

[54] **COMBINED WATER REMOVING AND CONTENTS INDICATING DEVICE FOR UNDERGROUND LIQUID FUEL CONTAINING TANKS**

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[51] Int. Cl. **E03b 7/07**

[58] Field of Search **137/172, 315, 345, 557, 137/558, 572, 576, 578, 565, 588, 590, 591; 150/1; 206/219, 221, 0.5; 73/299, 302, 322.5; 222/189, 383, 464, 564; 23/267 A**

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[57] **ABSTRACT**

A device to enable the removal of the water that collects in the bottom of an underground liquid fuel containing tank, and also to visibly indicate the liquid contents in the tank, consisting of a two-chambered flexible plastic container, each chamber being connected with one end of a pair of flexible tubular members. One of the chambers is airtight and liquid tight, and the other chamber has one or more perforated walls and is filled with small particulate matter, such as round pebbles or shots, to sink the container to the bottom of the liquid containing tank. The container is inserted into an existing underground tank through a hole formed in the wall of the usual vent pipe, with the other ends of the tubular members extending through the hole. A suction pump is attached to the outer end of the tubular member connected with the perforated chamber, and a pressure gauge, calibrated in gallons, is attached to the outer end of the tubular member connected with the airtight chamber, the latter tubular member having a valved branch duct to enable pressurizing of the airtight chamber and tubular member with a fluid under pressure.

To install the device in an existing tank, a hole is formed in the wall of the upstanding vent pipe, at a desired level above the ground level. Holding the free ends of the tubular conduits, the container is inserted into the hole and forced into the tank by applying pressure to the conduit, or by applying an air blast into the vent pipe.

