

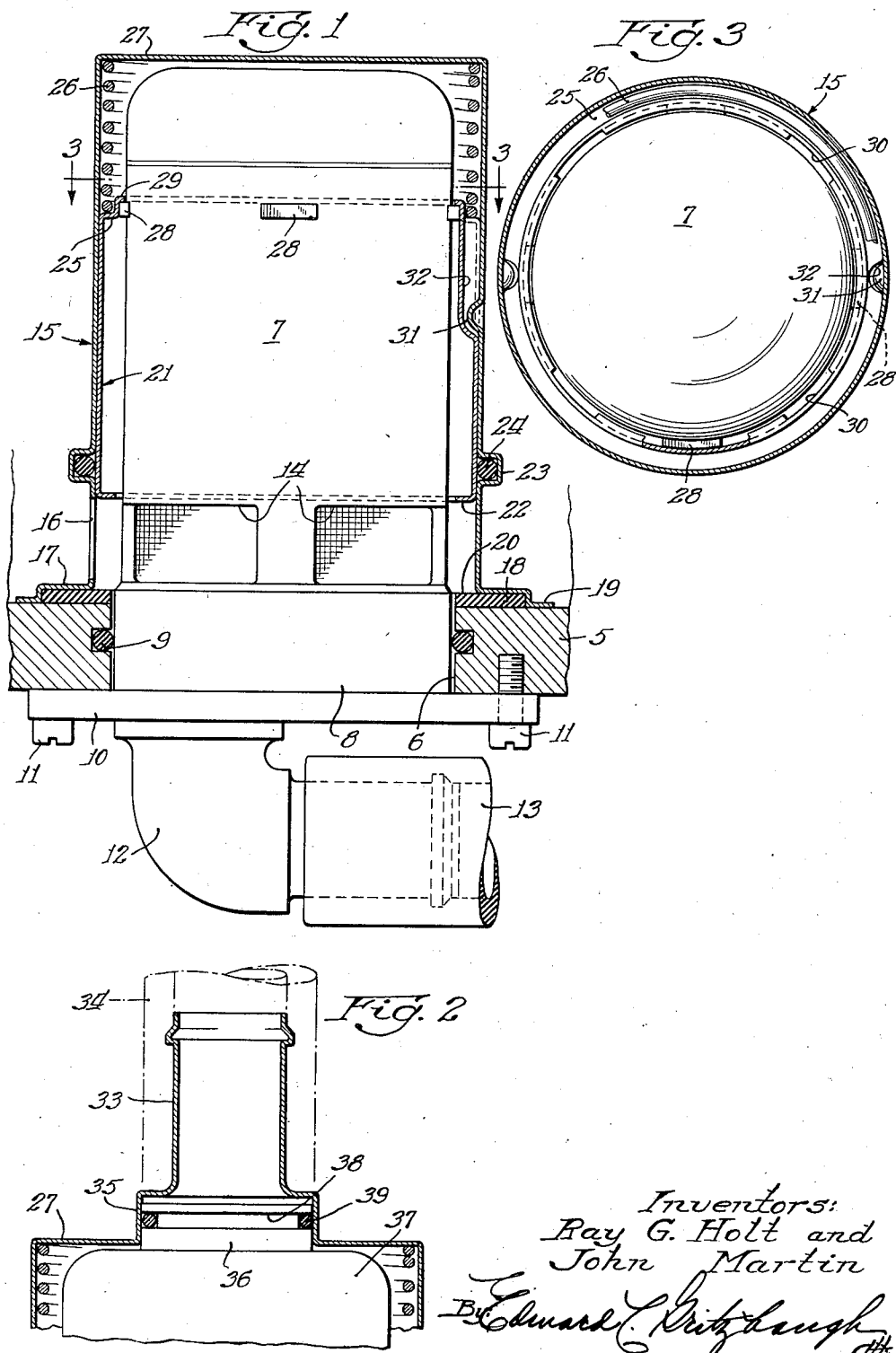
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BOOSTER PUMP SHUT-OFF CASING FOR PUMP REMOVAL

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BOOSTER PUMP SHUT-OFF CASING FOR
PUMP REMOVAL

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8 Claims. (Cl. 222—385)

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The present invention relates to a shut-off for a pump used in a tank or reservoir, and it has specific reference to an assembly that will permit the removal of the pump from the interior of a reservoir containing a liquid such as gasoline, without it being necessary to first drain the liquid from the reservoir.

