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LIQUID ELEVATING PUMP

Original Filed July 15, 1922

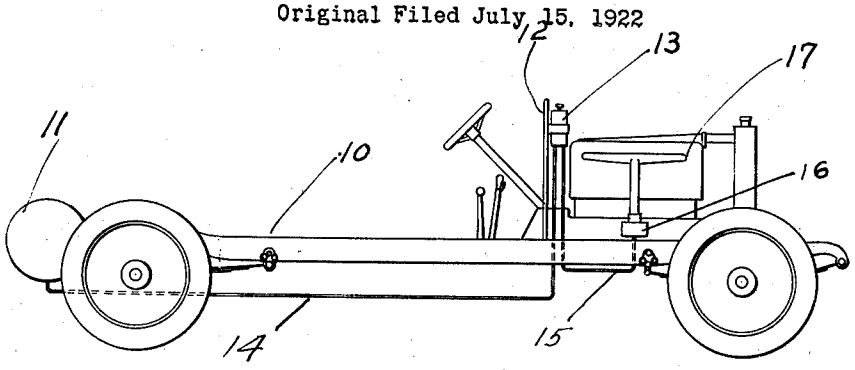


Fig. I.

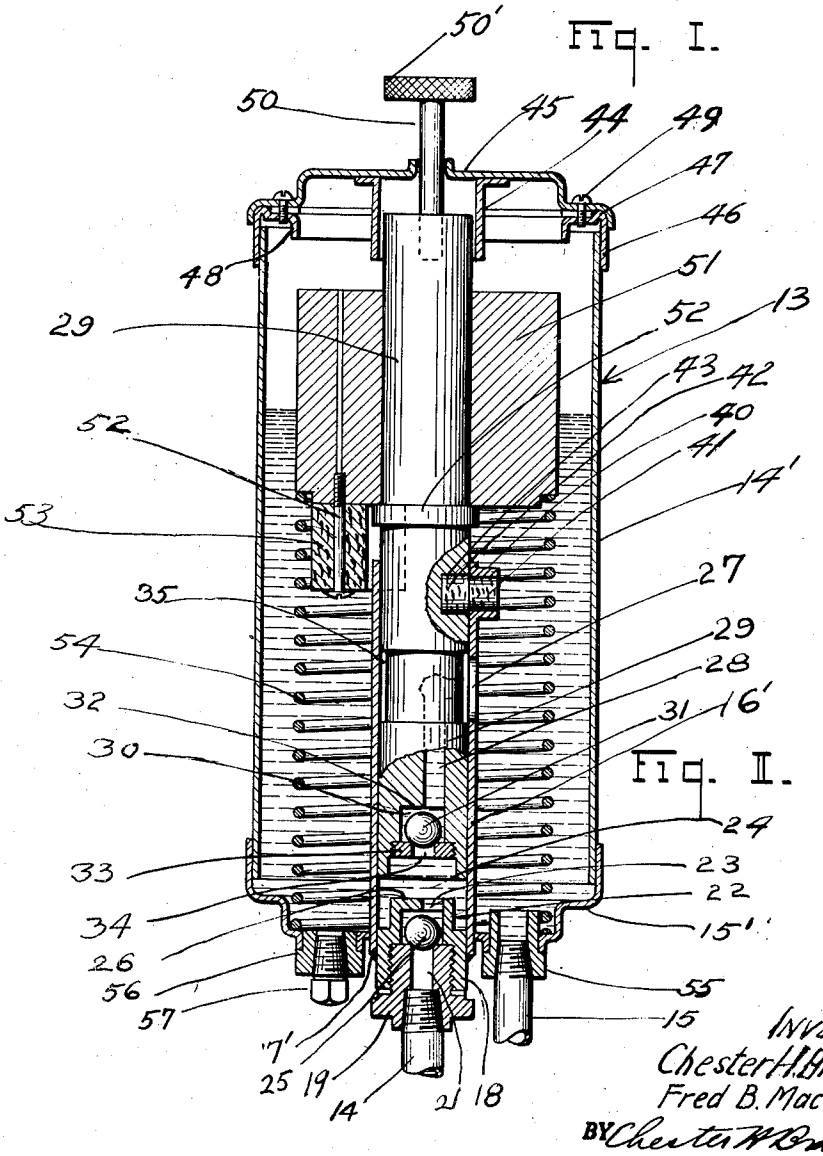


Fig. II.

