

[54] **HOSE NOZZLE WITH SEAL SENSING SYSTEM**

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[51] Int. Cl. **B65b 57/06; B67c 3/26**

[58] Field of Search 137/154, 390, 393; 141/1, 141/39, 46, 52, 59, 65, 97, 192-195, 198-229, 276, 290, 291, 292, 287, 346-351, 392

[56] **References Cited**

UNITED STATES PATENTS

3,590,890	7/1971	Young	141/198 X
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3,605,824	9/1971	Madden et al.	141/46 X
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Primary Examiner—Richard E. Aegerter

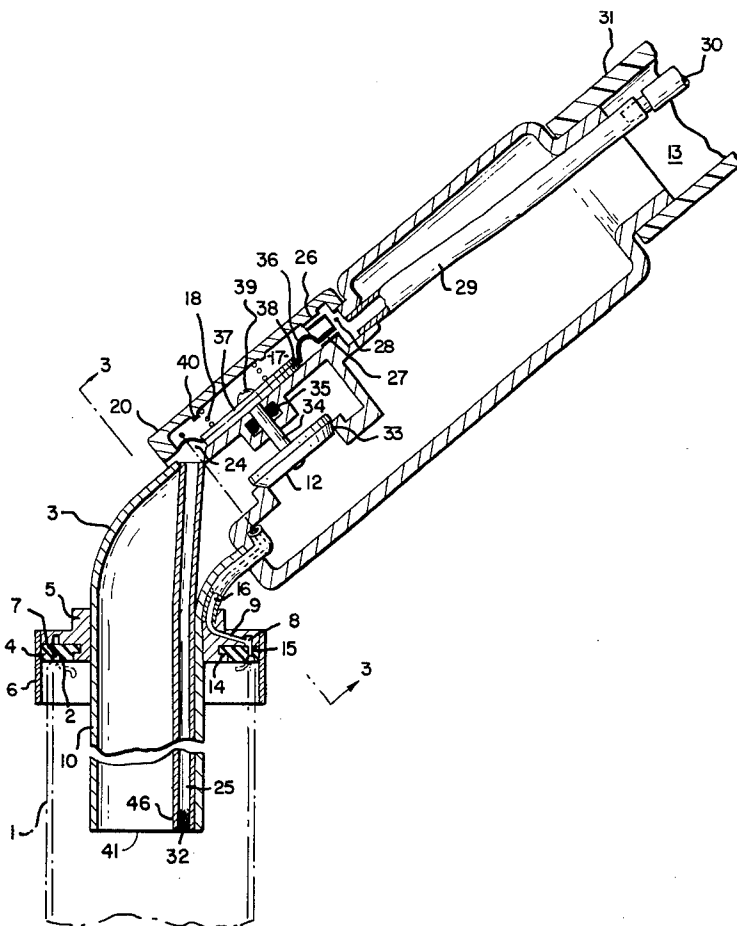
Assistant Examiner—Frederick R. Schmidt

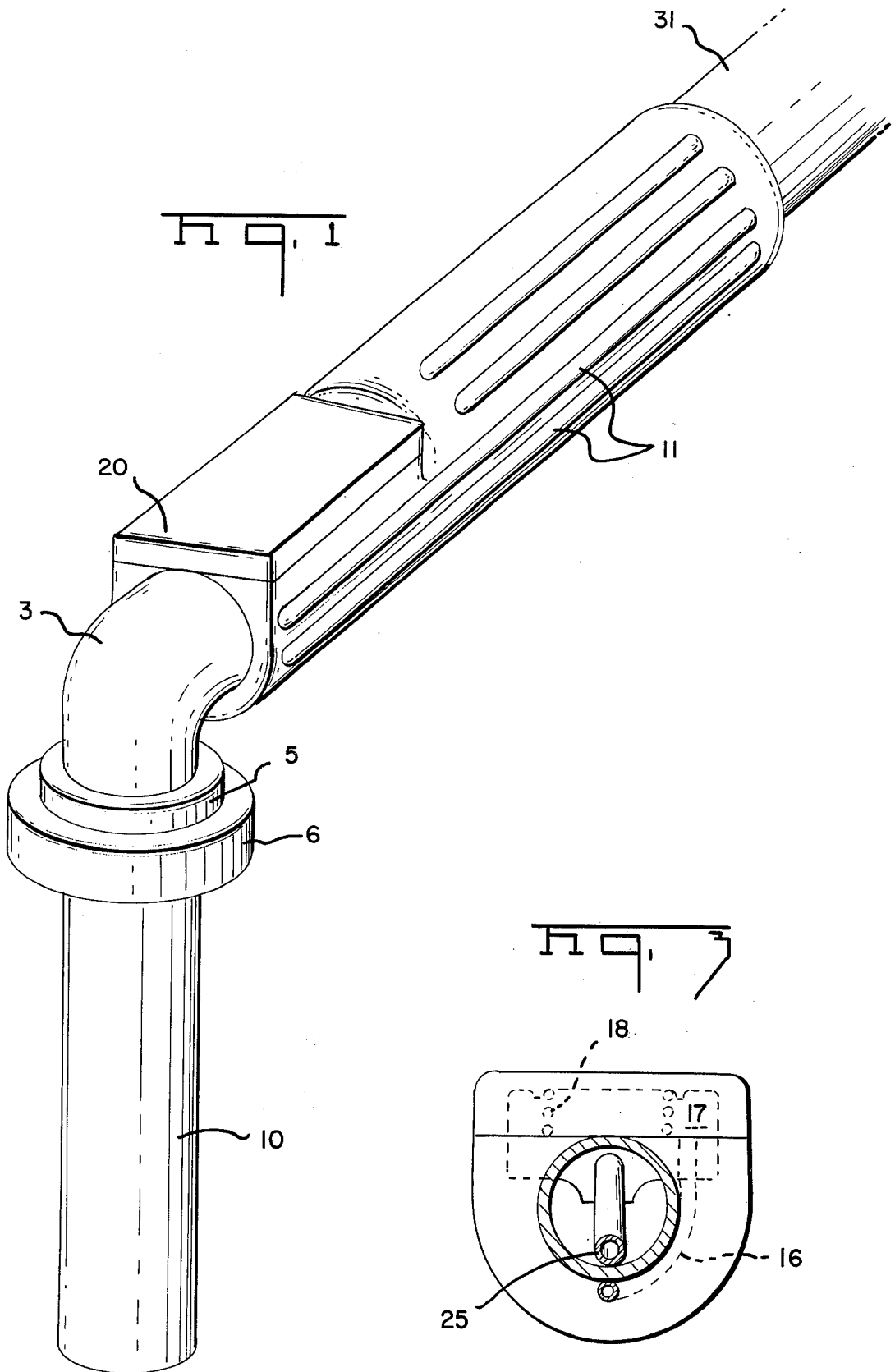
Attorney, Agent, or Firm—Woodcock, Washburn, Kurtz & Mackiewicz