In prior fuel tank and booster pump arrangements for aircraft engines it has been the practice to mount the pump inside the tank, usually introducing the pump through an opening in the bottom wall portion thereof at an elevation below the normal fuel level in the tank. In the event it became necessary to remove the pump, there was no provision affording access to or removal thereof without first draining the fuel from the tank. The foregoing practice usually results in the spilling of a considerable quantity of the fuel; it entails a loss of time to drain and refill the tank; and it requires an unnecessary amount of labor. The present improvements eliminate these inherent objections in that they permit the removal of the pump from the tank without disturbing or draining the fuel, thus effecting a saving of both time and labor.

It is one of the principal objects of this invention to simplify the construction of a pump shut-off such as contemplated herein, and to improve the efficiency, operation and dependability of such pump shut-off.

It is also one of the principal objects of this invention to provide a supplementary receptacle within the liquid receptacle to receive and sheath the pump and having valve-controlled communication with the interior of the receptacle to supply the pump with liquid, and also having means for effecting a shutting off of such communication prior to the removal of the pump.

In the embodiment of the structure herein shown, the means for closing and opening the communication between the fuel tank and the supplementary receptacle are operated by the pump itself during the movement thereof out of or into the supplementary chamber. The valve in the present embodiments is maintained or locked in its opened position by an arcuate movement of the pump assembly in one direction, and the valve is released to shut off the intercommunication upon an arcuate movement of the pump assembly in a reverse direction. The supplementary receptacle and its control valve together with the pump, are preferably unitary structures that are adapted to be installed in tanks of different types.

Additional objects, aims, and advantages of the

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invention contemplated herein will be apparent to persons skilled in the art after the construction and operation of the booster pump shut-off is understood from the within description.

It is preferred to accomplish the numerous objects of this invention and to practice the same in substantially the manner hereinafter fully described and as more particularly pointed out in the appended claims, reference being made to the accompanying drawings that form a part of this specification and wherein:

Fig. 1 is a vertical section through a tank or other liquid receptacle, the view being taken on the axis of the pump and the supplementary chamber surrounding the pump;

Fig. 2 is a fragmentary vertical section similar to Fig. 1 showing an alternative form wherein the discharge from the pump is through the top of the supplementary chamber; and

Fig. 3 is a transverse section taken on the plane of line 3—3 on Fig. 1 looking down in the direction of the arrows.

The drawings are to be understood as being more or less of a schematic character for the purpose of disclosing typical or preferred forms of the improvements contemplated herein, and in these drawings like reference characters identify the same parts in the several views.

The structure shown in Fig. 1 comprises a tank, receptacle, or reservoir 5 that is supplied with gasoline or similar liquid to be fed to the internal combustion engine that drives the propeller of an aircraft. In the bottom of reservoir 5 there is an opening 6 through which access may be had to the interior of the tank, said opening providing for the mounting and removal of the fluid displacement device or booster pump unit 7. The base portion 8 of the pump unit fits the opening 6 and is sealed therein against leakage by a sealing 9 received in an annular recess in the side of said opening. A lateral mounting flange 10 on the pump base 8 is engaged against the outer face of the tank bottom and is anchored in position by cap-screws 11 that clamp the pump unit in place for ready removability. The discharge coupling or nipple 12 is assembled with the base flange 10 and is outside the reservoir 5 for distribution of the pressure fluid through a conduit or hose 13 adapted to be lead to the engine driven pump or carburetor (not shown).

The pump unit 7 is preferably of cylindrical shape and its body portion that is within the reservoir 5 has screened openings 14 through which the liquid fuel in the receptacle will flow to the suction side of the pump from which such

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liquid is discharged under pressure to the coupling 12. A second receptacle, container or valve housing 15 surrounds the body portion of pump unit 7, said housing having one or more ports or inlet openings 16 in the lower portion of its side wall that effect intercommunication between the reservoir 5 and said valve housing 15. The bottom of valve housing 15 is open and is provided with a lateral base flange 17 resting upon a gasket or seal pad 18 surrounding the receptacle opening 6, the outer marginal portion of said base flange having a lip 19 of approximately L-shape in cross-section that is brazed or otherwise securely fastened to the inner surface of the bottom wall of the liquid receptacle 5. It will be seen that the internal diameter of the valve housing 15 is greater than the diameter of the bottom opening 6 of the reservoir 5, and that the seal pad 18 extends inwardly from the valve housing side wall to the edge of said opening 6. This provides an annular seat 23 for cooperation with a suitable valve that controls the passage of liquid through the ports 16 into the housing.

The valve above mentioned comprises a longitudinally reciprocal sleeve 21 having a tubular shape in cross-section and open at its ends. The sleeve valve 21 is of proper dimension to effect a sliding fit with the inner surface of the valve housing 15 with which it cooperates, and at its lower end said valve has a radially inwardly projecting foot-like seat engaging terminal portion 22. When valve 21 is in its raised position as shown, ports 16 are open for the passage of liquid from reservoir 5 to pump 7. When the valve has been lowered to close ports 16 the foot 22 will press against the pad 18 to effect a seal therewith and thus shut off the flow of liquid from reservoir 5 to the interior of valve housing 15.

