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LIQUID TRANSFER APPARATUS

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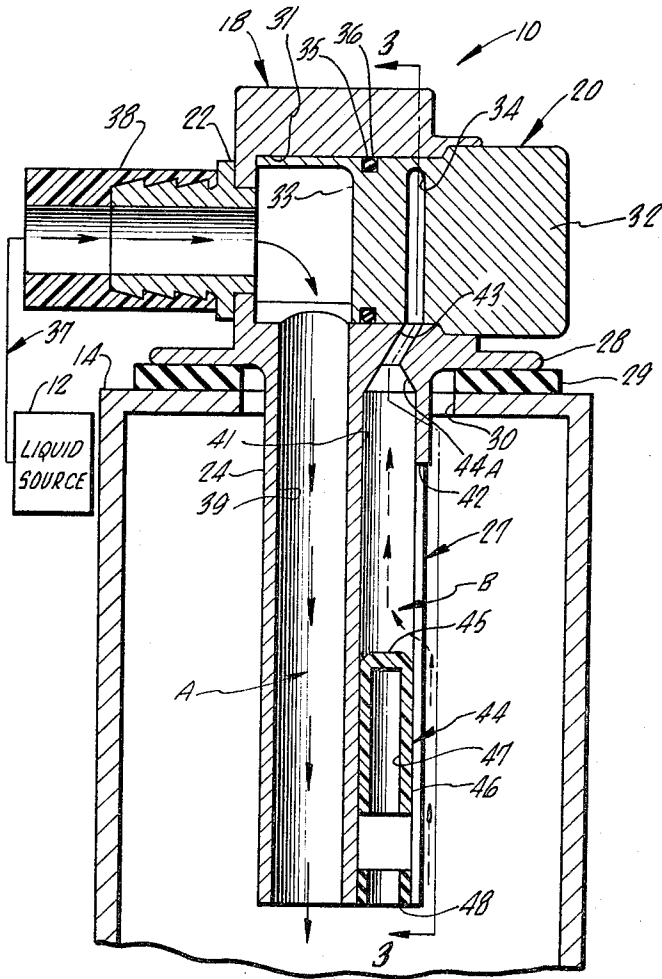


FIG. 2

FIG. 3

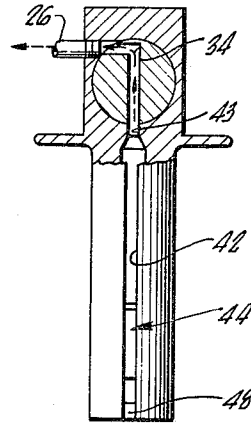


FIG. 4

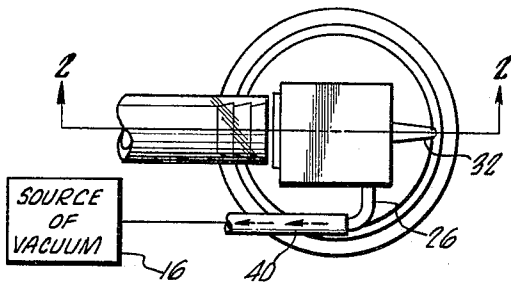
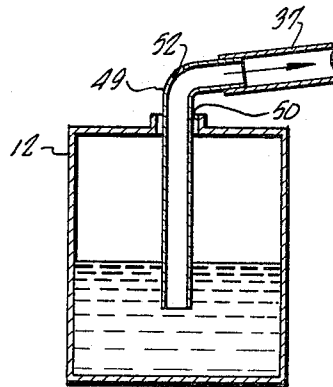


FIG. 1

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LIQUID TRANSFER APPARATUS
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This invention relates to apparatus for transferring liquid from a reservoir to a receiver and is particularly useful for transfer of fuel from a reservoir to the fuel tank of a vehicle such as a tractor.

There has been a continuing need for portable apparatus enabling transfer of fuel from a supply into the tank of a vehicle in locations, such as farms or camps, where pumping equipment is either unavailable or impracticable. To this end, various filling devices have been proposed in which use is made of the intake manifold of a vehicle's internal combustion engine as a means for producing a partial vacuum in the fuel tank of the same or another vehicle. By the suction that is created, fuel may be transferred from a fuel drum to the tank.