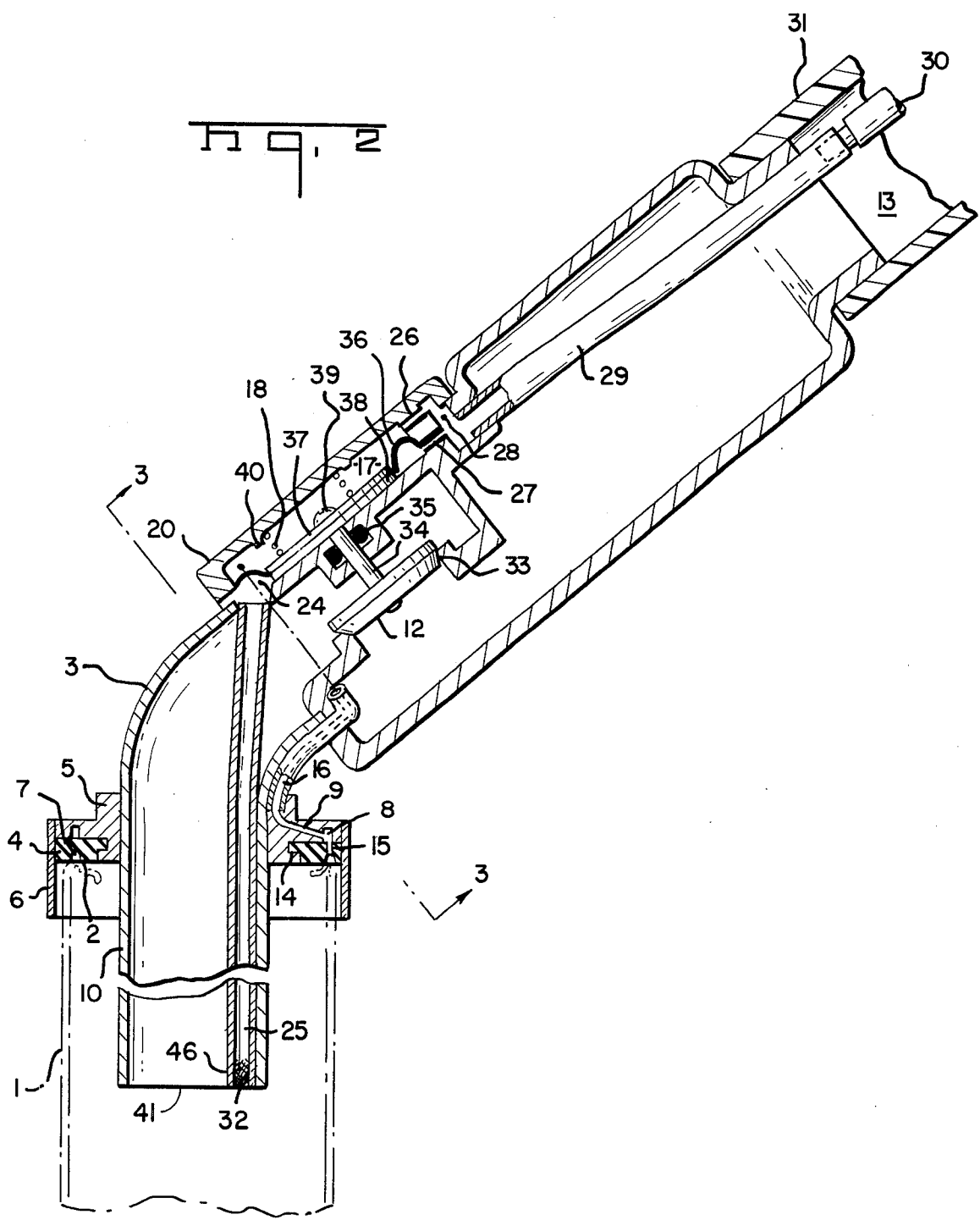
[57] **ABSTRACT**

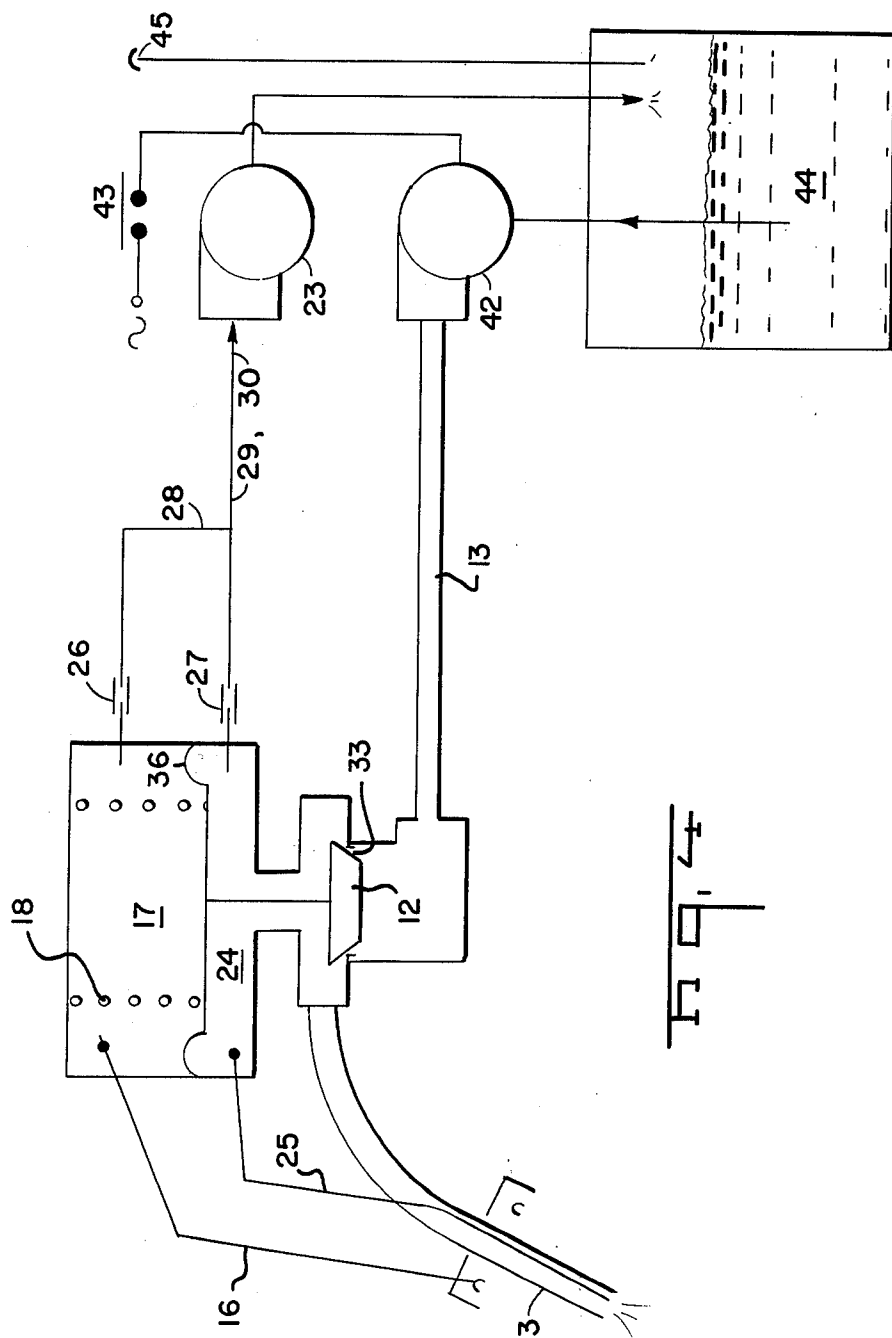
A hose nozzle particularly suitable for use in self-service gasoline pumps has a pressure seal mounted on the flange of the spout. The seal mates with a matching surface on the filling neck of the tank to be filled. A source of vacuum is connected to a chamber in the seal. When this chamber is blocked by reason of the nozzle being properly seated in the filler cap, a pressure sensitive relay device is actuated to allow gasoline to flow through the nozzle. A source of vacuum pressure is connected to a sensor tube which operates the pressure sensitive relay device when the tank is full. This same tube exhausts gasoline vapors into a remote nonhazardous area.

7 Claims, 4 Drawing Figures









HOSE NOZZLE WITH SEAL SENSING SYSTEM**BACKGROUND OF THE INVENTION**

This invention relates to liquid transfer hose nozzles and more particularly to a hose nozzle which can be operated only when a tight seal exists with the tank to be filled.

The evolutionary development of equipment for gasoline service stations for automobiles has done much to reduce the hazards inherent in the handling of gasoline. However, the highly volatile flammable and explosive nature of gasoline makes fumes and spillage a continuing serious danger. This is particularly true because the general public is largely unconditioned to these hazards.

Self-service gasoline stations are a developing need and progress is dependent upon adequately safe equipment becoming available. This involves handling by untrained, sometimes careless and perhaps mischievous persons with minimal danger of spill of gasoline or its fumes. Until now no known system for filling automobile gas tanks has been available to accomplish this. The commonly used automatic overfill shutoff for gasoline pump nozzles protects against accidental spillage to a considerable degree but does not contain the explosive atmosphere polluting vapor emitted as the tank is filled nor prevent accidental or deliberate pumping of gasoline through the nozzle when it is not inserted into the tank filler neck.

