended by the operator. Other improvements will be noted in my new nozzle tending toward economical construction and ease of assembly.

The principal object of my invention, therefore, is to provide a filling nozzle that is fully automatic in operation in that it may be used automatically only when its spout is fully inserted into the opening of the receiving tank or container, will automatically shut-off when the tank is approximately full or when the spout is removed from the tank opening for one reason or another and yet may be fully usable in the conventional, manual manner.

Another object of my invention is to provide positive means leading to the secure retention of the nozzle within the opening of the receiving tank or container.

A further object of the invention is to provide improved means for effecting the automatic operation set forth above.

A still further object is to provide additional valve means whereby the flow of gasoline or other similar liquid may be effectively stopped before it enters the nozzle.

Another object of my invention is to provide a nozzle with a minimum number of parts, so designed as to lend themselves to high production by economical manufacturing methods and to ease of assembly or disassembly, without special tools.

Other objects and advantages of the invention will be apparent from the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a side elevational view of the filling nozzle with parts broken away and showing the main valve in open position with the nozzle in automatic operation and operating handle at mid-position;

FIG. 2 is a partial side elevation with parts broken away

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and showing the main valve closed with handle at its lower closed position;

FIG. 3 is a partial side elevation with parts broken away and showing the main valve open with handle in the upper, manual position;

FIG. 4 is a cross-sectional view of the spout venturi taken on the line 4-4 of FIG. 1;

FIG. 5 is a plan view of the special diaphragm;

FIG. 6 is a cross-sectional view of the diaphragm taken on the line 6-6 of FIG. 5;

FIG. 7 is a perspective view of the balanced valve;

FIGS. 8, 9, and 10 are detailed and related views of the balanced valve cage.

With reference to FIG. 1, the nozzle 15 comprises a body portion 16, a handle guard 17 and a spout portion 18. Extending generally longitudinally of the body portion and then trending down through the spout portion is passage 20 which is provided for the controlled flow of the gasoline or other liquid being dispensed. The upper end of this passage has a threaded aperture 22 which is adapted to receive the male threaded end of the hose conveying the liquid from the storage tank to the nozzle. Adjacent to the inner end of the threaded aperture, a check valve 23 may be furnished which is positioned by the spider 24. Next adjacent the spider, a body venturi section 26 is fixedly mounted in the passage 20 for a purpose to be described later. At the end of the passage 20 in the body portion 16 is formed a valve chamber 28 which opens into the spout portion passage 20. The lower portion of this chamber 28 is constructed so as to form a valve seat 29 for the reception of the lower passage closing portion of the main valve 30.

A pilot valve cage 32 is provided for insertion in the valve chamber 28. As shown in more detail in FIGS. 8, 9, and 10, this cage contains a central pilot valve chamber 34 having lower valve seat 35 and upper valve seat 36. A lower auxiliary main valve chamber 37 is provided in the foot portion of the cage for the closely fitting upper portion of the main valve 30. It will be noted here that tube 27 connects the throat of body venturi 26 to the upper portion of this chamber 37. Three feet 38 are cast into the lower portion of the cage for positioning it with respect to the main valve seat 29. These feet not only position the cage with respect to the main valve chamber 28 but insure that, when the main valve is open, passage 20 is fully opened for the flow of the liquid being dispensed. A key 39 is provided in the lower portion of the upper rim 40 which key fits into a keyway formed into the upper portion of the valve chamber 28. By this manner of construction, the cage is constrained from any rotation. The central portion of the cage is provided with a plurality of apertures 41 which are formed radially of its principal vertical axis. These apertures lead into the pilot valve chamber 34 for reasons to be explained hereinafter. A balanced pilot valve 42 is positioned in the chamber 34. This pilot valve, as shown in FIG. 7, has a stem 43 connecting two downwardly coned valve portions 44 and 45. An upper stem extension 46 is furnished for supporting a spring 47. It will be noted that valve portion 44 is of greater diameter than valve portion 45.

A cover 48 is fitted over the valve chamber 28 and may be secured to the upper portion of the nozzle body portion in any suitable manner. This cover contains a central cavity 49 and a short passageway 50. Interposed between the cover and the body portion and covering the valve chamber 28 is a diaphragm 51. This diaphragm, as detailed in FIGS. 5 and 6, has holes 52, matching passageway 50, and 53 for the insertion of stem extension 46. For greater flexibility, and positive positioning of the valve stem 46 with its spring 47, a raised rim 54 is formed in the upper surface of the diaphragm. This

diaphragm also acts as an hermetic seal for the cavity 49 thus preventing liquid from gaining access thereto. A washer 55 may be centered on stem extension 46 underneath the spring 47 for preventing the spring from wearing on the upper surface of the diaphragm. The other holes 56 in the diaphragm may be formed for the insertion of screw fastenings between the cover and the nozzle body portion, if such be used.