8 Claims, 4 Drawing Figures

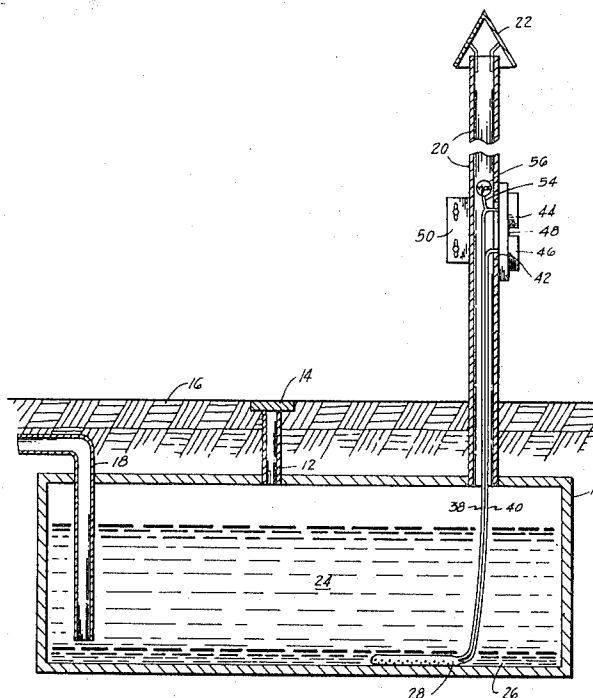


Fig. 2

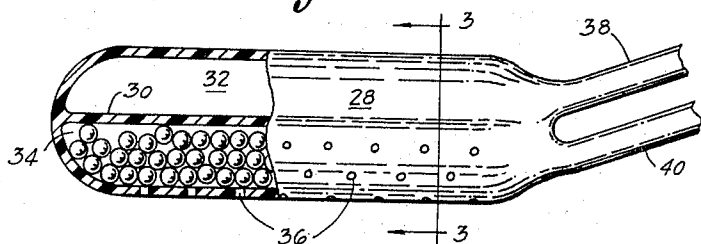


Fig. 4

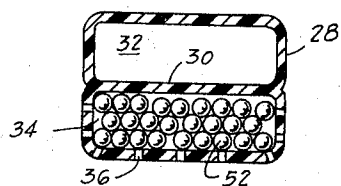
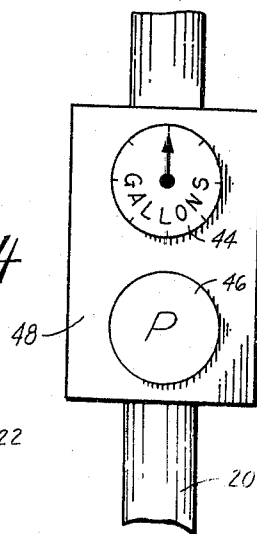
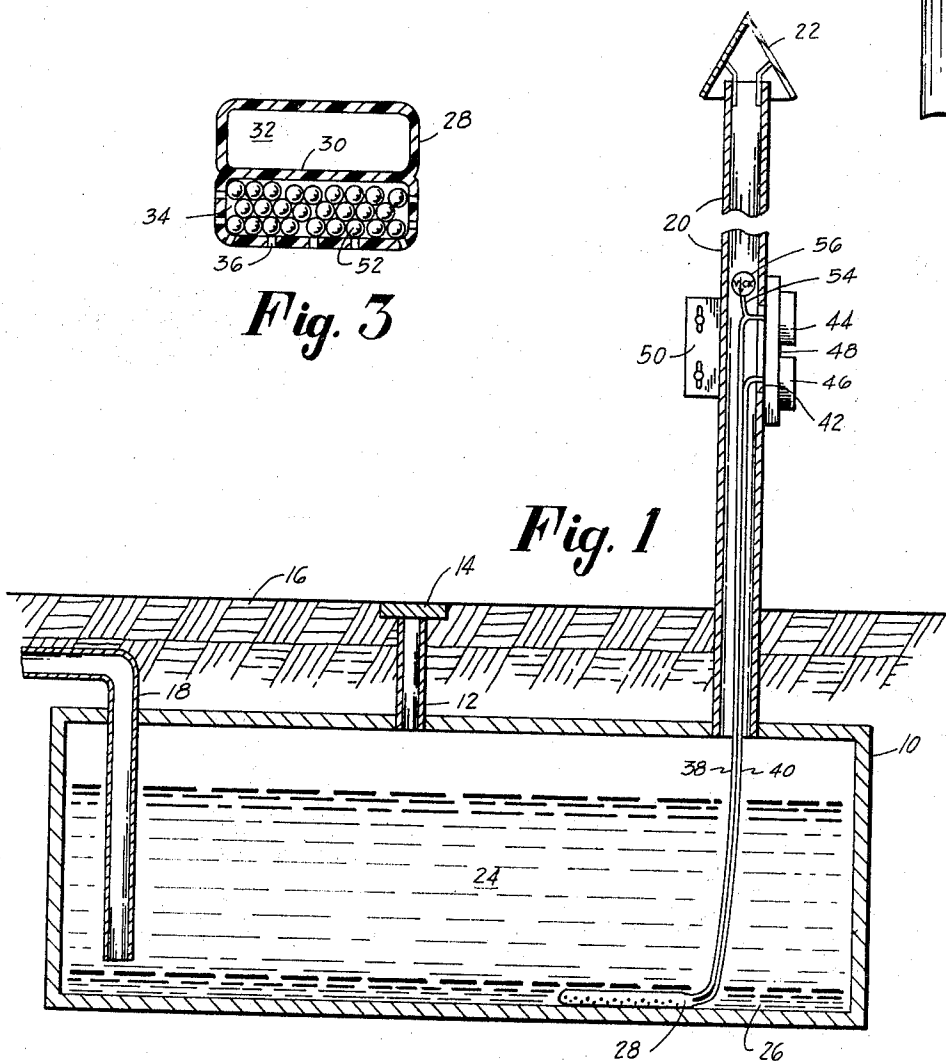


Fig. 3

Fig. 1



COMBINED WATER REMOVING AND CONTENTS INDICATING DEVICE FOR UNDERGROUND LIQUID FUEL CONTAINING TANKS

CROSS-REFERENCES TO RELATED APPLICATIONS

In an application entitled Device For Removing Water From The Bottom Of Underground Liquid Fuel Tanks, Ser. No. 396,576, filed concurrently herewith, a simple device is disclosed to enable the removal of water that collects in the bottom of underground liquid fuel containing tanks, such device being capable of installation in existing tanks without excavating the ground or paving above the tank, and without cutting into the tank.

In a second application entitled Device To Indicate The Contents In An Underground Liquid Containing Tank, Ser. No. 396,577, filed concurrently herewith, there is disclosed a device to indicate the contents in an underground liquid containing tank, for example, an existing liquid fuel containing tank, which can be easily installed without excavating the earth or paving above the tank, and without cutting into the wall of the tank.

BACKGROUND OF THE INVENTION

The present invention combines features of the two above mentioned applications into a single unit which can readily be applied to an existing underground installation, thus enabling a person to remove the water that collects in the bottom of underground liquid fuel containing tanks, and to easily read the amount of liquid fuel within the tank. The present invention also encompasses a method of installing the combined devices, applicable as well to the individual devices disclosed and claimed in the copending applications referred to above, into an existing underground tank without removing the paving and/or the earth above the tank, and without cutting an additional hole in the tank.