The present invention provides an economical and effective liquid transfer apparatus which overcomes disadvantages found in the known prior art. As one aspect of the invention, the apparatus includes a valve which simultaneously shuts off both liquid flow and communication with a vacuum source, thereby controlling liquid transfer more rapidly than heretofore known in the art and eliminating the hazard of overfilling. Further, the valve provides a means for unseating the float valve by which communication with a vacuum source is interrupted when the liquid reaches a predetermined level in the tank.

Another aspect of the invention is the provision of a transparent section in the liquid conducting conduit used in the apparatus so that the liquid being transferred into the tank may be viewed. In this manner, the operator is able to stop liquid transfer immediately in the event foreign matter is noticed in the liquid. As another aspect of the invention, the liquid conducting conduit is provided with means that act to empty the conduit of liquid when transfer is completed and also act to prevent later siphoning action.

The above-described aspects of the invention as well as others will be more apparent from the following description made in conjunction with the accompanying drawings in which:

FIG. 1 is a top view of a liquid transfer apparatus according to the present invention;

FIG. 2 is a cross-sectional view of the liquid transfer apparatus according to the invention seated on a tank and connected to a liquid source, the section being taken along line 2-2 of FIG. 1;

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

FIG. 4 is an elevational view of the liquid source with a liquid conducting conduit in place.

With reference to all the figures, a liquid transfer apparatus 10 is connected between a liquid source 12, such as a fuel drum, and a tank 14, such as the fuel tank of an internal combustion engine. A source of vacuum 16 communicates through the liquid transferring apparatus 10 so that a partial vacuum is created within tank 14. Since the liquid source is at atmospheric pressure, a pressure differential is produced which acts to transport liquid from source 12 to tank 14.

The liquid transfer apparatus includes a valve body 18, a valve plug 20, a liquid inlet 22, a liquid outlet 24, a first vacuum passage 26, and a second vacuum passage 27.

The valve body 18 is generally rectangular in shape and is joined to an integrally formed cylindrical flange 28. A

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gasket 29 disposed between flange 28 and a filling inlet 30 of the tank seals valve body 18 against tank 14. Valve plug 20 is rotatably fitted within a cylindrical chamber 31 in valve body 18 and includes an integrally formed flat handle 32 by which the valve plug may be conveniently rotated from an open position to a closed position. The valve plug includes a liquid flow passage 33 and a spaced-apart vacuum passage 34, the former being alignable with liquid inlet 22 and liquid outlet 24, and the latter being alignable with first vacuum passage 26 and second vacuum passage 27. In the drawings, the valve plug is shown in an open position. The valve is closed by rotating the valve plug so that passages 33 and 34 of the valve plug are no longer in communication with their associated passages in the valve body.

An O-ring seal 35 is disposed in a circumferential groove 36 formed in the valve plug between liquid passage 33 and vacuum passage 34 and prevents leakage between the two passages.

Liquid inlet 22 is a fitting fixedly mounted upon the valve body 18 and aligned with liquid passage 33 in valve plug 20 when the valve plug is in the open position. A liquid conducting conduit 37 extends between liquid source 12 and liquid inlet 22. Conduit 37 includes a transparent tubular section 38 that is mounted upon the liquid inlet 22 and allows the operator of the device to view the liquid as it enters the tank. The operator may thereby periodically or constantly monitor the appearance of the liquid and terminate flow by rotating the valve plug in the event foreign matter, such as dirt, shavings, water, or the like is observed. Also, the operator can determine when liquid flow automatically terminates upon filling of the tank, as will be described.

Liquid outlet 24 is an elongate tubular member integrally formed with the valve body 18, and includes a passage 39 which is aligned at one end with liquid flow passage 33 in the valve plug and opens into the tank at its other end. The solid arrows in FIG. 2 indicate the path of the liquid in passing from the liquid source into the tank.