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LIQUID-ELEVATING PUMP

Application filed July 15, 1922, Serial No. 575,293. Renewed July 18, 1928.

This invention relates to mechanism for elevating a liquid from a lower level to a receptacle at a higher level, and has particular utility when applied to vehicles such as automobiles, utilizing liquid fuel.

For automobiles it is customary to provide a main tank or reservoir for fuel in the rear end of the frame and utilize some form of pumping mechanism for lifting the fuel to a secondary tank above the carbureter from which the liquid feeds by gravity down to the carbureter and thence to the engine.

In the co-pending application, Serial No. 533,493, inventors Chester H. Braselton and Fred B. MacLaren, there is disclosed a form of pumping mechanism for lifting the liquid fuel from the main tank, which is based in principle upon the inertia of the movable element positioned within the secondary tank, a pumping effect being obtained by the movement of a weighted plunger in relation to the fixed support of the tank induced by the vibration of the engine, or by the movement of the automobile over a rough road bed, thus imparting an up and down movement to the weighted plunger and causing the movement of liquid from the main tank to the elevated or secondary reservoir. In the present invention there are disclosed various improved details designed to increase the efficiency and precision of operation of the pumping mechanism.

Among the objects of the invention, therefore, is the utilization of means in connection with a weighted plunger of the pump, which tends to restrain or completely stop the pumping effort when the amount of liquid in the secondary tank has reached a predetermined maximum value. Another object is the provision of a retarding or checking device in connection with the pump which is normally ineffective during the ordinary pumping operation and which is made effective only by the inflow of the liquid from the lower tank or reservoir. It is further the object of the invention to stop the inflow of liquid to the secondary tank by means not involving the use of valves, the inhibition of pumping action being dependent upon float members rigidly secured to the weighted member and upon a frictional device fixed to the plunger to cooperatively have movement with a similar friction member fixed in the cylinder of the pump, this frictional action being normally ineffective but the members having contact when the supply of liquid has arrived at its maximum value.

Further objects involving details of construction and the methods of manufacture will become apparent from an inspection of the drawings and the accompanying description of a form of the mechanism and secondary tank to which in an illustrative manner has been applied the various improvements above referred to.

In the accompanying drawing,

Figure I is a diagrammatic showing of an automobile chassis showing the relative position of the pumping element and reservoirs, and

Figure II is a detailed cross sectional elevation of the combined pumping and liquid receiving unit.

Referring to Figure I of the drawing, there is shown an automobile chassis 10, at the rear of which a main reservoir 11 for liquid fuel, such as gasoline, is secured. At the top of the dash 12 is the secondary tank 13 containing the pumping mechanism as clearly shown in Figure II in the drawing.

A conduit 14 makes connection between the main tank and the secondary tank 13 and from this latter tank the fuel is adapted to feed by gravity through a pipe 15 to the carbureter 16, whence it is distributed to the various cylinders of the engine 17 in the usual way. The automobile is provided with the usual springs which tend to extend in a measure the frequency and amplitude in movement of the car body as the automobile passes over a road.

The secondary tank 13 has an outer cylindrical shell or casing 14′ at the base of which is welded or soldered a base cap 15′ apertured at its center to receive the end of the pump cylinder 16′ which extends outside of the tank and below the base thereof.

The base 17′ of the pump cylinder 16′ is closed by means of an external plug 18 sealed to the interior of the cylinder at its end, and

an interior plug 19 screw-threaded within the outer plug 18. The plug 19 forms a connection between the inlet pipe 14 and the inlet valve formed by the exterior plug 18, there being a passage-way 21 extending through the inner plug 19 to a chamber formed by the upper end of the plug 19 and an annular extension 22 formed integral with the exterior plug 18, but possessing a smaller diameter than that of the plug itself. The upper side of the annular valve extension 22 is closed by a flat plate 26, there being, however, an aperture 23 at the top thereof, through which liquid from the inlet pipe may escape into the pump chamber 24. Included within the annular chamber 22 is a spherical valve 25, which is adapted to close the entry channel 21 in the inner plug 19 by virtue of gravity, its movement being limited in an upward direction, when the suction is such as to lift the valve, by the top plate 26 forming the closure of the annular valve chamber 23. It is to be noted that the aperture 24 is positioned off center of the plate 26, so that when the valve 25 is lifted, escape of liquid through the aperture 24 is not prevented.