The accumulation of water presents a common problem in underground liquid fuel containing tanks. Being heavier than hydrocarbon fuels and immiscible therewith, the water collects at the bottom, making it difficult to remove. In gasoline tanks, the inlet to the dispensing pipe is customarily disposed at a point about two inches from the bottom, and should there be a substantial accumulation of water, even though the level thereof does not reach the inlet to the dispensing pipe, the agitation caused by the dispensing of fuel, in the neighborhood of the inlet, will cause the entrainment and dispensing of water with the gasoline.

This water accumulation comes from several sources. Some may result from a poorly fitting fill cap, allowing rain water or other surface water to enter, or from the operation of filling the tank during a rain storm. Water may also enter through the vent pipe. Although a cap is usually provided at the outlet end of the vent pipe, a driving rain will deliver some water into the pipe which flows into the tank. Furthermore, as the fuel level decreases within the tank as a result of fuel withdrawal, the volume thereof is displaced by moist air drawn through the vent pipe, which condenses in the cool atmosphere within the tank.

Various devices have been suggested to withdraw this accumulated water, but most are inefficient, or are of a type that must be installed within the tank before it is buried underground.

Another problem is that of determining the quantity of fuel within the tank for inventory purposes. Here again the prior art devices are either inefficient in operation or are of a type that must be installed within the tank before it is buried. The most common form is a measuring stick which is calibrated in gallons for the particular tank. This requires the removal of the fill cap and the insertion of the stick to the bottom of the tank, removing the stick, and reading the quantity of gasoline from the wetted indication on the stick. This method has the drawback that the opening of the fill cap permits the entry of dust, dirt and water. This method is also time consuming.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a novel combined water removing and contents indicating device for underground liquid fuel containing tanks that can readily and quickly be inserted in existing installations without disturbing the paving and/or the earth above the tank or cutting a new hole in the tank, and to a novel method of accomplishing this result.

It is a further object to provide a novel combined water removing and contents indicating device for underground liquid fuel containing tanks that is economical to manufacture, and is efficient in operation.

The attainment of the above objects and additional objects and advantages is accomplished by providing a novel plastic container having a partition dividing the interior into a pair of chambers, an upper chamber being airtight and water tight, and the other or lower chamber having perforations in a wall. A separate flexible tubular member is attached at one end to each chamber, the other end of the tubular member that is attached with the upper chamber receiving a pressure gauge calibrated in gallons, and the other end of the tubular member that is connected with the lower chamber receiving a suction pump.

The method of installation in an existing liquid fuel containing tank having an upstanding vent pipe involves the steps of removing the cap from the upper end of the pipe, lowering a small deflated balloon having a tube connected therewith into the vent pipe from the upper end to a point below that point where one desires to drill or cut a hole in the side of the vent pipe, and inflating the balloon to form a block in the vent pipe. The interior of the pipe above the block is purged by inserting a tube into the pipe through the upper end, and delivering a blast of air through the tube to rid the vent pipe of any fuel vapor therein. At a suitable point above the block, a hole is formed in the side wall of the pipe by drilling, sawing, grinding, or by means of a blow torch. The balloon is then deflated, raised to a point above the hole, and reinflated.

The plastic container is inserted through the hole, one end of each of the tubular members being connected with the chambers therein, and the other ends being secured outside the hole to prevent entry into the hole. A blast of air into the vent pipe through the hole will force the container into the fuel tank, whereupon the balloon can be deflated and removed.

The airtight and water tight chamber is inflated through the connecting tube, and small particulate matter is delivered through the tubular member connected with the perforated chamber to sink the container in a position in which the perforated chamber is below the inflated chamber. The particulate matter

must be smaller than the connecting tube and larger than the perforations in the wall of the perforated chamber. Additional air is then pumped into the airtight chamber until the reading on the gauge corresponds to the known contents in the tank.

BRIEF DESCRIPTION OF THE DRAWING

For a clearer understanding of the invention and its operation, reference is made to the detailed description which follows and to the annexed drawings, in which:

FIG. 1 is a diagrammatic illustration of an underground liquid fuel containing tank with my invention installed therein;

FIG. 2 is an enlarged detailed view, partly in section, of the container portion of the invention;

FIG. 3 is a sectional view of the container, taken on the line 3—3 of FIG. 2; and

FIG. 4 is an enlarged elevation view of the panel of FIG. 1.

Referring to the annexed drawings, illustrating a preferred embodiment of the invention, the numeral 10 designates an underground liquid fuel containing tank of the type used to store gasoline, having a fill pipe 12 extending from an opening in an upper wall thereof to a point just short of the surface of the earth or paving 16, and provided with a removable fill cap 14 having its upper surface flush with the surface of the surrounding earth or paving. A fuel dispensing pipe 18 extends through another opening in the upper wall of the tank, the lower end of the pipe being disposed a few inches above the bottom of the tank to prevent entrainment of water, the pipe passing to a remotely positioned fuel pump, not shown.