First vacuum passage 26 is a tube joined to valve body 18. A conduit 40 extends between the vacuum passage 26 and the source of vacuum 16. The dotted arrows in the drawings indicate the direction of air flow as a partial vacuum is produced in the fuel tank.

Second vacuum passage 27 is integrally formed with the same member defining liquid outlet 24 and is produced by a partition 41 which divides the tubular member into two separate coextensively elongate compartments. Compartment A serves as the liquid outlet, and compartment B serves as a valve housing for a float valve 44. An elongated slot 42 extends along the major portion of the compartment B and is part of the passage through which air is evacuated as vacuum source 16 creates a partial vacuum in the tank. An opening 43 in valve body 18 is aligned with compartment B and is aligned with vacuum passage 34 in the valve plug when the latter is in the open position.

A float valve 44 is slidably disposed within compartment B and is aligned with opening 43. The valve is lifted by liquid rising within the tank, and its upward movement continues until it seats against a valve seat 44A, thereby blocking flow communication between the tank and the vacuum source. In the embodiment shown, the float valve includes a closed upper end 45 and a skirt 46 which is open at its bottom so that a chamber 47 is provided. It is formed from a buoyant material, as, for example, a plastic such as polyethylene. A tubular plug 48 is compressed within the lowest portion of the channel and prevents the valve 44 from leaving the compartment B.

The structure of the float valve 44 is such that rising liquid traps air within the chamber 47. The buoyancy of the float valve is thereby increased so that a major portion of the valve projects above the surface of the liquid. It therefore seats against valve seat 44A before the liquid level reaches the filling inlet and aids in preventing overfilling of the tank. The elongate nature of slot 42 eliminates blocking by foreign material of the flow communication path between the vacuum source and the tank.

As shown in FIG. 4, the end of liquid conducting conduit 37 near liquid source 12 is joined to a tube 49 which is loosely insertable through an opening 50 in the source so that the tube extends below the liquid surface. The tube includes a small opening 52 near its juncture with conduit 37. As will be described, the opening functions during operation of the device as a passage for air into the conduit so that a high degree of vacuum in tank 14 is avoided. The same opening acts to empty the conduit of liquid and to prevent siphoning after liquid transfer is stopped.

The operation of the invention will now be described. Commonly, the liquid transfer device is mounted on a vehicle, such as a pick-up truck, which can provide the vacuum source for a number of other vehicles such as tractors. First vacuum passage 26 remains connected through conduit 40 to the intake manifold of the pick-up internal combustion engine as a source of vacuum. Conduit 37, shown in FIG. 2, is preferably a flexible tubing such as an elastomeric hose or the like which permits insertion of tube 49 within a drum that may be carried by the pick-up or located at some convenient point. The liquid transfer device is inserted in the fuel tank of the tractor requiring fuel. With the pick-up engine running, valve 20 is rotated by handle 32 into the position illustrated in FIG. 1. In this position, air from the fuel tank is evacuated to place the fuel tank at subatmospheric pressure. The pressure differential thereby created between the fuel drum and the tank causes fuel to flow through conduit 37, tube 38, valve inlet 22, liquid inlet 33, and through outlet 24. The fuel flows into fuel tank 14 and continues to do so until the rising level of fuel lifts the float valve 44 to seat against valve seat 44A. Air, entering through opening 52 of tube 49, passes into the fuel tank with the fuel and prevents a large pressure differential across tank 14. A large pressure differential, caused by a high degree of vacuum within tank 14, could result in collapse of the tank.

With float valve 44 blocking flow communication between the fuel tank and the source of vacuum, the fuel tank returns to atmospheric pressure as a result of air leakage through opening 52. The opening also prevents continued siphoning of fuel after flow communication when the source of vacuum is blocked. Dependent upon the relative elevation of the drum and the tank, the fuel in conduit 37 will flow into one or the other. The operator then rotates valve plug 20 to the closed position. Communication with the manifold is therefore additionally blocked by the plug. The vacuum in opening 43 between the valve plug and the seated float valve is gradually dissipated through leakage between the plug and the wall of chamber 31 so that float valve 44 is no longer held against the seat and drops down when the transfer device is removed from the tank. Without the closure provided by the valve plug, float valve 44 would remain seated since the intake manifold would continue to maintain suction. The operator would then be required to manually unseat the float valve in order to reuse the device.