Gasoline pump nozzles are available with mechanical latches that are actuated by the act of inserting the nozzle spout into the tank neck. A flange with a sealing surface may be a part of the actuating device. Such mechanisms are not foolproof in that, even with a seal provided, there is no verification that the seal is effective. The latch can also be manually bypassed readily by careless or irresponsible persons.

The increasing need for avoiding pollution of the atmosphere requires additional precautions to eliminate the unavoidable escape of fumes that now occurs when fueling automobiles. Presently, Federal and State anti-pollution agencies are tightening regulations so that avoiding escape of fumes may be a legal requirement.

While other hose nozzles have been devised aimed at providing seal-actuated controls, they do not provide the foolproof operation and simplicity of the present invention. For example, Madden, U.S. Pat. No. 3,605,824 teaches application of a seal to a tank filling nozzle whereby pressing the seal against the tank filler neck initiates a control action allowing fluid to be pumped through the nozzle. However, this does not truly test the seal between the nozzle and the filler neck but only that there is a force holding the exposed seal member against the sensing device that actuates the fluid control valve. This force could readily be applied manually by an irresponsible or malicious person. Cuts or other damage to the seal ring rendering its sealing action useless would not be detected by this mechanism which would allow fluid flow despite seal damage. Other unique features not previously available which are the subject of this invention are described later on.

SUMMARY OF THE INVENTION

This invention is a self-sealing filling nozzle with integral pump control mechanism and safety shut-off devices primarily for filling automobile gasoline tanks. It prevents feeding of gasoline through the nozzle unless

the nozzle is sealed to the tank inlet fitting. If any part of the nozzle seal system is damaged so that the system is not completely sealed, gasoline flow cannot be started or maintained. Design of the nozzle makes it easily and safely operated by inexperienced members of the general public even in unattended locations.

It is an object of this invention to provide a filling nozzle for automobile gasoline tanks that is suitable and safe for self-service use by the general public by providing simplified operation and automatic non-spill features plus provision to contain the fumes and return them to the supply tank or vent them at a remote location.

It is a further object of the invention to provide a filling nozzle for automobile gasoline tanks suitable for self-service use in isolated unattended locations where vandalism, tampering and unauthorized operation are a problem.

It is a further object to provide a filling nozzle for automobile gasoline tanks that is turned on by the act of inserting the nozzle into the tank filler neck until a seal is established and turned off as soon as the nozzle is backed off enough to break the seal.

It is a further object to provide a filling nozzle for automobile gasoline tanks that is turned on by the act of inserting the nozzle into the tank filler neck until a seal is established and which is designed so that the required seal can be established only by inserting the nozzle into a tank filler neck of the intended standard design.

It is a further object to provide a filling nozzle for automobile gasoline tanks having non-spill safety features that are entirely fail-safe making the device inoperative if the safety features become ineffective through damage or loss of power.

It is a further object to provide a filling nozzle for liquid storage tanks that can be quickly applied and turned on or off entirely by the operation of engaging a tank filler coupling without requiring operation of any other controls.

It is a further object to provide a filling nozzle for liquid storage tanks, especially useful where spillage is to be avoided, requiring that a seal be established and verified before liquid can flow and wherein the seal is readily established by insertion of the nozzle into the filler neck.

It is a further object to provide a filling nozzle for liquid storage tanks with provision for sealing the nozzle to the tank connection while filling and including means for venting the fumes and air displaced by the filling liquid to a remote location through the filling nozzle and its attached hose.

It is a further object to provide a filling nozzle for liquid storage tanks with self-contained, power operated non-spill valve in which the source of power is a remote vacuum source and using no electrical power or control circuitry of any kind.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view of the hose nozzle; FIG. 2 is a cross-section of the hose nozzle; FIG. 3 is a section on the lines 3—3 of FIG. 2; and FIG. 4 is a schematic diagram of the liquid delivery system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1, 2, 3 and 4, a preferred embodi-

ment of the present invention, adapted specifically for use with standard automobile gasoline tank filler necks, will now be described.