The main valve 30, which fits closely into cage chamber 37 and is guided thereby in its limited vertical movement, has a valve stem 31 terminating in an enlarged bobbin 57. These details may be observed more closely in FIGS. 2 and 3.

A coaxial valve actuator 58 is further provided which has a central cavity 59 for the reception of stem bobbin 57. The upper portion of the actuator is formed over the bobbin and closely surrounds the stem 31. The cavity 59, while of a diameter to allow the bobbin to reciprocate freely, is somewhat longer than the bobbin and allows the main valve to float up and down under certain conditions of operation. The lower end of the valve actuator 58 is provided with a horizontal slot 60. Located in the nozzle body portion and surrounding the valve actuator 58 is seal 61 which is provided for the prevention of liquid leaking outwardly from passage 20 to atmosphere along the valve actuator.

Handle 62, which is formed as shown for ease of manual manipulation, is pivoted on pin 63 fastened into the body of the spout portion. This handle 62 is provided with a bifurcated outer end 64 which rides over and is strengthened by ridge 65 formed on the inner surface of handle guard 17. The lower end of valve actuator 58 is formed so as to pass through the handle 62. A pin 66 is fastened in the handle 62 and passes through the slot 60 formed in the lower end of the actuator. Thus, as the handle is moved through its travel zone, the actuator may be vertically reciprocated through the seal 61. In order to return the handle 62 to its lower position, as shown in FIGS. 1 and 2, when released by the operator, torsion spring 67 is provided for insertion between the spout portion and the upper surface of the handle adjacent its pivoting point. This handle is further provided with a dog latch 68 which will be further described in connection with the safety sleeve 69 carried by the spout.

The safety sleeve 69 is supported by the spout portion 18 and is designed to reciprocate thereon. A threaded portion 70 is formed on the external cylindrical surface of the spout for the reception of the threaded sleeve annular base ring 71. Annular sleeve 72 surrounds the spout and the base ring 71 and is designed to reciprocate with relation to both. The sleeve 72 is provided with a lower reduced diameter bore which forms a shoulder stop 73. This stop, taking up against the lower edge of the base ring, limits the upward movement of the sleeve as it slides upwardly over the base ring. Between the inner wall of the reduced diameter sleeve bore and the external surface of the spout enclosed thereby, a compression spring 74 is furnished for extending the sleeve downwardly to the full limit of its travel from the base ring. A rubber or plastic guard ring 75 is inserted into the end of the reduced diameter of the sleeve bore which serves to retain the spring 74 within the sleeve and also as a guard when the spout is inserted into the opening of the receiving tank or container. This guard ring may be adhesively secured within the sleeve or otherwise suitably fastened therein.

At the upper end of the annular sleeve 72, a stop 76 is secured thereto which slides in a keyway 77 which keyway is formed or cut into the wall of the spout, adjacent thereto, and into the base ring 71. By abutting against the bottom of the keyway, this stop limits the downward travel of the sleeve 72 with relation to the base ring 71. When the sleeve 72 is in its full retracted position, i.e., its limited upward movement, this stop 76 also serves as a latch which, in cooperation with the handle dog latch

68, serves to maintain the handle 62 in its mid or automatic position as shown in FIG. 1.

Spout anchor spring 78 is wrapped externally around the lower portion of the spout and is provided to anchor the spout in the receiving tank opening when the nozzle is otherwise unattended by the operator. This anchor spring is suitably secured to the spout by soldering, brazing, or other suitable means.

A partial spout venturi fitting 80, shown in FIGS. 1 and 4, is installed internally of the lower end of the spout. This fitting is provided with a small radial orifice 81 leading from the longitudinal bore 82 to the throat of the venturi fitting. Installed in and leading upward from the bore 82 is the tube 83 which terminates at its upward end just under the passage 50 in the cover 48 after passing up through the spout and a passage 84 formed in the nozzle body portion. As will be explained more fully, this tube 83 in conjunction with the partial spout venturi 80 is provided to establish a vacuum in the cover cavity 49 above the sealed pilot valve 42.