An upstanding vent pipe 20 extends from still another opening in an upper wall of the tank to a point well above the surrounding buildings, being surmounted with a protective cap 22 spaced slightly above the upper end of the vent pipe, to permit the discharge of fuel vapors from the tank 10 into the surrounding atmosphere, and to prevent the entry of rain water or snow into the vent pipe and tank.

The tank 10 is shown as containing a quantity of liquid petroleum fuel 24 overlying a small quantity of water 26. In installations of this type, it is impossible to prevent the accumulation of water within the tank. The water, being heavier than the fuel, collects at the bottom, the two liquids being immiscible. This water enters the tank from various sources. It may be present in the fuel delivered to the tank, or may enter the tank when the fill cap 14 is removed for filling or for measuring the fuel by insertion of a calibrated stick, or flow in from the area surrounding the fill cap, or in rainy weather, the water may enter through the open fill cap or be driven by wind through the vent pipe. Furthermore, as the liquid fuel is dispensed from the tank and the quantity of fuel is lowered, moisture laden air may be drawn into the tank through the vent pipe to displace the withdrawn fuel, which moisture condenses in the cool atmosphere within the tank.

The lighter fuel 24 overlies the body of water 26, as shown in FIG. 1. The collection of small quantities of water is not objectionable, since the lower end of the dispensing pipe 18 is usually disposed a few inches above the bottom of the tank. However, as the quantity of water 26 accumulates, it reaches an objectionable level, whereby the agitation of the liquid fuel in the vicinity of the inlet to the dispensing pipe 18, during the

withdrawal of fuel, entrains some of the water and discharges it, with the fuel being dispensed, into the fuel tank of an automobile.

Various means have been suggested to remove this accumulated water. Most call for the installation within the tank of a suitable conduit having an open end at the bottom of the tank. This conduit must be inserted, in existing installations, through the fill cap. This is not only time consuming, but requires the removal of the fill cap, thus permitting the entry of dust, dirt, and possibly additional water. Frequently, the fill cap is located in a position where it is undesirable to remove because of moving traffic. Other installations call for the formation of a hole in the top of the tank for the conduit to pass through. This can be done before the tank is buried, but is impractical for existing installations for obvious reasons, principally because of the hazard of creating a spark while forming a hole in the top of the tank.

The invention comprises a container 28, made from a flexible plastic material or rubber which does not chemically react with the fuel or water within the tank, this container being installed within an existing underground tank 10 without cutting or otherwise forming an additional hole or opening in the wall of the tank 10 as appearing hereinafter.

A transverse partition 30 divides the interior of the container 28 into an upper airtight chamber 32 and a lower perforated chamber 34, the latter chamber having a plurality of perforations 36 through a lower wall as seen in FIGS. 2 and 3. A first tubular conduit 38 is attached to one end of the upper chamber 32, and a second tubular conduit 40 is attached to one end of the lower chamber 34, the two tubular conduits extending upwardly through the tank 10 and the upstanding vent pipe 20, and through an opening 42 formed in a side wall of the latter pipe. This opening, as will be described fully hereinafter, is formed at a convenient point above the upper surface of the earth or paving 16.

The outer end of the first tubular conduit 38 is connected with a pressure gauge 44 calibrated in gallons, thus forming a liquid fuel contents indicating means, and the outer end of the second tubular conduit 40 is connected with an exhaust pump means 46, which may be of the squeeze type in which a resilient walled member having inlet and outlet check valves may be squeezed and released to perform a pumping action through the elongated conduit 40. Both the liquid fuel contents indicating means 44 and the exhaust pump means 46 are mounted on a panel 48 supported on a mounting bracket 50 attached to the vent pipe 20.

The interior of the lower perforated chamber 34 is filled, or partially filled, with particulate matter 52 that is insoluble in the fuel and water within the tank 10, such as shot or pebbles delivered into the interior in a manner to be described later.

Adjacent the outer end of the tubular conduit 38 there is provided a branch duct 54 having an inwardly opening check valve 56 therein for a purpose to be described later in this specification.

The vent pipe 20 has usually about a 2 inch internal diameter, and it is proposed to form an opening 42 having a diameter of about 1½ inches, which should not materially weaken the vent pipe which is customarily supported by attachment to the wall of a building.