The operator may rotate the valve plug into a closed position at any time after the flow of fuel has started, and, in so doing, immediately prevent further fuel flow through the liquid inlet 22 and simultaneously block flow communication with the source of vacuum. As a result, the vacuum within the tank will be dissipated because

of air leakage through opening 52. If the fuel drum is higher in elevation than the tank, the fuel in conduit 37 cannot flow into the tank with the plug in the closed position. Nevertheless, opening 52 breaks the siphon so that continued flow by siphoning will not occur in the event the valve plug is later inadvertently placed in an open position.

What is claimed is:

1. A liquid transfer apparatus for insertion in a tank having a filling inlet for liquid comprising:
 - (a) sealing means adapted to cover the filling inlet and seat the apparatus;
 - (b) a valve body including a chamber above the sealing means;
 - (c) a tubular member depending from the valve body and opening into the chamber;
 - (d) a first flow passage opening into the chamber;
 - (e) a separate pair of spaced-apart vacuum passages opening into the chamber;
 - (f) a valve plug rotatably fitted in the chamber and having spaced-apart first and second flow passage means positioned in the plug whereby rotational movement of the plug places the first flow passage in flow communication with the tubular member as the pair of vacuum passages are placed in flow communication with each other, and continued rotational movement stops said flow communications;
 - (g) a float housing below the sealing means and including a float valve disposed to seat against a portion of the valve body defining one of the pair of vacuum passages when the liquid in the tank reaches a predetermined level;
 - (h) a conduit between the other of the pair of vacuum passages and a vacuum-creating means; and
 - (i) a liquid conducting conduit between a source of liquid and the first flow passage.
2. Apparatus in accordance with claim 1 wherein the liquid conducting conduit includes a transparent conduit section adjacent the first flow passage.
3. Apparatus in accordance with claim 1 wherein the float housing includes an elongate slot formed to parallel the path of rise of the float valve as the tank is filled with liquid.
4. Apparatus in accordance with claim 1 wherein the liquid conducting conduit includes a small opening enabling air to enter the conduit.
5. A liquid transfer apparatus for insertion in a tank having a filling inlet for liquid comprising:
 - (a) sealing means adapted to cover the filling inlet and seat the apparatus;
 - (b) a valve body including a chamber above the sealing means;
 - (c) a tubular member depending from the valve body into the tank and opening into the chamber;
 - (d) a first flow passage opening into the chamber;
 - (e) a separate pair of spaced-apart vacuum passages opening into the chamber;
 - (f) a valve plug rotatably fitted in the chamber and having spaced-apart first and second flow passage means positioned in the plug whereby rotational movement of the plug places the first flow passage in flow communication with the tubular member as the pair of vacuum passages are placed in flow communication with each other, and continued rotational movement stops said flow communication;
 - (g) sealing means in the chamber between the valve plug and the valve body and disposed in sealing engagement between the first and second flow passage means in the plug;
 - (h) a float housing below the sealing means and including a float valve disposed to seat against a portion of the valve body defining one of the pair of vacuum passages when the liquid in the tank reaches a predetermined level;
 - (i) a conduit between the other of the pair of vacuum passages and a vacuum-creating means; and

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(j) a liquid conducting conduit between a source of liquid and the first flow passage.

6. Apparatus in accordance with claim 5 wherein the sealing means is an O-ring disposed in a peripheral groove in the valve plug.

References Cited by the Examiner

UNITED STATES PATENTS

220,509	10/1879	Trautmann et al. ---	141—382	X
1,786,846	12/1930	Hodsdon -----	137—205	10

6

2,018,853	10/1935	Hitchcock -----	137—2.2	X
2,227,611	1/1941	Walleser -----	141—42	
2,317,589	4/1943	Collinson -----	137—205	X
2,495,905	1/1950	Pogue -----	137—205	
2,623,513	12/1952	Robertson -----	137—205	X
2,661,886	12/1953	Speer -----	137—205	X

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