In operation, the operator with nozzle in hand approaches the tank or container to be filled. As he inserts the spout portion 18 into the opening thereof, he raises the handle 62 to its upward limit of travel, raising the main valve 30 to its open position by means of valve actuator 58 and valve stem 31 and bobbin 57. The fluid trapped in the nozzle above the main valve from the last operation escapes and allows the incoming fluid from the delivery hose to open the check valve 23 against its comparatively weak spring. This condition is best illustrated in FIG. 3. As the fluid flow through body venturi 26 reaches its maximum rate, the drop in pressure transmitted through opening and tube 27 creates a vacuum condition in the upper part of valve chamber 37 on top of the main valve 30. Thus, as the spout 18 is pushed further into the tank opening, sleeve 72 is pushed upwardly and stop 76, attached thereto, is positioned to engage with dog latch 68 on the inner end of handle 62. When the latter is then released, it is forced downwardly by torsion spring 67 until latch 68 engages stop 76. The handle now is in the mid or automatic operating position as shown in FIG. 1. In this condition of operation, main valve 30 is held open by the pressure of the fluid under it in conjunction with the vacuum above it in the chamber 37, stem bobbin 57 is floating in the cavity 59 of the valve actuator 58 and fluid pressure, entering through the radial orifices or apertures 41 in the pilot valve cage 32, maintains the balanced pilot valve 42, in conjunction with the spring 47, in a closed condition.

In the event the spout 18 is inadvertently removed from the tank opening, sleeve 72 is forced downwardly by its associated spring 74, thus disengaging stop 76 from dog latch 68, and handle 62 drops or is forced to its low position, pulling main valve closed by means of valve actuator 58. As the fluid pressure builds up above the closed main valve, the pressures between the nozzle body and the delivery hose equalize and check valve 23 is closed by its spring which now becomes operative. This automatic shut-off condition is illustrated in FIG. 2.

When in delivery operation with the spout 18 in the tank opening and the handle 62 in the automatic or mid-position, as shown in FIG. 1, and the fluid in the tank or container reaches its desired level, fluid rises in the tank end of the spout 18. As the fluid rises above the tip of the spout and the air supply is cut-off, the normal laminar flow of fluid through the spout is transformed to turbulent flow and a lowered pressure or suction is instantaneously created at orifice 81 in the throat of the partial venturi fitting 80. This suction is then transmitted by tube 83 to the sealed cavity 49 in cover 48 over the balanced pilot valve 42, creating a momentary vacuum therein. Since the fluid pressure in chamber 34 is at full delivery pressure, this creation of a vacuum above the valve portion 44, coupled with its larger size, allows the fluid pressure to overcome the combined force

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of the fluid pressure on the top of lower valve portion 45 and that exerted by the spring 47 and thus raise the balanced pilot valve, lifting valve portion 45 from its seat 35. This latter event allows fluid pressure to build up in main valve chamber 37 over the top of the main valve and forces it down on its seat 29, thus shutting off the flow of fluid through the nozzle. As indicated previously, the elongated cavity 59 in the valve actuator 58 permits this main valve closure since the handle 62 is in the mid-position, FIG. 1. As also previously described, with the buildup in pressure in the nozzle above the closed main valve, check valve 23 operates to close off the delivery at its entering connection 22.

It will be appreciated that, while the automatic features are normally fully applied, failure of any of these automatic features will not prevent a normal manual use. When handle 62 is raised and held in its upper limiting position, the main valve is held open. When the spout is removed from the container opening and handle 62 is released, its associated torsion spring 67 forces the handle down to its lower limiting position and the main valve is closed in its seat, all by means of valve actuator 58.

Having thus described a preferred form of my improved filling nozzle and since various changes may be made in minor structural details without departing from the essence of the invention, it is intended that all such changes be included within the scope of the appended claims wherein I claim:

1. An automatic filling nozzle for controlling the flow of fluids into a container comprising:

- a body portion having a substantially horizontal passageway formed therein;
- a centrally disposed substantially vertical main valve chamber having a main valve seat at its lower end formed in said body portion;
- a spout portion leading angularly downwardly from said body portion beyond said main valve seat having a passageway therethrough, said passageways in said body portion and spout portion in conjunction with said main valve chamber forming a single passageway for the delivery of fluid through said filling nozzle;
- a valve cage fixedly supported in said main valve chamber;
- a cylindrical chamber formed in a lower foot portion of said cage;
- a vertically movable main valve closely fitted in said cylindrical chamber for cooperation with said main valve seat;
- means for reciprocating said main valve with respect to its seat;
- a body venturi located in said horizontal passage of said body portion upstream of said cylindrical chamber;
- means communicating the throat of the body venturi with the upper portion of said cylindrical chamber so that a vacuum is created at the top of said main valve to hold the main valve in an open position when fluid is flowing through the body venturi; and
- means positioned within said spout and being responsive to a change from laminar flow to turbulent flow within said spout for breaking said vacuum and closing said main valve when the fluid level within said container reaches a bottom portion of said spout.

2. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 1 further characterized by:

- said horizontal passageway in said body portion having connection means for connecting said nozzle to a fluid delivery hose; and
- a check valve positioned in said horizontal passageway adjacent said connection means for shutting off the

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fluid flow from said delivery hose when said main valve is closed.

3. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 1 further characterized by said means communicating the throat of the body venturi with the upper portion of the cylindrical chamber being a tube.

4. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 1 further characterized by said main valve comprising:

- an enlarged cylindrical head portion adapted to reciprocate within said cylindrical chamber and having a lower conical portion for cooperation with said main valve seat;
- a valve stem depending downwardly from said head portion, said stem terminating in an enlarged bobbin portion;
- a valve actuator mounted coaxially and concentrically with said valve stem and valve stem bobbin, said valve actuator passing through a sealed aperture in said body portion and having a cavity in the upper end thereof adapted to enclose said stem bobbin with allowance for a limited vertical motion of said bobbin in said cavity; and further characterized by said means for reciprocating said main valve with respect to its seat including:

- a handle guard depending downwardly from said body portion and extending laterally to a point of attachment at the junction of said body portion with said spout portion;
- a movable handle mounted within said handle guard and pivoted at said point of attachment;
- a torsion spring mounted between the upper portion of said handle and said body portion at said point of attachment for forcing said handle downward to its lower limiting position within said handle guard; and

- pivot means connecting the lower end of said valve actuator with said handle for vertically reciprocating said valve actuator and said main valve.

5. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 4 further characterized by:

- a safety sleeve mounted for limited reciprocable movement upon the upper external portion of said spout portion, said safety sleeve having a stop attached thereto adapted to limit its downward movement;
- a dog latch means on the end of said handle adjacent said point of attachment adapted for engagement with said safety sleeve stop when said safety sleeve is forced to its upward limit of motion with respect to said spout portion; and
- resilient means associated with said safety sleeve for forcing said sleeve to the limit of its downward movement.

6. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 1 further characterized by:

- a pilot valve chamber formed in the interior of said valve cage;
- radial apertures in said cage connecting said pilot valve chamber with said horizontal passageway in said body portion;
- a lower axial aperture in said cage connecting said pilot valve chamber with said main valve cylindrical chamber, said aperture forming an upwardly coned pilot valve seat;
- an upper axial aperture in said cage coaxial with said pilot valve chamber, said aperture being formed as an upwardly coned pilot valve seat;
- a balanced pilot valve consisting of a stem separating and connecting two downwardly coned valve portions, said valve portions being spaced and adapted to close off said upper and lower axial apertures when

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said balanced pilot valve is forced downwardly; and resilient means adapted to force said pilot valve onto its valve seats against the fluid pressure developed in said pilot valve chamber through said radial apertures.

7. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 6 further characterized by providing:

- a cover for said centrally disposed substantially vertical main valve chamber secured to said body portion in substantially coaxial relationship with the vertical axis of said main valve chamber;
- a central cavity formed in said cover;
- a sealing flexible diaphragm disposed between said cover and said body portion for hermetically sealing said central cavity in said cover from said main valve chamber and said pilot valve chamber;
- said resilient means adapted to force said pilot valve onto its valve seats being situated in said central cavity above said diaphragm; and
- said means for breaking said vacuum and closing said main valve comprising means to create a vacuum in said central cavity of said cover whereby said pilot valve is lifted upwardly off its seats by the fluid pressure in said pilot valve chamber and said fluid pressure is introduced on the top of said main valve in the upper portion of said main valve chamber to break the vacuum caused by the venturi.

8. An automatic filling nozzle for controlling the flow of fluids into a container as claimed in claim 7 wherein said means to create a vacuum in said central cavity in said cover comprise:

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- a passageway formed in said cover between said cavity and the substantially horizontal base of said cover;
- a vertical passageway formed in said body portion as a continuation of the passageway formed in said cover;
- a partial venturi fitting mounted interiorly of said spout portion near the bottom portion thereof, said spout venturi fitting having a vertical passageway formed therein and a substantially radial orifice leading from the throat of said spout venturi fitting to said vertical passageway therein; and
- a tube mounted interiorly of said spout portion, said tube leading from said venturi fitting passageway to said body portion vertical passageway.

References Cited by the Examiner

UNITED STATES PATENTS

1,114,431	10/1914	Bopp	251—43	X
1,551,893	9/1925	McDonald	141—382	
2,111,851	3/1938	Flinchbauch	141—215	
2,650,617	9/1953	Wasser	251—77	X
2,686,626	8/1954	Slattery	141—207	
2,934,103	4/1960	Frise	141—208	
3,172,420	3/1965	Brown et al.	251—43	X

FOREIGN PATENTS

427,586 4/1935 Great Britain.

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