The housing 15 has an outwardly projecting annular head 23 of U-shape cross-section above the ports 16 to receive a seal ring 24 that prevents seepage of fluid upwardly into the housing when the sleeve valve 21 has closed the ports 16. The upper end of the sleeve valve 21, which is below the top of the pump unit, has an inwardly projecting annular seat 25 against which the adjacent lower terminal of a compression spring 26 is engaged, the upper end of said spring engaging with the upper closure or end wall 27 of the housing 15. Thus the compression force of spring 26 is exerted against the sleeve valve 21, urging said valve in the downward direction of its reciprocal movement to press the foot 22 upon the seal pad 18 and close the ports 16 when said valve is released, as will appear.

The means for maintaining the sleeve valve 21 at the upper limit of its reciprocal movement to open the ports 16, comprises lugs 28 projecting from the side of the pump unit 7 contacting the horizontal or lateral portion of an L-shape lip 29 projecting upwardly and inwardly from the edge of the flange that forms said spring seat 25. The inner peripheral edge of lip 29 is disposed close to the surface of the pump unit and it is provided with open slots 30 of sufficient dimensions to permit the lugs 28 to pass therethrough upon being brought into opposed relation, as will be later explained.

The sleeve valve 21 is guided in its reciprocal movement to open or close the ports 16 by semi-spherical bosses 31 that are pressed inward in the cylindrical wall of housing 15, said bosses being received in longitudinal channels or guide grooves 32 that are pressed inward in the adjacent upper portion of the sleeve valve. This

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boss and groove arrangement permits reciprocal movement of the valve that is limited in an upward direction by the bosses 31 that act as stops when they are engaged in the lower ends of said guide grooves, and said arrangement also prevents relative arcuate movement of the valve with respect to the pump unit.

When it is desired to remove the pump unit from the tank or receptacle 5, the cap screws 11 are removed and the pump unit is bodily rotated until the lugs 28 thereon are registered with the open slots 30 in the valve lip. The spring 26 will then force the sleeve valve 21 down past the ports 16 and press the foot 22 against the seat pad 18, thus preventing entry of the liquid into the valve housing 15 from the tank or reservoir 5. The pump unit 7 may then be withdrawn longitudinally from the valve housing and the tank without necessitating the draining of the liquid from the tank. To replace the pump unit, it is inserted through the tank opening 6 until the lugs 28 engage the underside of lip 29 between the slots 30, and further or continued inward movement will lift the sleeve valve 21 to compress the spring 26 and open the ports 16 in the housing 15.

In the type of assembly shown in Fig. 2, the discharge nozzle 12 of Fig. 1 carried outside the bottom of the receptacle 5, is dispensed with and in lieu thereof a nozzle 33 is formed integrally with the top or end wall 27 of the housing. The hose 34 that is coupled to this nozzle extends upward in the reservoir 5 and out of the same where it is provided with a shut-off cock (not shown). The lower portion of the coupling or adaptor 33 nearest the housing top 27 is enlarged as at 35 to receive the outlet stub 36 of the pump unit 37. An annular channel or groove 38 is made in the outlet stub 36 to seat a seal ring 39 that engages the inner surface of enlargement 35 to prevent seepage back into the receptacle. In the type of assembly that has just been described, the shut-off cock on the hose is closed before the pump unit is removed, and the removal and replacement of the pump unit proceeds in the same manner as hereinbefore described.

While this invention has been described in detail in its present preferred forms or embodiments, it will be apparent to persons skilled in the art, after understanding the improvements, that various changes and modifications may be made therein without departing from the spirit or scope thereof. It is intended that the appended claims cover all such changes and modifications.

We claim:

1. A structure of the kind described comprising a liquid reservoir having an access opening therein; a pump unit removably mounted in said access opening and being adapted for rotative movement therein; a pump enclosing valve housing in said reservoir, said valve housing having a port for the transfer of liquid from said reservoir to said pump unit; a sleeve valve surrounding said pump unit and slidable in said housing to open and close said port; yieldable means urging said valve in a direction to close said port; a slotted flange on said valve; and projections on said pump unit normally engaged with said flange between the slots therein to maintain said valve in a position against the urge of the yieldable means thereby to open said port, the aforesaid rotative movement of said pump unit, being effective to register said projections with the slotted portion of said flange for releasing the

valve whereupon said yieldable means is rendered effective for moving the valve to close said port and permit ready removal of the pump unit through said access opening.

