

[54] NOZZLE

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[51] Int. Cl. **B67d 5/371**

[58] Field of Search 222/17, 20, 14, 16, 29

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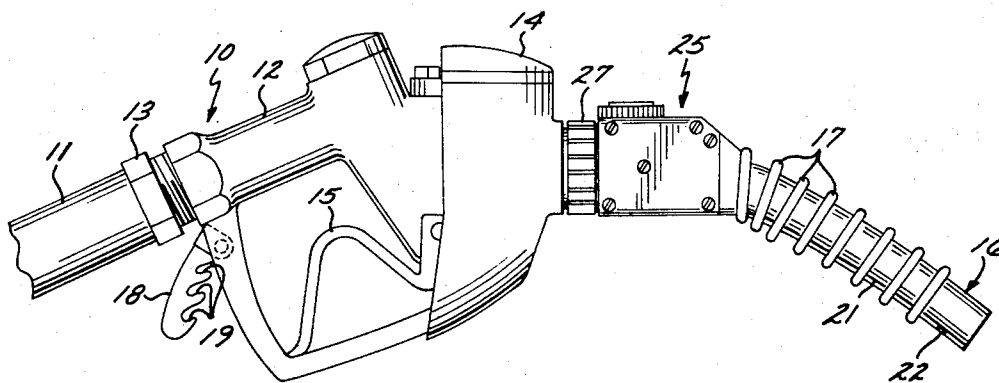
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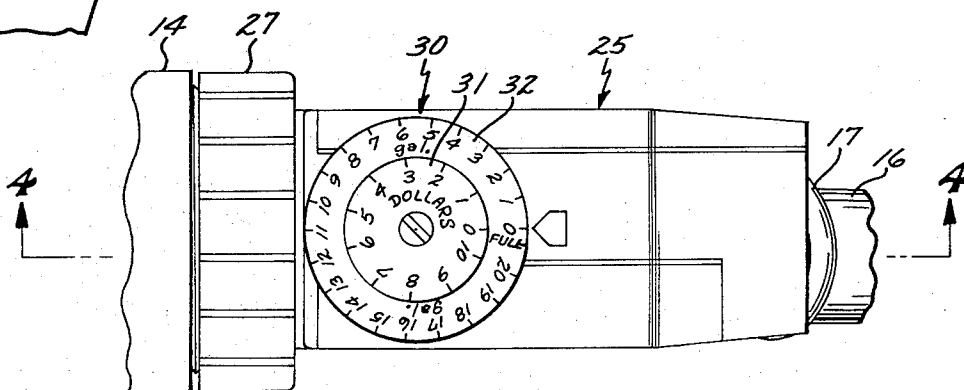
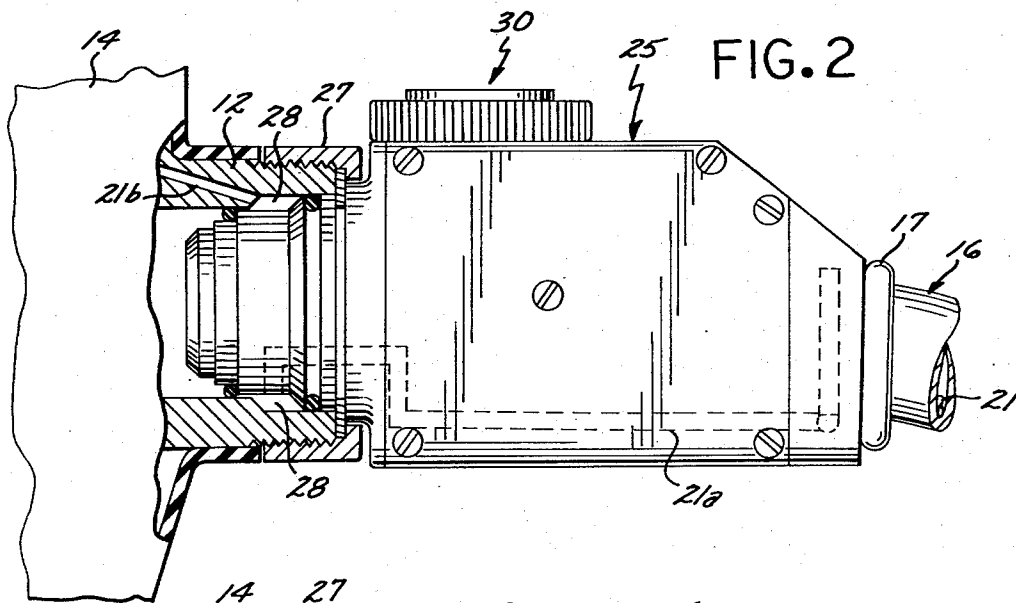
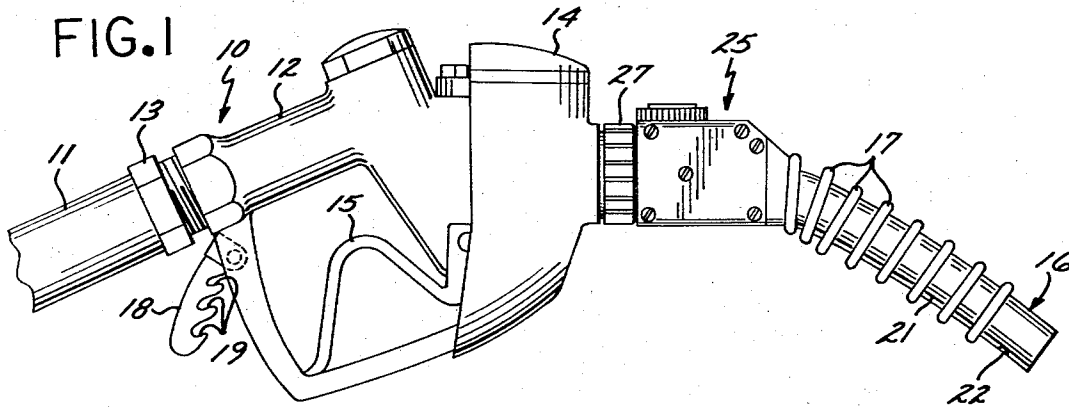
[57] **ABSTRACT**