The operation of refueling an automobile using this device is accomplished as follows: First, the gasoline supply pump operating switch 43 is actuated starting pump 42 which pumps gasoline from the supply tank 44 through hose 13 up to main valve 12 which is normally closed blocking further flow at main valve seat 33. Control of the supply pump switch 43 may be via coin operated, credit card operated or dollar bill operated vending mechanisms; key lock switches; remote manual switches or by present conventional pump-side hand lever switches depending on the type of installation required.

The operator, who may be an unexperienced self-service customer, now removes the gasoline tank filler cap and inserts the outlet spout 3 of the filling nozzle into tank filler neck 1 as far as possible. In so doing spout extension 10 and shield 6 will guide seal 4 into a sealing relationship with sealing surface 2 of the filler neck. This causes the main valve 12 to open, by means described later, supplying gasoline through spout 3 into the automobile's tank through filler neck 1.

Serrated hand grip 11 provides a convenient and comfortable aid to finding the seal engagement position and maintaining it as required to keep the gasoline flowing.

With seal engagement position established gasoline will flow until the occurrence of one of the following:

- A. The operator removes the spout breaking the seal,
- B. The tank is filled; in which case the main valve 12 will be tripped closed by means to be described later. The pump is shut off by any one of the pump control mechanisms described above that are included in the individual installation. Irrespective of the means used to control the pump, gasoline will not flow through the outlet spout unless a continuously maintained pressure tight seal exists between the outlet spout and the filler neck sealing surface.

FIG. 2 shows outlet spout 3 inserted in tank filler neck 1 with seal 4 engaging sealing surface 2 of the filler neck 1. Together with spout extension 10 shield 6 protects seal 4 when the outlet spout is not in service and prevents intentional or accidental engagement of seal 4 with devices other than the standard gasoline tank filler neck for which it is designed. Shield 6 is mounted to spout flange 5 which is secured rigidly to outlet spout 3. Spout flange 5 contains flanged recess 14 which mounts and retains resilient seal 4. Annular chamber 7 in seal 4 communicates via holes 15 with internal passages 8 and 9 in spout flange 5. Passages 8 and 9 communicate through tube 16 with pilot chamber 17 establishing a pressure tight passageway between annular chamber 7 and pilot chamber 17. Pilot chamber 17 is enclosed by cover 20 and is further connected through restriction 26 with a vacuum pressure source 23 by way of passage 28, tube 29 and auxiliary power hose 30.

Thus a circuit is established by which vacuum pressure from source 23 is applied to pilot chamber 17 establishing a subatmospheric pressure, when and only when, annular chamber 7 is completely sealed against atmospheric pressure. Vacuum pressure applied to the source side of restriction 26 will not be established in pilot chamber 17 unless chamber 7 is sealed off. Restriction 26 is sized so that the low value of vent air flow

necessary to maintain chamber 17 at substantially atmospheric pressure can readily be supplied from chamber 7 through passages 8 and 9 plus tube 16 whenever chamber 7 is not sealed against atmospheric pressure.

When atmospheric pressure is reduced sufficiently in pilot chamber 17, pilot diaphragm 36 is moved upward against the force of coil spring 18. Coil spring 18 is positioned by spring seat recess 40. Screw 39 attaches pilot diaphragm 36 to main valve 12 via diaphragm discs 37 and 38 and valve stem 34. Upward movement of diaphragm 36 thus also moves main valve 12 off main valve seat 33. This admits flow of gasoline from hose 13 into outlet spout 3 from which it flows out through spout end 41 into tank filler neck 1.

An automatic shut-off feature, that closes main valve 12 when the tank being serviced becomes filled, is actuated by sensor tube 25. Sensor tube 25 has protective screen 32 inserted in its outer end which extends to a position adjacent to spout end 41. The other end of sensor tube 25 terminates in auxiliary valve chamber 24. Chamber 24 is further connected through restriction 27, passage 28, tube 29 and auxiliary power hose 30 with vacuum pressure source 23. Stem seal 35 isolates chamber 24 from the pressure of the flowing gasoline by sealing stem 34. During normal filling operations, the vacuum pressure source 23 draws air through restriction 27 in sufficient quantity to vent the tank fumes via sensor tube 25. The fumes are then drawn through chamber 24, restriction 27, passage 28, tube 29 and power hose 30 by the suction of vacuum pressure source 23. Vacuum pressure source 23, typically a vacuum pump, is vented into supply tank 44 returning surplus gasoline overflow liquid or vapor to the safety of the remote supply tank. Vent 45 is a standard type of safety vent for underground fuel tanks as required by most local building codes. Restriction 27 limits this flow so that pressure in chamber 24 is not decreased enough to permit spring 18 to overcome the thrust on diaphragm 36 which is produced by vacuum pressure in chamber 17. This allows main valve 12 to remain open.