Before forming the opening, the protective cap 22 is removed, and a deflated balloon, having a duct connected therewith, is lowered into the vent pipe 20

through its upper end to a position below that where the opening is to be formed. This opening should be about eye level. The balloon is inflated, creating a block within the vent pipe between the point where the opening is to be formed and the fuel tank 10, thus preventing any sparks or hot metal entering the tank. The balloon should be made from a material that is resistant to hot metal.

The space in the vent pipe above the block is purged by delivering a blast of air or inert gas, such as nitrogen, through a pipe lowered into the top of the vent pipe, to remove the gasoline vapors and to leave the interior of the vent pipe filled with air or inert gas.

The opening 42 may then be formed by any suitable means, as by drilling, sawing, grinding, or by a blow torch. In any of these operations, care must be taken to avoid cutting the duct connected with the balloon, and if a blow torch is used, the duct should obviously be made from a material that will resist the torch heat.

Having formed the opening, the balloon is deflated, moved to a position above the opening, and reinflated, forming a block above the opening. The container, deflated, crumpled and devoid of particulate matter, can easily be passed through the opening and pushed down by applying pressure to the tubular conduits 38 and 40, or by applying a blast of compressed air into the vent pipe above the container, which will be sufficient to force the container into the tank 10 even though there may be underground bends in the vent pipe 20. Obviously, the tubular conduits 38 and 40 should be long enough to permit the outer ends to reach out of the opening 42 when the container 28 is in position at the bottom of the fuel tank as shown in FIG. 1.

A small quantity of compressed air or inert gas is delivered through the outer end of the tubular conduit 38 to assure that the container 28 is upright, this air or inert gas entering the upper chamber 32 and causing the container to float on the surface of the fuel 24. Particulate matter 52, having a specific gravity greater than that of the fuel and water within the tank, which may be shot or pebbles that will not chemically react with the fuel and water, is then delivered through the outer end of the tubular conduit 40 and into the lower chamber 34 until the container sinks to the bottom of the tank, below the fuel 24 and water 26 therein, with the lower perforated chamber 34 in the lowermost position with the perforations 36 adjacent the bottom of the tank where the water collects. Obviously, the particulate matter must be smaller than the interior of the tubular conduit 40, and larger than the perforations 36.

Additional compressed air or inert gas is delivered through the check valve 56 and branch duct 54 until the reading on the gauge 44, which is calibrated in gallons, corresponds to the known contents within the tank, which contents could have been determined in advance by any customary means, such as by lowering a calibrated stick through the fill pipe 12.

The outer end of the tubular conduit 40 is connected with the suction pump means 46 mounted on the panel 48, and the panel attached to the vent pipe 20 by the mounting bracket 50, thus covering the opening 42 to prevent the entry of dust and moisture.

It is evident, from the foregoing, that the invention solves the problem of determining the contents within the fuel tank and the removal of collected water by a simple device which can readily be installed within an

existing underground liquid fuel containing tank without excavating and without cutting into the tank. If the exhaust pump means 46 is of the squeeze type, the collected water can be simply removed by squeezing and releasing the pump means until all of the water is removed and fuel is discharged.

I claim:

1. A combined water removing and contents indicating device for underground liquid fuel containing tanks, comprising: a flexible walled container; a partition dividing said container into an upper chamber and a lower chamber, said upper chamber being imperforate, and said lower chamber having perforations in at least one wall thereof; means within said lower chamber having a specific gravity greater than that of water and fuel within the tank; a first tubular conduit connected at one end with said upper chamber; a pressure responsive liquid contents indicating means connected with the other end of said first tubular conduit; said first tubular conduit including a connection for admitting fluid under pressure into said conduit and into said upper chamber; a second tubular conduit connected at one end with said lower chamber; and an exhaust pump means connected with the other end of said second tubular conduit.

2. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 1, in which said container and said partition are made from a plastic material.

3. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 1, in which said means within said lower chamber comprises particulate matter.

4. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 3, in which the perforations are in the bottom wall of said lower chamber.

5. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 3, in which said particulate matter has a cross section greater than the cross section of the perforations and less than the internal cross section of said second tubular member.

6. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 1, in which said connection for admitting fluid under pressure comprises a branch duct communicating with said first tubular conduit, and a valve in said branch duct.

7. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 1, in which said tank is provided with an upstanding vent pipe, an opening in the wall of said vent pipe, said tubular conduits extending through said opening.

8. A combined water removing and contents indicating device for underground liquid fuel containing tanks as defined in claim 7, in which the cross sectional dimension of said container, in its expanded state, is greater than the cross sectional dimension of said opening and said vent pipe, and in its deflated state the container has a cross sectional dimension less than that of the opening and vent pipe, whereby the container may be inserted into the tank through said opening in the vent pipe.

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