The present invention relates to a nozzle adapted to dispense fluids, such as gasoline and the like. The disclosed nozzle is designed to dispense a volume of fluid in accordance with filling requirements; these fill requirements being determined in terms of a selected volume of fluid, in terms of a dollar value of fluid, or in terms of the tank's capacity.

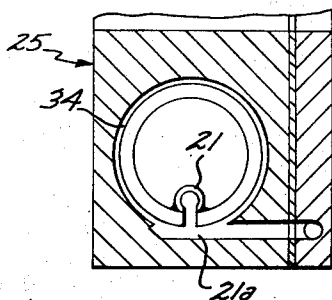
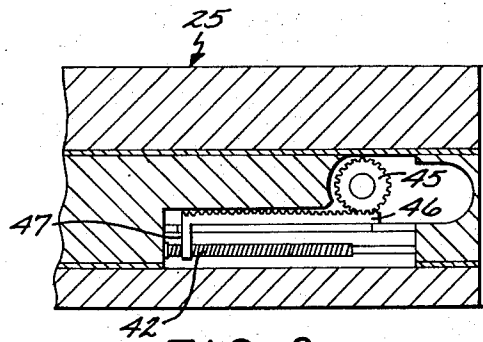
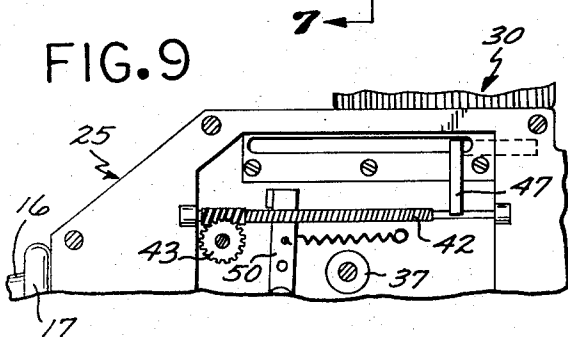
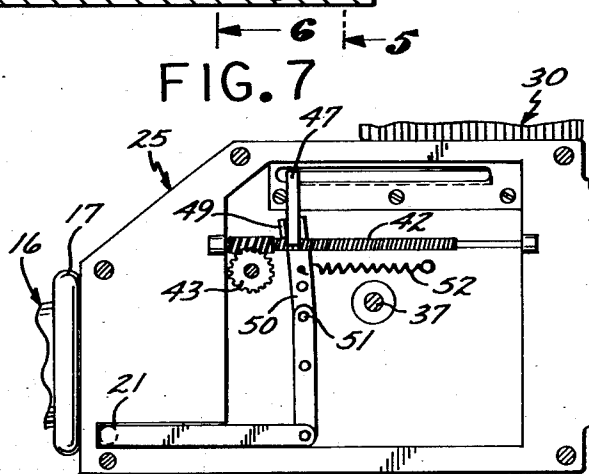
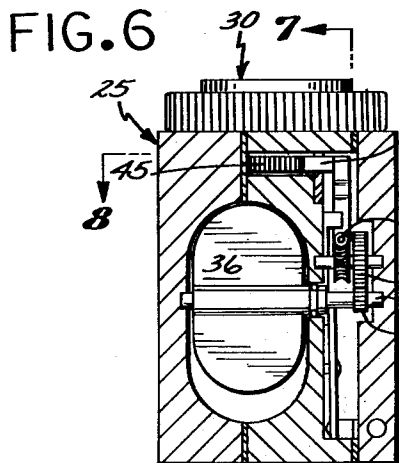
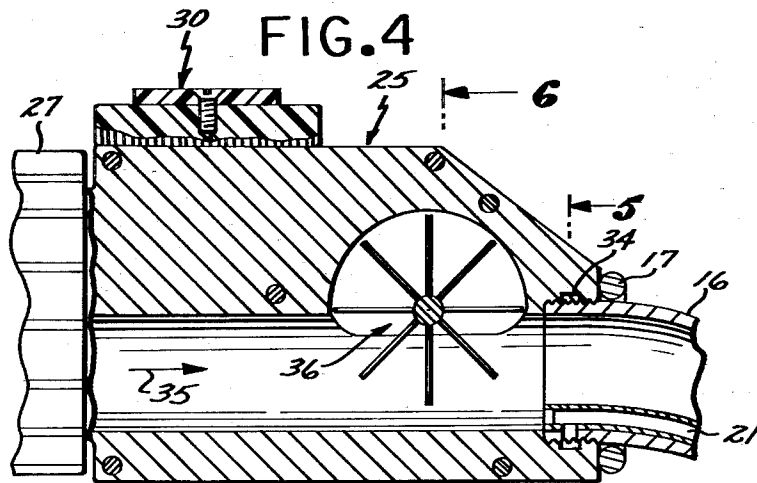
The disclosed nozzle comprises a control unit that produces data corresponding to the actual volume of fluid flow, regardless of the flow rate. Coordinating apparatus coordinates the flow data with the requirement data and when the correct volume of fluid has been dispensed, the control unit terminates the fluid dispensing operation.

8 Claims, 9 Drawing Figures





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NOZZLE

BACKGROUND

It is well known that a tremendous volume of fluids — gasoline, diesel fluid, and the like — are dispensed daily into various tanks of automobiles, boats, trucks, etc. In the past, it was necessary for an attendant to carefully watch a fluid flow meter during the fluid dispensing operation, in order to stop the fluid dispensing operation at the desired time.

At the present time, an improvement to the dispensing mechanism provides a nozzle that senses when the tank is filled; and automatically terminates the fluid dispensing operation when the tank has been filled.

This "fill-up" technique works quite well but does not solve the "partial fill" problem that arises when the customer wants a given number of gallons, or wants a given dollar value of gasoline.

OBJECTS AND DRAWINGS

It is therefore the principal object of the present invention to provide an improved fluid dispensing mechanism.

It is another object of the present invention to provide an improved fluid dispensing mechanism that solves the partial fill problem.

It is still another object of the present invention to provide an improved fluid dispensing nozzle that dispenses a given volume of fluid.

It is a further object of the present invention to provide an improved control that controls the volume of fluid dispensed by a fluid dispensing nozzle.

It is a still further object of the present invention to provide an improved control unit that may be retrofitted to an existent fluid nozzle.

