Feb. 8, 1966 K. EHLERS 3,233,641

LIQUID-DISPENSING NOZZLE

Filed Jan. 13, 1964 2 Sheets-Sheet 1

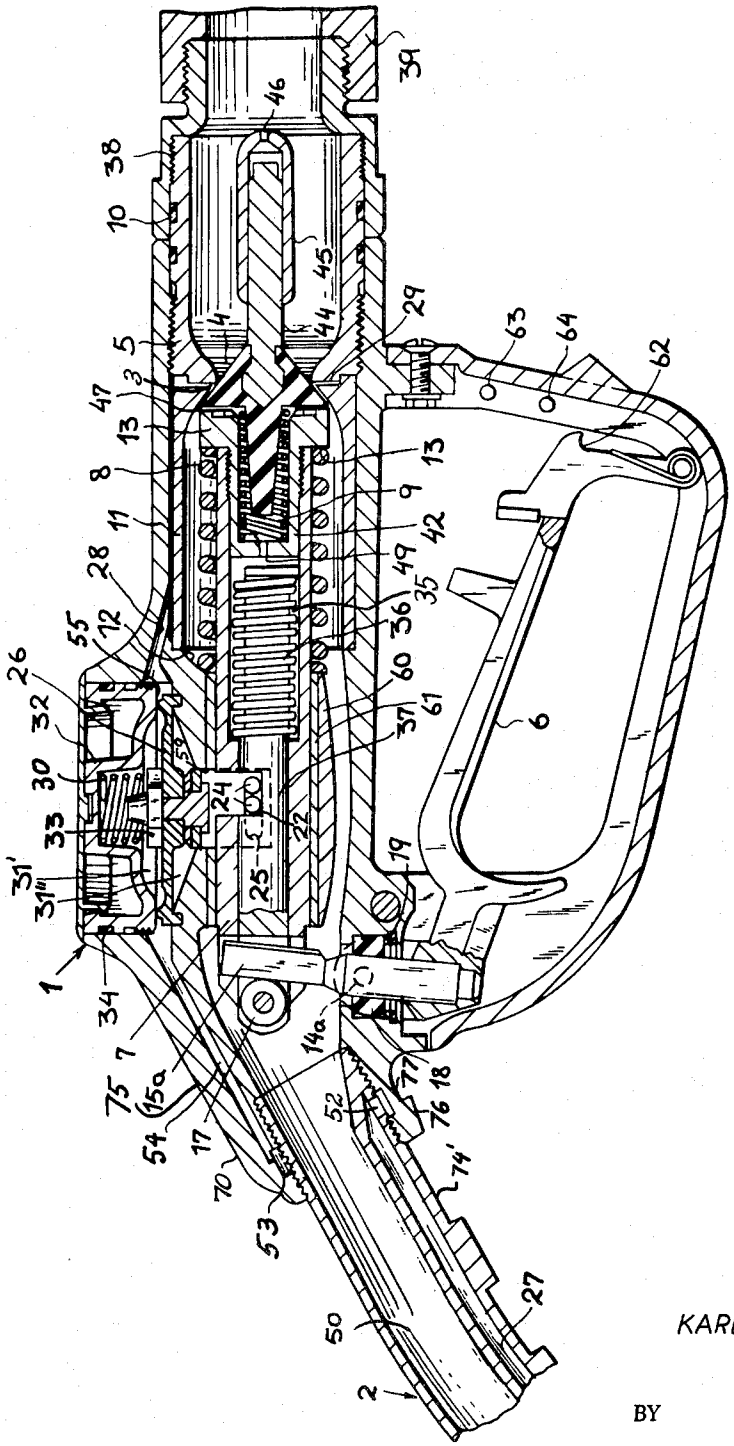

Fig.1

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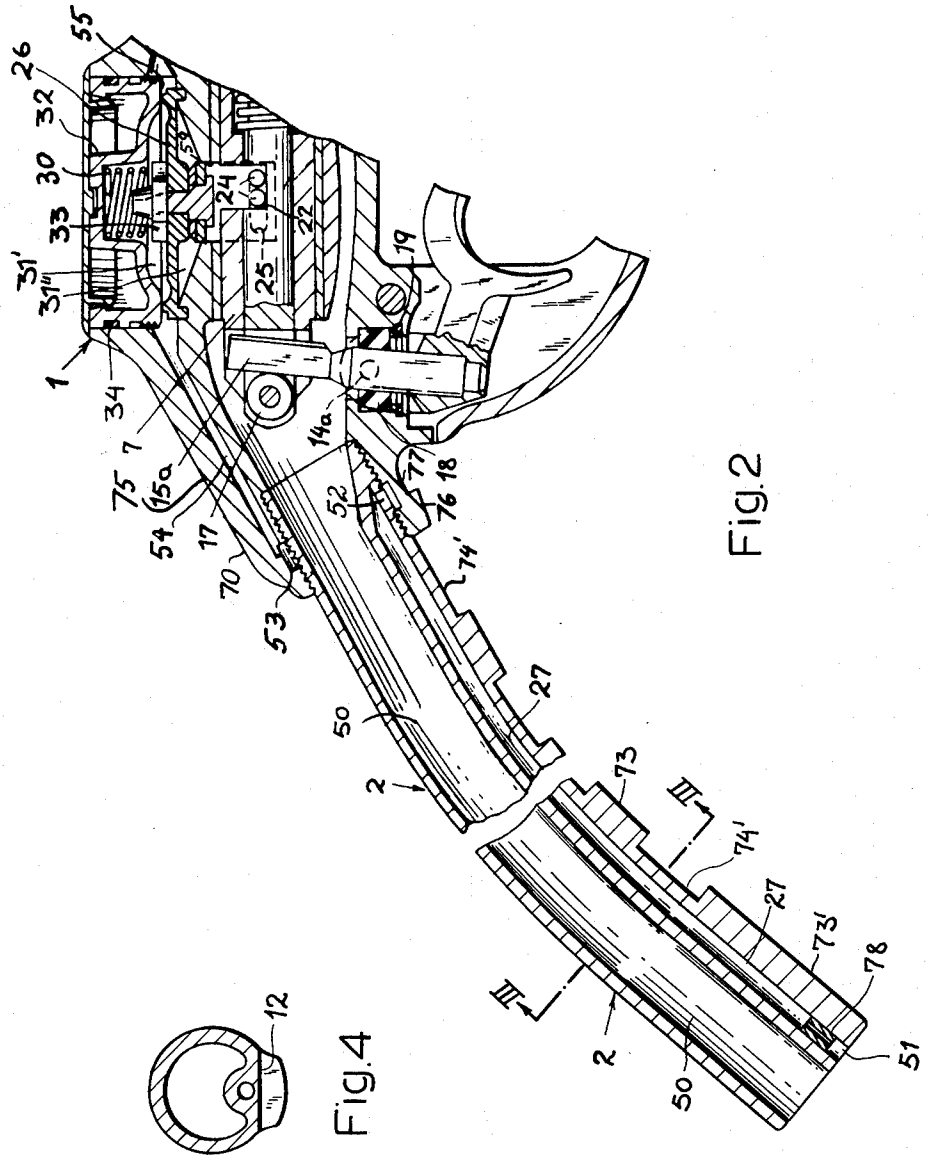

Fig.2

Fig.4

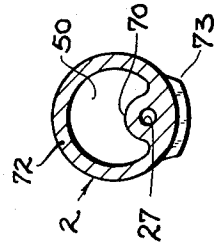

Fig.3

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3,233,641

LIQUID-DISPENSING NOZZLE

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6 Claims. (Cl. 141—209)

My present invention relates to liquid-dispensing nozzles of the type disclosed in my copending application Ser. No. 273,895, filed April 18, 1963, of which the present application is a continuation-in-part.

Liquid-dispensing nozzles for nondraining hoses generally have a pistol-like configuration and are conventionally employed in the dispensing of metered quantities of gasoline or the like to receptacles such as the fuel tanks of automotive vehicles and are provided with means for automatically cutting off the flow of liquid through such nozzles upon the attainment of a predetermined filling level in the receptacle served thereby. For the most part, such automatic cut-off devices, which can be generally termed valve means for selectively blocking and unblocking the passage of liquid to the spigot of the nozzle, are provided with pressure-differential means having an air passage, the pressure-differential means being operable upon blocking of the air passage by the liquid within the receptacle for controlling the valve means to cut off flow of liquid to the spigot when the predetermined liquid level is attained.