When the automobile's tank is filled gasoline will rise in filler neck 1 and enclose the tip 46 of sensor tube 25. This causes an immediate change in pressure in tube 25 and chamber 24 which will create a vacuum in chamber 24 to partially counteract thrust produced by the vacuum in chamber 17 on diaphragm 36. This thrust will be counteracted sufficiently that, combined with the thrust of spring 18, the net force on the diaphragm assembly of 12, 34, 36, 37 and 38 will be such as to quickly close main valve 12. This will stop flow of gasoline through the outlet spout 3 avoiding overflow of the tank.

What is claimed is:

1. A liquid transfer hose nozzle comprising:
 - a flanged outlet spout,
 - a pressure seal mounted on the flange of said spout, said seal being constructed to mate with a matching surface on a filling neck of a vessel to which liquid is to be transferred,
 - a sensing chamber within said seal, an opening in said seal communicating said sensing chamber with said matching surface on said filler neck so that said sensing chamber is enclosed pressure tight when said seal is mated with said matching surface over said opening so as to seal said spout to said filling neck,

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a main valve connected between said outlet spout and a source of said liquid,
 a pressure sensitive pilot relay having a pilot chamber for operating said main valve, and
 a source of air pressure, said pilot chamber being connected between said sensing chamber and said source of air pressure so that a change in pressure in said sensing chamber caused by sealing said spout to said filling neck will actuate said pilot relay to open said main valve which will remain open only while an unbroken seal is maintained between said spout and said filling neck.

2. The liquid transfer hose nozzle of claim 1 in which said source of air pressure provides subatmospheric pressure.

3. The liquid transfer hose nozzle of claim 2 further including an internal passage communicating with said outlet spout and extending through said nozzle to a remote, non-hazardous location for venting of the vessel while filling.

4. The liquid transfer hose nozzle of claim 1 further including a protective shield enclosing said pressure seal and having a shield opening shaped to fit said filling neck so as to guide said pressure seal into an aligned position relative to said matching surface to effect a seal, said shield opening having a configuration in combination with the shape of said outlet spout, which prevents sealed mating with nonconforming filling neck shapes.

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5. The liquid transfer hose nozzle of claim 4 in which said matching surface is the filler cap sealing surface of a standard automobile gasoline tank filler neck.

6. The liquid transfer hose nozzle of claim 1 wherein said sensing chamber is an annular opening in said pressure seal and wherein said matching surface is an annular filling neck, said annular filling neck aligning with said annular opening to close said chamber.

7. A gasoline hose nozzle for filling gasoline tanks having a filling neck comprising:

a flanged outlet spout,

a pressure seal mounted on the flange of said spout, said seal being constructed to mate with a matching surface on a filling neck,

a sensing chamber in said seal having an opening which mates with said filling neck to enclose said sensing chamber when said seal is mated with said filling neck,

a valve connected between said outlet spout and a source of said gasoline, and

a pneumatic sensing device connected to said sensing chamber, said sensing device being actuated when said seal is mated with said filling neck, said sensing device being connected to open said valve when said sensing device is actuated so that the gasoline flows through said valve only when said seal is mated with said filling neck.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,881,528 Dated May 6, 1975

Inventor(s) ELBERT K. MACKENZIE

It is certified that error appears in the above-identified patent
and that said Letters Patent are hereby corrected as shown below:

Column 4, line 8, "recess 40." should read --recess 40 in
cover 20.--.

Signed and Sealed this

twenty-ninth Day of July 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

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Commissioner of Patents and Trademarks