The attainment of these objects and others will be realized from a study of the following detailed description, taken in conjunction with the drawings of which:

FIG. 1 shows a front view of the improved nozzle;

FIG. 2 shows a front view of the control unit of the nozzle;

FIG. 3 shows a top view of the control unit of the nozzle;

FIG. 4 shows a cross sectional view of the control unit of the nozzle;

FIG. 5 shows a partial, transverse cross sectional view of the nozzle portion;

FIG. 6 shows a transverse cross sectional view of the control unit;

FIG. 7 shows a longitudinal cross sectional view of a portion of the control unit;

FIG. 8 shows a longitudinal cross sectional view of a portion of the control unit; and

FIG. 9 shows another longitudinal cross sectional view of a portion of the control unit.

SYNOPSIS

Broadly speaking, the present application discloses a control unit that may be retrofitted onto an existent fluid dispensing nozzle in order to provide the nozzle with updated ability of dispensing given preselected volumes of fluid. The disclosed control unit uses a settable one way clutch arrangement that coordinates the flow rate and the fill requirement; and when the fill requirement has been satisfied in view of the flow rate, the fluid dispensing operation is terminated. Thus, the

fluid may be dispensed in terms of volume, in terms of dollar value, or in terms of tank capacity. A constant surveillance attendant is not needed.

DESCRIPTION

Introduction

As indicated above, present day fluid dispensing nozzles have means for terminating the fluid dispensing operation at the discretion of the attendant, and/or means for terminating the fluid dispensing operation at such time that the tank is filled.

The operation of such a nozzle will be understood from the FIG. 1. Here a nozzle 10 is shown to be connected to a fluid supply hose 11; nozzle 10 comprising a valve assembly 12 that is attached to the supply hose 11 by any suitable leakproof means such as suitable gaskets and a screw-on coupling 13. The valve assembly 12 comprises an internal valve that controls the actual flow of the fluid through the nozzle; a protective hood 14 of rubber or the like being positioned to protect the hands of the attendant.

The internal valve is actuated by a spring loaded trigger handle 15; and as long as the trigger handle 15 is held in its "open" position, the fluid flows through the nozzle 10, and out of a spout 16 that is inserted into the fill opening of a tank. Spout 16 is often encircled by a plurality of rings 17 or by a coil to prevent the spout from inadvertently toppling from the tank's fill opening during the fluid dispensing operation.

As soon as the trigger handle 15 is released, its spring loading causes it to return to its illustrated "closed" position and the flow of fluids is shut off.

When the tank is to receive an appreciable volume of fluid, it is inefficient for the attendant to stand there, holding the trigger handle 15 so a trigger catch 18 is provided to hold the trigger handle 15 — the trigger catch 18 usually having a plurality of notches 19 that hold the trigger handle 15 in selected partially open positions that provide controlled flow rates.

In this way, the attendant can attend to other duties — provided that he frequently glances at the fluid flow meter associated with the nozzle — he can usually return to the nozzle in time to release the trigger handle 15 and to thus stop the fluid dispensing operation at the desired time.

In order to free the attendant from the task of having to continually watch the fluid flow meter, the "fill up" nozzle was introduced; and the technical operation of the fill up nozzle is as follows.

The main internal cross sectional area of the spout 16 is devoted to the flow of fluid from the supply hose 11; so that the fluid flows through the spout 16, and into the fill opening of the tank. However, a minute portion of the spout's internal cross sectional area is reserved for a "vacuum line" 21; this vacuum line 21 terminating at a small aperture 22 near the end of the spout 16. (Alternatively, an externally positioned vacuum line may be used.)

When the fluid dispensing mechanism is pumping fluid into the tank's fill opening, it is also creating a vacuum in vacuum line 21. As long as the end 22 of vacuum line 21 is exposed to the atmosphere, a small volume of air flows through the vacuum line 21. However, as soon as the fluid level in the tank rises to the level where it covers the exposed end 22 of the vacuum line 21, the fluid closes off the vacuum line 21; and, due to the disrupted vacuum, the fluid dispensing operation

is terminated. In this way, the tank is filled to a given level; and after that, no more fluid is pumped into the tank. Depending upon the design, the fluid dispensing operation may be terminated by releasing the trigger handle and/or the trigger catch, by shutting off the pump, by closing an auxiliary valve, by opening an electrical switch, etc.