Nozzles of this type are usually inserted by the filling-function attendant into the inlet pipe of a receptacle and are permitted to remain there while the attendant occupies himself with other duties. When the liquid level in the receptacle rises to the spigot of the nozzle, the aforementioned air passage is blocked and the receptacle prevented from overflowing. The air passage of earlier devices was provided along the outlet spigot in different ways. In one construction, a relatively thin wall tube was soldered to the outlet tube of the nozzle along its concave or underside while in other constructions the thin copper tube was clamped to the aluminum outlet. It will be evident that effective functioning of the pressure-differential responsive means to trip the valve means is essential in order to prevent overflow of the receptacle with consequent danger to the attendant and property in the region of the fuel pump because of the high flammability of the liquid dispensed. Thus the control means must be of such character that, even when the nozzle is overlooked by the attendant, the fuel flow will be terminated prior to overflow of the tank. With earlier devices of the type described, however, undesirable air passages were readily formed in communication with the pressure-differential responsive means to give a false indication that the liquid level had not yet been obtained when this level had indeed blocked the normal air passage. These undesirable passages arose from bending and cracking of the thin-walled tube above the mouth of the spigot, from loosening of the junction between the spigot and the housing of the nozzle, and from strains at the junction of the air-passage tube and this housing. These difficulties arose from the strain applied to the spigot after the latter was inserted into the fuel tank of a vehicle as a consequence of the weight of the nozzle housing and hose, tension on the hose caused by wind and untimely withdrawal of the hose, and accidental forcing of the nozzle in the tank. Moreover, with conventional devices the nozzle frequently slipped out of the tank inlet and was damaged upon striking the ground.

It is the principal feature of the present invention to provide a nozzle for a liquid-dispensing hose whereby the aforementioned disadvantages can be avoided.

A further object of this invention is to provide a nozzle

of the character described which will retard accidental withdrawal of the spigot from the receptacle and prevent deformation of the air-passage tube and the development of auxiliary air passages leading to a false indication that the liquid level has not attained its predetermined maximum.

Still another object of the present invention is to extend the principles of my aforementioned copending application and provide an improved spigot construction for the novel control mechanism described therein.

A further object of the invention is to provide a spigot for a nozzle of the character described which has high structural rigidity but which can be formed simply and inexpensively.

These objects and others which will become apparent hereinafter are attained, in accordance with the present invention, through the provision of a pistol-like nozzle for a dispensing hose which comprises a housing communicating with the hose, valve means in the housing for selectively blocking and unblocking the passage of liquid therethrough, pressure-differential means for controlling the valve means as previously described, and an elongated spigot, extrusion molded to form an integral arcuate tubular body having an outlet of relatively large cross-sectional area for the liquid and a bore extending along the outlet and constituting the air passage for the pressure differential means. Thus, the air passage and the outlet are commonly formed in a single elongated body (preferably by extrusion molding) with round annular cross section, the air passage or bore being defined by a tubular wall portion whose thickness is equal to or greater than the wall thickness of the body surrounding the remainder of the outlet. The entire body can, therefore, be monometallic with the wall portion surrounding the bore or air passage simultaneously constituting an inwardly convex ridge extending along an interior wall of the outlet preferably along the underside (concave side) thereof and of smoothly curved configuration merging with the interior wall of this outlet. The spigot body can be substantially circular in cross-section with the air passage formed in the generally cylindrical outlet wall. The spigot will thus have a high degree of stiffness, being reinforced by the wall portions surrounding the air passage along the underside of the body, i.e. the portion thereof resting against the vehicle tank and subjected to most of the bending stresses applied to the nozzle. In this manner, there is no danger that the air passage will be interrupted or provided with undesirable communication with the atmosphere. The smooth configuration of the ridge prevents the formation of turbulence and foaming in the fuel delivered. This is particularly important when the liquid to be dispensed is gasoline since this liquid foams readily and frequently can rise to the nozzle because of foaming to cut off the flow of fuel prematurely; laminar flow of the fuel through the spigot is thus highly desirable.