2. A structure of the kind described comprising two receptacles disposed the one within the other and having an inter-communicating port, the outer receptacle having an opening for affording access to the inner receptacle; a valve for opening and closing said port; a pump unit in said inner receptacle adapted for rotative movement in said access opening; releasable coacting means on said pump and said valve for maintaining said valve in a position to open said port; and a spring urging said valve in a direction to close said port, the construction and arrangement being such that the aforesaid rotative movement of the pump disengages said coacting means whereby said spring is effective to seat said valve opening independently of said pump, and said pump is removable through said access opening.

3. A structure of the kind described comprising a closed reservoir having an access opening; a receptacle in said reservoir having an open portion registering with said access opening, said receptacle having port means affording communication with said reservoir; a valve movable on said receptacle to positions to close said port; a pump unit adapted for longitudinal movement into and out of said receptacle through said access opening and also for rotative movement therein; means on said pump coacting with means on said valve for maintaining said valve in a position to open said port; and a spring urging said valve toward its seat to close said port, the construction and arrangement being such that the aforesaid rotative movement of said pump disengages said coacting means whereby said spring is effective to seat said valve independently of said pump and said pump is removable through said access opening.

4. A structure of the kind described comprising a closed reservoir having an access opening; a pump unit removably mounted in said opening and adapted for rotative movement therein; a valve housing surrounding said pump, said housing secured to said receptacle around said access opening and having a port communicating with said reservoir; a normally unseated spring-loaded valve for opening and closing said port; and means on said pump coacting with means on said valve for maintaining said valve in said normally unseated position to open said port; the construction and arrangement being such that the aforesaid rotative movement of said pump disengages said coacting means and releases said valve for seating movement to close said port and said pump is removable from said opening.

5. A structure of the kind described comprising a closed reservoir having an annular access opening; a pump unit removably mounted in said opening and adapted for rotative movement therein; a cylindrical valve housing enveloping said pump unit within said reservoir, said housing being open to the exterior of the reservoir through said access opening and having a port communicating with said reservoir; a cylindrical valve slidable on said housing for opening and closing said port; and means providing a releasable connection between said pump and valve whereby said valve is held by said pump in position to open said port, the construction and arrangement being such that the aforesaid rotative movement of said pump disengages its connection

with said valve and said valve is freed for sliding movement to its port closing position.

6. A structure of the kind described comprising a closed reservoir having an annular access opening; a pump unit removably mounted in said opening and adapted for longitudinal movement to effect its removal from said reservoir, said pump being adapted for rotative movement in said opening; a cylindrical valve housing enveloping said pump unit within said reservoir, said housing being open to the exterior of the reservoir through said access opening and having a port communicating with said reservoir; a non-rotatable cylindrical valve slidable on said housing for opening and closing said port; a slotted flange on said valve; and projections on said pump unit normally engaged with said flange between the slots therein for maintaining said valve in a position to open said port, the aforesaid rotative movement of said pump being effective to disengage said projections from said valve flange whereby said valve is movable to its port closing position independently of said pump.

7. A structure of the kind described comprising a closed reservoir having an annular access opening; a pump unit removably mounted in said opening and adapted for longitudinal movement to effect its removal from said reservoir, said pump also adapted for rotative movement in said opening; a cylindrical valve housing enveloping said pump unit within said reservoir, said housing being open to the exterior of the reservoir through said access opening and having a port communicating with said reservoir; a non-rotatable cylindrical valve slidable on said housing for opening and closing said port; a spring urging said valve in a direction to close said port; spaced lips on said valve; and projections on said pump normally engaged with said lips for maintaining said valve against the urge of said spring and in a position to open said port, the aforesaid rotative movement of said pump being adapted to disengage said projections from said lips whereby said spring is effective to shift said valve to its port closing position independently of said pump.

8. In an arrangement providing for the ready removal and replacement of a reservoir supported pump making it unnecessary to first drain said reservoir, said arrangement comprising a shut-off valve housing having an open terminal portion sealably fastened to the wall of said reservoir below the normal level of liquid therein; an access opening formed in the wall of said reservoir communicating with the inside of said valve housing for the ready insertion and removal of a pump unit; a pump unit inserted by a longitudinal movement through said access opening to position said pump unit in said housing; a seal between said pump unit and the surrounding wall of said access opening, said shut-off valve housing being further provided with a port for flow of liquid from said reservoir to the interior of said valve housing and to the inlet of said pump; a normally open non-rotatable valve for said port; and spaced projections on both said pump and valve adapted to be engaged with each other during the introduction of said pump unit into said access opening for moving said valve to open position and retaining the same in such position, said pump unit being adapted for rotative movement to disengage the respective projections for permitting closing movement of said valve independent of said pump unit whereby said valve is engaged with said seal thus preventing the escape of liquid from said tank through said access opening.

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ing during withdrawal of said pump there-
through.

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