Thus, the prior art fill up nozzle provides a fill up, but it will be noted, cannot handle the partial fill problem that requires a pre-selected volume of fluid. An example of such a nozzle is shown in U.S. Pat. No. 2,582,195 to Duerr.

THE BASIC INVENTIVE CONCEPT

It was pointed out above that a solution was needed for the partial fill problem; regardless of whether this problem arose because of a desire for a given volume of fluid or whether the problem arose because of a desire for a given dollar value of fluid. This partial fill problem will be designated as the "fill requirement"; and will be solved, as well as the previous fill up problem, by the following inventive concept.

Referring back to FIG. 1, it will be noted that nozzle 10 comprises a control unit 25 that is positioned between the valve assembly 12 and the spout 16. Therefore, all of the fluid that is being pumped from the supply hose 11 into the tank's fill opening must traverse the control unit 25; and this control unit measures or "meters" the fluid flow, and terminates the fluid flow when a predetermined volume of fluid has passed through the control unit 25.

In FIG. 2 the control unit 25 is shown in a partially cutaway form and in larger detail. Here, the leftmost input end of control unit 25 is attached in a separable leak-proof manner to valve assembly 12; a threaded coupling 27 being indicated for this purpose.

At the rightmost output end of the control unit 25, spout 16 is attached in a separable leak-proof manner — as by means of suitable gaskets and threaded connection; so that a damaged spout may be readily replaced without permanently disabling the overall apparatus.

In FIG. 2, the vacuum line 21 of spout 16 connects — in a manner to be discussed later — to the vacuum line 21a of the control unit 25; and, at the leftmost input end of the control unit 25, the vacuum line 21a of control unit 25 is shown to be in communication with an annular groove 28 that, in turn, communicates with a vacuum line 21b that leads to the pumping portion of the fluid dispensing apparatus. Thus, the vacuum line 21 is continuous from spout 16 is capable of operating as described above; and is automatically re-established whenever a new control unit, a new valve assembly, or a new nozzle is attached.

In a manner to be discussed more fully later, control unit 25 comprises a knob 30 that is set in accordance with the desired fill requirements.

FIG. 3 shows a top view of the control unit 25, this view corresponding to the views of FIGS. 1 and 2. In FIG. 3, knob 30 is indicated to comprise two separate circular configurations; the "inner" circular configuration 31 appearing as a disk marked in the illustration with dollar values; the other "outer" circular configuration 32 appearing as a surrounding ring marked in the illustration with gallon markings. Knob 30 preferably takes the form of two superposed disks that may be

locked together by means of a suitable locking device.

The two circular configurations 31 and 32 of knob 30 are separately rotatable, in order to adapt the dispensing apparatus for various prices of the fluid; but once the two circular configurations have been suitably aligned, they are fastened together by means such as the illustrated locking screw.

In use, as will be discussed later, the knob 30 is set to the desired fill requirements — either partial fill, complete fill, or dollar value. The disclosed apparatus then dispenses that particular volume of fluid and then terminates the fluid dispensing operation.

Generation of Flow Rate Data

Attention is now directed to FIG. 4, which shows a partial cross sectional view of the control 25 previously shown in FIG. 2. FIG. 4 indicates that the spout's vacuum line 21 is in communication with an annular groove 34 (see FIG. 5) that, in turn, is in communication with the vacuum line 21a of the control unit 25 as indicated in FIG. 2. This use of a vacuum line will be more fully discussed later.

FIG. 4 also indicates the fluid to flow through the lower part of the control unit 25 in the direction indicated by arrow 35; this fluid flow being produced by the pump portion of the fluid dispensing mechanism. As the fluid flows in the direction indicated by arrow 35, the flowing fluid rotates a flow meter rotor 36 — illustrated as being of the paddle type — that therefore senses the volume of fluid passing through the control unit 25, regardless of its actual flow rate.

Flow meters such as 36 are available in many types, and are extremely sensitive and accurate. The illustrated flow meter 36 is designed not to touch the bottom of the fluid passageway, in order to avoid the possibility of trapping a flammable material in the nozzle.

Thus, the use of flow meter 36 permits the measuring, or the "metering," of the fluid that flows through the nozzle 10.