According to a more specific feature of this invention the underside of the spigot body is additionally strengthened by a longitudinally extending reinforcing rib externally of the bore and interrupted by a plurality of longitudinally spaced recesses adapted to engage the receptacle wall and prevent premature withdrawal of the nozzle from the receptacle. The thickness of the body is increased at this rib so that, even at the recesses, the wall thickness of that portion of the body surrounding the bore is at least equal to the wall thickness of the outlet portion of the body. The recesses can be formed by removal of material from the extrusion-molded body and preferably have the configuration of chordal segments. The body can be composed of copper or aluminum and formed by conventional extrusion-molding techniques so that both the outlet and the passage will terminate at the end face of the body, the bore then

being provided with constriction means adapted to reduce the cross-section of the air passage at its end. The constriction means permits the extrusion molding of a bore of sufficiently large diameter that finishing will not be required, but nevertheless having the advantage of a small-diameter passage for purposes of controlling the valve means.

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is an axial cross-sectional view of a nozzle embodying the invention, illustrating the pressure differential and valve means thereof;

FIG. 2 is a similar view showing the spigot in greater detail;

FIG. 3 is a cross-sectional view taken along line III—III of FIG. 2; and

FIG. 4 is a view similar to FIG. 3 of a modified spigot.

In FIG. 1, I show a nozzle in which the valve means and pressure-differential means are identical with those of my above-identified copending application. Thus the nozzle comprises a tubular valve housing **1** to whose front end a spigot **2** is secured; the rear end of housing **1** has screwed into it a nipple **5** with threads **38** by which it can be attached to a nondraining hose **39** of a conventional fuel pump not shown. Nipple **5** forms a valve seat **3** normally engaged by a valve body **4** which, in the specific embodiment shown in the drawing, is of frustoconical configuration; other, e.g. disk-shaped, types of valves may also be used.

A pistol-grip handle **6** is pivotally attached to the exterior of housing **1** by a lever **15***a*, rigid therewith, which is fulcrumed in the lower housing wall by pins **14***a*. This housing wall has a bore through which the lever **15***a* passes and which is sealed against the outside by a fluid-tight plug **18** of fuel-resistant rubber or other elastomeric material; plug **18** is held in place by a split ring **19** seated in an annular groove of the housing wall. Lever **15***a* is formed with two lateral arms which are received in recesses and through which the pins **14***a* pass without traversing either the plug **18** or the main body of lever **15***a* embraced thereby, hence these elements need not be perforated. The upper end of lever **15***a* is received in a slot of a rod **37** extending axially within housing **1**, the forward end of this rod also carrying a rod **17** forming an abutment for the end of lever **15***a*.

Rod **37** constitutes the inner one of the two telescoped valve-control members slidably but nonrotatably guided in the housing **1**, the outer one of these members being a sleeve **7** which also has a slotted front end straddling the lever **15***a*. Sleeve **7** slidably supports the valve body **4** by means of a thimble **42** rigid with that sleeve, the valve body **4** having a forward extension projecting into the bore of thimble **42** as well as a rearward extension **44** guided in a stationary bracket **45** having a vent **46**. A relatively strong coil spring **8** surrounds the sleeve **7** and is confined under pressure between a flange **13** of thimble **42** and a shoulder **12** of housing **1**; this flange has a rear face defining with the front face of valve body **4** a variable clearance **47**, a minimum separation between these two faces being always positively maintained by spacers on the flange **47**. A coil spring **9**, weaker than spring **8**, is seated in thimble **42** and bears upon valve body **4** so as to urge the latter rearwardly with reference to sleeve **7** and onto the valve seat. An annular gasket **10** is inserted between housing **1** and nipple **5** to prevent any leakage of fluid between the rear end of the nozzle and the hose **39**. The front end of thimble **42** has an orifice **49** through which the interior of the thimble communicates with an annular channel formed between the telescoped members **7** and **37**. A further compression spring **36**, also weaker than spring **8** occupies this channel and tends to maintain the members **7**, **37** in their normal relative position illustrated in FIG. 1.