The pump cylinder 16′ is apertured adjacent its top as at 27 to permit access to the interior of the casing 13 from a conduit 28 formed within the body of the pump plunger or piston 29. This conduit 28 is enlarged at its base to form a valve chamber 30 in which a spherical valve 31 is adapted to have movement. The valve 31 is limited in its upward movement by a shoulder 32 formed through the enlargement 30 above referred to and in its downward movement by the valve plate 33 apertured at its center as at 34 to form a connection between the pumping chamber 24 and valve chamber 30. Normally, the valve 31 rests over the aperture 34 so that movement of liquid down is prevented, while, on the other hand, movement upwardly from the pump chamber of liquid is made possible, the provision of the shoulder 32 making impossible a complete stoppage of liquid in an upper direction.

The portion of the plunger 29 adjacent the valular opening 27 has a diameter less than the normal diameter of the cylinder 16′ so that there is a space formed in between the wall of the plunger and the cylinder at this point. The object of this arrangement is to permit liquid to come into the cylinder and pass in between the cylinder and piston wall, thereby forming a liquid seal tending to increase the efficiency of the pumping action. Another advantage of this constricted diameter resides in the fact that should the piston rotate relative to the cylinder, the effect as to the cross section of outlet is not apparent, inasmuch as the liquid passes completely around the piston at this point and discharges through the port, 27.

Adjacent the top of the cylinder 16′ is formed an opening 40, adapted to receive an element 41 which has high frictional effect relative to other materials, particularly to materials of similar composition. This material might be cork, for example, or some other analogous material and is adapted to cooperatively engage under certain conditions a similar friction element 42 inserted in a recess 43 formed in the wall of the plunger. The function of these two cooperating friction elements is, as will hereafter be more fully explained, to, under certain conditions, mutually engage each other and retard the reciprocating movement of the plunger element, thereby deenergizing the pump and, consequently, the inflow of liquid into the auxiliary tank 13.

The plunger 29 extends above the upper wall of the cylinder 16′ so as to engage a guiding collar 44 fastened securely to the upper cap 45 of the casing and forming a guide and holding means for the reciprocating plunger. The diameter of this guide is somewhat greater than that of the plunger, so that there is some lateral movement possible in the plunger element. The top cap 45 does not rest directly upon the top of the casing 13, but is secured to a ring 46 which surrounds the upper part of the casing and is soldered or welded to the exterior thereof. This ring is bent inwardly and downwardly forming an annular rib 47 and then inwardly and downwardly upon an inner supporting rib 48. The attachment between the cap 45 and the ring 46 is made by means of machine screws 49 which pass through the ring 46 inwardly of the rib 47, so that the tightening of the screws causes a rigid and fluid tight joint between the cap and ring. In order to increase the tightness of this joint, the outer extremity of the cap 45 is bent downwardly, so that it curves around the rib 47, thereby providing additional contacting area between the two members.

The center of the cap 45 is apertured to receive the stem 50 of a hand operated member attached at its lower end to the top of the piston 29 and having at its upper end a knurled cap 50′ by means of which the plunger may be manipulated to cause reciprocation in the pump chamber and bring liquid into the casing. This hand-operated pumping mechanism is entirely secondary and is adapted to be used only when the primary pumping means is for any reason inoperative.

The primary pumping means comprises a weighted element 51 which rests upon a collar 52 surrounding the plunger above the top of the cylinder 16, and is formed of metal or any other material having a sufficiently high density to permit relative movement of the plunger and cylinder by reason of inertia.