It was pointed out above that the volume of fluid that flowed through the nozzle was to be metered; and that this data was to be used to terminate the fluid dispensing operation. This result may be accomplished as follows.

FIG. 6, which shows a frontal cross sectional view of the control unit 25, indicates one type of mechanism for accomplishing the above result. In FIG. 6, flow meter 36 rotates a shaft 47 to which is affixed a gear 40; gear 40, in turn, engaging and rotating a gear 41 that is affixed to a second shaft. The rotation of the second shaft causes rotation of a worm gear 43 affixed to the second shaft; the teeth of worm gear 43 being engaged with the teeth of worm 42 — the worm/worm gear (43/42) relation being more clearly illustrated in FIG. 7 — which is a backside cross sectional view of the control unit 25. Thus, flow rate data is available at worm 42.

Generation of Fill Requirement Data

Referring back to FIG. 6, it will be recalled that the setting of knob 30 is to control the volume of fluid that is to be dispensed, and this result may be achieved as follows.

When the knob 30 of FIG. 6 is rotated to set the knob to the desired fill requirement, whether this requirement is in terms of volume or dollar value, the rotation of knob 30 rotates a gear 45 that in turn advances the rack 46 of the rack and gear combination being more

clearly shown in the cross sectional top view of FIG. 8.

As indicated in FIG. 8, the rack 46 carries a rack arm 47, and it will be seen from FIG. 7 that the lower end of rack arm 47 is adapted to ride along worm 42 and will therefore be known as "worm rider" 47. The bottom end of worm rider 47 preferably has a U-shaped configuration adapted to straddle worm 42; its inner surface comprising teeth that are adapted to engage the teeth of worm 42.

When knob 30 is to be set, it is first raised (in the manner of setting the knobs on a watch, on a clock, on a television tuner, etc.) and this raising of the knob causes the entire rack 46 and its worm rider 47 to also be raised. Now, when the knob 30 is rotated to set it to its desired value of fill requirement, the rotation of the raised knob moves the raised worm rider 47 to a corresponding location along the worm 42; and when the knob 30 is lowered, the teeth in the U-shaped end of the worm rider 47 immediately and positively engage the worm teeth of worm 42.

Thus, the fill requirement data, as set by knob 30, is ready to be incorporated into the apparatus.

Volume Control

Now, as the flow meter rotor 36 is rotated by the passage of fluid through the control unit 25, the resultant rate of rotation of the flow meter corresponds with the flow rate of the fluid. Therefore, the resultant rotation of the worm 42 also corresponds with the flow rate of the fluid.

The rotation of worm 42 moves the engaged worm rider 47; the direction of worm rider movement preferably being toward the left in FIG. 7, for the following reason. As the worm rider 47 is moved to the left by the rotation of the worm 42, the worm rider 47 eventually abuts a stop element 49 that produces an output signal which may be an electrical signal, a mechanical signal, or the like.

One convenient arrangement is to form stop element 49 into the configuration of a bent off-set end of a spring loaded stop arm 50. Stop arm 50 is suitably pivoted, as on a pivot pin 51; so that its pivotal motion may be used to terminate the fluid dispensing operation. One of the easiest ways to terminate the fluid dispensing operation is to have the stop arm produce a mechanical motion or a mechanical signal and to use this mechanical signal to close off the vacuum line 21 as previously discussed.

In FIG. 7, it will be seen that the fluid flow causes the worm 42 to always turn in the same direction and at a rate in accordance with the actual flow rate. In this way, flow rate data is accumulated. Moreover, the setting of knob 30 positions the worm rider 47 at a distance from the stop 49; the distance corresponding to the fill requirement. In this way, the fill requirement data and the flow data are both incorporated into the apparatus.

As a result, the worm 42 always returns the worm rider 47 to its leftmost home position; at which time the resultant mechanical signal may be used to terminate the fluid dispensing operation.

A number of such coordinating mechanisms can be designed to perform the above described function of coordinating the flow rate data and the fill requirement data; and these mechanisms may be similar to the resettable odometer found on automobiles, etc. For con-

venience, such mechanisms will be designated as "settable one-way clutches."