A cylindrical bushing **11** is held in place within housing **1** by the nipple **5** and has a forwardly divering inner wall surface in the region surrounding the clearance between flange **47** and valve body **4**. The annular space between this wall surface and the sleeve **7**, whose cross-sectional area is larger than that of the annular passage formed between the valve seat and valve body **4** in any axial position of the latter, forms part of the path along which the liquid from hose **39** passes through the interior of housing **1** on its way to spigot **2**. Within that spigot this path is constituted by a relatively wide fluid channel **50** alongside which there extends a relatively narrow air passage **27** terminating in a port **51** at the free end of the spigot. Another port **52** in the opposite end of the spigot connects channel **27** with an annular recess **53** in the tapered front end **70** of nozzle housing **1** from which a passage **54** leads to the upper compartment **31'** of a piston chamber whose lower compartment **31''** is separated therefrom by a flexible membrane **26**. This membrane, which could be held in position within its chamber in a variety of ways (as, for example, by being formed with a peripheral bead received in an annular groove of the chamber wall), is here shown clamped between an annular shoulder **55** and a cap **32** screwed into the upper compartment **31'**. An annular gasket **34** forms a fluid-tight seal between the cap **32** and the adjoining part of housing **1**.

A bolt **33**, extending radially of the nozzle housing, centrally traverses the membrane **26** which is seen to lie parallel to the housing axis. Bolt **33** is secured to the membrane in airtight manner by a nut **56**; the head of this bolt supports a cage of inverted U-shape, so that the latter is limitedly rotatable thereon and also has some play in the direction of the bolt axis. This relative mobility avoids objectionable deformation of the membrane and insures that the cage is freely displaceable in radial direction of the housing, without binding or jamming, in a rectangular lateral aperture **59** of a boss **60** which supports a similarly apertured cylindrical liner **61** forming a guideway for the axially displaceable sleeve **7**.

The cage is provided, at the lower ends of its two sides, with a pair of slots **25** which extend in longitudinal direction of the telescoped members **7**, **37** and accommodate a pair of latch rollers **24** for releasably coupling these members together. Sleeve **7** and rod **37** are formed with lateral recesses which are normally aligned to receive the rollers **24**, the longitudinal extent of these recesses being substantially less than that of the slots **25** whereby the assembly **7**, **37**, **25** is axially displaceable from the valve-closing position to the wide-open position in which they can be releasably held by a catch **62** on handle **6** engaging an indexing stud **63**. The assembly can also be indexed in an intermediate position, in which liquid can flow at a reduced rate past the valve **4**, by the interengagement between catch **62** and another stud **64**. A coil spring **30** in a recess of cap **32** bears upon membrane **26** to urge it inwardly under light pressure, thereby tending to maintain the rollers **24** engaged in both recesses. The membrane can flex outwardly only so far that the rollers are lifted out of the inner recess **22** on rod **37**.

Cap **32** is provided with two peripheral ports of which one communicates with the test passage **54** connected with air channel **27** whereas the other leads to a bore **28** forming part of a low-pressure connection between the space **31'** above the membrane and the valve seat. The latter connection includes a peripheral passage **28***a* between bushing **11** and the adjoining housing wall as well as a radial passage **29** between that nozzle and the nipple **5**. A further low-pressure passage interconnects the space **31''** below the membrane **26** and the diverging internal region of the nozzle just forwardly of the valve seat, this passage including the clearance **47**, the orifice **49**, the

channel housing spring 9, the recess in sleeve 7, housing spring 36 and the aperture 59 of boss 60. The last-mentioned passage, serving to relieve the pressure below the membrane, is always filled with liquid from the supply hose 39; it will be noted that the path between space 31'' and the channel of spring 9 is substantially interrupted by the cage in aperture 59 when the cage rests in its bottom position illustrated in FIG. 1.

The operation of the liquid-dispensing nozzle is as follows:

In the cut-off position shown in FIG. 1, spring 8 is expanded to press the valve body 4 against its seat 3 through the intermediary of sleeve 7. The sleeve and its companion rod 37 are in their normal relative position in which their recesses 25, 22 register with each other and are interlinked by the latch rollers 24, the membrane 26, which forms a piston means, being deflected downwardly by its biasing spring 30. Test passage 27, 54 is open to the atmosphere and no suction is developed at the inlets to the upper and lower membrane compartments 31', 31'' since no liquid flows past the valve 4.

When it is desired to use the nozzle for dispensing fuel from a metering pump to the tank of a vehicle, the lifting of the nozzle from its holder on the pump housing actuates the pump motor in the conventional manner so that pressure is built up in the supply hose 39 which is filled with liquid. After the forward end of spigot 2 has been inserted into the inlet of the tank, the operator pulls the handle 6 to swing it counterclockwise about its fulcrum 14*a* into the rapid-feed position or into the slow-feed intermediate position in which the detent 62 hooks onto the stud 64. The telescoped members 7, 37 with their latch rollers 24 are thereby displaced fully or partly to the left, within the limits of mobility afforded by the slot of the cage, so that flange 13 is retracted from the valve seat and allows the valve body 4 to follow suit under the pressure of the oncoming liquid. Should the pump pressure fail for any reason, spring 9 would continue to hold the valve 4 closed so that the liquid in hose 39 cannot drain out.

As the liquid rushes past the inlets 47 and 29 of the two low-pressure passages leading toward the membrane 26, suction is created at these inlets by the Pitot effect. The suction applied to low-pressure passage 28, 29 and through it to compartment 31' remains ineffectual as long as the port 51 of spigot 2 is not obstructed by liquid in the gooseneck of the tank. The suction prevailing in the bleeder passage 35, 49, 47 assists the spring 30 in tending to maintain the cage in its bottom position in which the sleeve 7 and the rod 37 are positively coupled together with latch rollers 24. This condition persists until the liquid level reaches the port 51 to disconnect air channel 27 and test passage 54 from the atmosphere. The suction in passage 28, 28*a*, 29 thereupon draws the membrane 26 outwardly, this suction being strong enough to override both the pressure of spring 30 and the partial vacuum in passage 35, 49, 47 in view of the fact that the rate of liquid flow past the inlet 47 of the latter passage is considerably less than that at the valve seat 3, i.e. at the inlet 29 communicating with compartment 31', by reason of the difference in effective cross-sectional area of the flow path at these two locations. The rollers 24 are thereby lifted out of the recess 22 of rod 37 so that the sleeve 7 is now released from the restraining action of lever 15*a* and handle 6, being thus free to return to its normal position under the urging of its restoring spring 8. It should be noted that this return stroke is cushioned by the spring 36 which is now compressed to bias the handle 6 in a clockwise sense so that the latter will return to its original position (FIG. 1) when the catch 62 is released from its indexing stud 63 or 64. With the closure of valve 4 upon the restoration of sleeve 7 to normal, the flow of liquid through the nozzle housing 1, 2 is stopped and the suction in chamber 31', 31'' ceases. Spring 30 returns the membrane 26 to its previous state as soon as the linkage 6, 15*a*, 37 has been reset by the operator, the rollers 24 thereupon again latching the members 7 and 37 to each other.

As will be evident from FIGS. 2–4, the spigot body 2 is monometallically extrusion molded in a single piece (except for the tubular plug 78) with the outlet 50 of large cross-sectional area and the air-passage bore 27 of small cross-sectional area, the body being bent in its plane and having the bore 27 extending within the wall of outlet 50 along the underside of the body. The transition 70 along the inner wall of outlet 50 and the ridge 71, extending along the bore 27, is rounded and smooth to ensure laminar flow of the liquid through the nozzle. The ridge 71 forms part of a wall surrounding the bore 27 and having a wall thickness at least as great as the wall thickness of the wall 72 defining outlet 50, although the wall of the bore may have a substantially greater thickness. The underside of the spigot 2 is also provided with a longitudinally extending reinforcing rib 73, formed with longitudinally spaced supporting recesses 74 which constitute notches holding the spigot in place in the receptacle. These recesses are preferably formed by chip-removal machining operations and can be of chordal segmental configuration as illustrated in FIG. 4.

From FIGS. 3 and 4, it may be seen that the body of the spigot has a generally circular annular cross-section and is of increased cross-section in the region of bore 27 which, even at the recesses 12, has a thickness at least equal to that of the remainder of the body around the outlet 50. The spigot 2 can commence with a recess 74', formed between the spigot body and the housings 1, and can have an end portion 73' free from recesses to reduce stresses when the spigot is inserted or removed from the tank. Moreover, the housing 1 preferably tapers toward a cylindrical outlet portion 75 whose diameter is only slightly greater than that of the spigot threaded therein, so that this portion of the housing can be inserted into the vehicle tank inlet if desired, the housing having a boss 76 engageable with the tank and defining a further supporting recess 77 for this purpose.

At the mouth of the spigot, the passage 27 is provided with constriction means or plug 78 forming a small-bore nozzle which prevents accumulations of the liquid in the passage and affords the latter the advantages of a narrow bore while permitting it to be produced as a somewhat larger bore by extrusion. There is no danger that an accumulation of fuel will wet the attendant upon withdrawal of the nozzle.