Subsequent Operations

When a fluid dispensing operation has been terminated, a subsequent one is initiated by merely resetting the knob 30. At this time, spring 52 of FIG. 7 repositions the stop arm 50; and the worm rider 47 is repositioned by the rotation of knob 30 — the new position of the worm rider 47 being in correspondence with the new knob setting.

Complete Fill Up

There will be times when the customer will want the tank to be completely filled and the disclosed apparatus accomplished this result as follows.

When the knob 30 is set to "full" (see knob markings in FIG. 3) the effect of this extreme rotation of the knob is to cause the worm rider 47 to move rightwardly completely off the teeth of worm 42; and to come to rest at the untoothed end portion of the worm 42 as indicated in FIG. 9.

In this case, since the worm teeth of worm 42 are not engaged with the teeth of worm rider 47, the rotation of worm 42 has no effect on the worm rider 47. Therefore, the worm rider 47 is not moved toward the stop arm 50; rather, it remains in its set position. Under this condition, the nozzle operates until the end of the vacuum line 21 is covered by fluid; whereupon the fluid dispensing operation is terminated as described previously.

Miscellaneous

It should be noted that in accordance with the above description, the leftward movement of the worm rider 47 will have the effect of returning the rack 47 and the knob 30 to their zero positions. If this returning action is undesirable for any reason, knob 30 may be disengaged from the rack 46 after the knob has been set for the desired fill requirements. The knob may be then returned to its zero position when the fluid dispensing operation has been terminated, or at any other convenient time.

We claim:

1. A fluid control unit comprising a body having a passage therethrough for a fluid to be dispensed and having:
 - means for determining the flow rate of said fluid;
 - means for presetting a fill requirement;
 - means for coordinating the data from said flow rate means and from said fill requirement means for determining the dispensing of a preset volume of said fluid;
 - means for producing an output signal, activated by said coordinating means, for changing the air pressure in a vacuum line when said fill requirement has been dispensed,
2. said body being adapted to be attached between a vacuum-controlled shutoff valve assembly and a dispensing spout, and said vacuum line extending through said body and being adapted to connect to corresponding lines in said valve and spout when attached thereto,
- whereby said signal causes said shutoff valve to close when said fill requirement has been dispensed.
3. The combination of claim 1 wherein said control unit is part of a fluid dispensing nozzle;
- means for removably affixing the input end of said control unit to the shutoff valve assembly of said nozzle;

means for removably affixing the output end of said control unit to the spout of said nozzle;
 said valve assembly, said control unit, and said spout adapted to be replaced independently of said other parts to re-establish said continuous vacuum line. 5

3. The combination of claim 2 wherein said control unit is adapted to be retrofitted onto an existent fluid dispensing nozzle.

4. The combination of claim 1, wherein: 10

said means for determining said flow rate comprises a flowmeter rotor disposed to be rotated by the motion of said fluid through said passage, and drivably connected to a speed-reducing gear train;

said means for presetting comprises a calibrated knob means disengagably connected to an output element of said gear train; 15

said coordinating means comprises means to sense when said knob means has been driven back to zero from a preset position, and
 said output signal causes obstruction of said vacuum line. 20

5. The combination of claim 1 wherein:

said flow rate determining means eventuates in a worm; 25

said fill requirement presetting means eventuates in a worm rider and includes means for establishing the starting position of said rider; and

said coordinating means comprises an engagement between said worm and rider.

6. A fluid control unit comprising:

A. means for determining the flow rate of a fluid being dispensed;

said flow rate determining means comprising a flow meter, a train of gears, and eventuating in a worm;

B. means for determining the fill requirements;

said flow requirement determining means comprising a knob for indicating the money value and the volume of fluid to be dispensed, and eventuating in a worm rider;

C. means for coordinating the data from said flow rate determining means and from said fill requirement determining means for determining the dispensing of a proper volume of said fluid;

said coordinating means comprising an engagement between said worm and said worm rider;

D. means for causing said coordinating means to produce a mechanical output signal when the proper volume of fluid has been dispensed;

E. a vacuum line traversing the length of said control unit;

F. means for causing said mechanical signal to close off said vacuum line to terminate the fluid dispensing operation.

7. The combination of claim 5 wherein said control unit is part of a dispensing nozzle.

8. The combination of claim 5 wherein said control unit is adapted to be retrofitted onto an existent fluid dispensing nozzle. 30

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