The invention as described and illustrated is believed to admit of many modifications and variations within the ability of persons skilled in the art, all such modifications and variations being deemed to be included within the spirit and scope of the appended claims.

What is claimed is:

1. A nozzle for a dispensing hose, comprising a housing communicating with said hose; a spigot connected with said housing for discharging liquid fed through said housing from said hose; valve means in said housing for selectively blocking and unblocking the passage of liquid to said spigot; and pressure-differential-responsive means having an air passage and operable upon blockage of said passage by said liquid for controlling said valve means to cut off flow of said liquid to said spigot, said spigot comprising an elongated integral tubular body formed with an outlet of relatively large cross-sectional area for said liquid and with a bore extending along said outlet and constituting said passage, said body being of round annular cross-section and having an inwardly convex ridge extending along the wall of said outlet and paralleling said bore, said ridge being of smoothly curved configuration merging with said wall, said bore being surrounded by a tubular portion of said body over the entire length of said bore, said tubular portion being of a wall thickness at least equal to that of said body surrounding said outlet, said body being provided with a reinforcing

wall portion of increased thickness monometallically formed on the body along said bore outwardly thereof, said wall portion forming a longitudinally extending rib along the exterior of said body, said rib being provided with recesses for supporting said nozzle on a receptacle inlet.

2. A nozzle as defined in claim 1 wherein said recesses include chordal segmental cut-outs in the round wall of said outlet.

3. A nozzle as defined in claim 1 wherein said rib at a location proximal to said housing defines therewith a further one of said recesses.

4. A nozzle as defined in claim 3 wherein said housing has an outlet portion receiving said body, said outlet portion tapering toward said body and being of a diameter only slightly greater than that of said spigot adjacent said body, said outlet portion of said housing being formed externally with a segmental reinforcing formation along a side of said outlet portion corresponding to the concave side of said body.

5. A nozzle as defined in claim 1 wherein said bore is provided with constriction means at its end remote from said housing.

6. A nozzle with automatic cutoff for dispensing liquid from a nondraining hose, comprising a tubular housing with an open front end and with an open rear end connectable to said hose;

an elongated spigot secured to said front end, said spigot having a relatively wide filling channel communicating with the interior of said housing and a relatively narrow air channel extending from a location within said housing to a port opening into the atmosphere near the free end of said spigot;

pressure-sensitive piston means in a space of said housing separated from said interior;

a valve body axially movable in said interior, said housing being provided near its rear end with a constriction forming a valve seat;

a pair of slidably interconnected control members axially movable in said housing with freedom of limited relative displacement in axial direction, one of said members bearing said valve body;

first spring means in said housing bearing upon said one of said members for urging said valve body against said seat, thereby blocking the flow of liquid through said housing; a handle externally mounted on said housing, said handle being provided with an extension projecting into said housing, the other of said members being linked with said extension for forward displacement away from said valve seat upon movement of said handle from a normal position to an off-normal position;

second spring means weaker than said first spring means bearing upon said members for tending to maintain them in a predetermined relative position;

and latch means in said housing limitedly displaceable in axial direction of said housing, said latch means being simultaneously engageable with cooperating formations on both said members in said predetermined relative position thereof whereby movement of said handle into said off-normal position forces said one of said members away from said valve seat and enables the flow of liquid from said hose to said spigot, said housing being formed with a first passage extending from said air channel of said spigot to a part of said space on one side of said piston means, said housing being further formed with a second passage extending from said part of said space to a point along the flow path of said liquid through said interior whereby suction due to said flow becomes effective upon the blocking of said port to displace said piston means, said latch means being linked with said piston means for disengagement from at least one of said formations upon suction-induced displacement of said piston means, thereby enabling said first spring means to restore said one of said members to flow-blocking position, said spigot comprising an elongated integral tubular body formed with an outlet of relatively large cross-sectional area for said liquid and with a bore extending along said outlet and constituting said air channel, said body being of round annular cross-section and having an inwardly convex ridge extending along the wall of said outlet and paralleling said bore, said ridge being of smoothly curved configuration merging with said wall, said bore being surrounded by a tubular portion of said body over the entire length of said bore, said tubular portion being of a wall thickness at least equal to that of said body surrounding said outlet.

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