To one side of the weighted element 51, there is formed a hole extending axially parallel to the plunger element and at the base

of this hole a machine screw 52 is adapted to hold a material 53 of relatively light density, such as cork or analogous wood. It should be observed that by the removal of the iron or weighted material because of the hole drilled therein, the plunger, if positioned correctly, would be unbalanced but by the addition of the cork element, the balance is restored and any up and down movement therefore of the plunger will be along the vertical axis. The object of the cork so disposed on the weighted element 51 is, in case the amount of liquid should reach a level in the tank at which the inflow should cease, to shift the top of the plunger over to one side against the ring 44, so that the frictional elements 41 and 42 are brought into contact and thereby retard the reciprocating movement of the plunger to such an extent that the inflow of liquid to the tank practically ceases.

The base of the weighted element 51 is cut away around its lower outer circumference to form a seat for the upper end of a spring 54, the base of the same resting upon the lower cap 15 of the casing. The spring supports the weighted element 51 and its attached plunger in a balanced position, so that in the case of any sudden jar being imparted to the casing, because of the inertia of the weighted element, there is brought about a relative movement of the plunger and cylinder, resulting in a pumping action within the cylinder and an inflow of liquid into the casing.

The outlet pipe 15 has entry into the casing 13 through a tubular bushing 55 in the base of the casing and in the cap 15. The cap 15 is also apertured to one side and a bushing 56 is attached thereto internally threaded to receive a plug 57 through which opening it is possible to drain and clean out the tank.

In the operation of a pumping mechanism above described, and assuming that the tank is empty, the initial operation would be to cause reciprocation of the pump plunger 29 by manipulation of the cap 50', the up and down movement of the plunger causing liquid to flow from the main tank 11 into the pump chamber and thence out into the secondary tank area. The engine may then be started and as soon as the vehicle is in motion, the vibration and up and down movement imparted to the casing 13, by virtue of the movement of the vehicle over the road bed, causes an up and down movement of the plunger element 29, this movement being facilitated by reason of the inertia of this plunger element in connection with the weighted element 51. While a greater impetus is given to the plunger through the movement of the car or vehicle over the road bed, there is also some vibration imparted to the pump merely by the action of the engine itself when the vehicle is motionless. The degree of movement depends, of course, upon the characteristics of the spring 54, as well as upon the inertia of the piston including the weighted mass 51, but the design of the piston is such as to cause elevation of the liquid from the main tank under all operative conditions of the automobile such as in hill climbing, for example, or over extremely smooth or rough roads. In the latter circumstance, of course, it is essential that means be provided to prevent an overflow when the movement of the plunger is extensive, as such would occur when traveling over rough and uneven roads. This situation is provided for in the friction elements 41 and 42 above referred to, which become effective only when the liquid in the tank has arrived at a level sufficiently high to cause a tilting of the plunger element, and thereby cause the inter-engagement of the friction members. It is, of course, apparent that the movement of the weighted plunger is variable, depending upon the road bed, vibration of the engine and other sources of vibration so that the average movement of the plunger is effective in determining the amount of liquid raised from the main tank, and the design is such as to take advantage of the various extremes of movement such as would come from movement of the vehicle upon a smooth road and upon a rough road and provide an average inflow of liquid to the secondary tank sufficient to supply the engine with all the fuel necessary for the proper operation of the engine.

It should be pointed out that the device and mechanism shown in the drawing and covered in the description is merely illustrative, the invention not being limited thereto, but subject to such variations as would come within the scope of the claims hereto appended.

What we claim is:

1. In a device of the class described, the combination of a casing adapted to receive a liquid; a cylinder within the casing; a plunger movable within the cylinder and forming therewith a pump chamber; inlet and outlet conduits to said chamber; an inlet valve in the inlet conduit and an outlet valve in the outlet conduit; inertia-actuated means for causing movement of the plunger; and additional means for frictionally retarding movement of the plunger when the supply of liquid in the casing has reached a predetermined value, said means comprising a friction element secured to the plunger and a co-operating friction element secured to the cylinder, said elements having an enlarged contact area and being normally out of contact with each other.

2. In a device of the class described, the combination of a tank; a reciprocatory fluid pump within said tank adapted to supply liquid thereto; inertia-actuated means within the tank automatically operative to energize

said pump; and frictional retarding means within the tank adapted to retard reciprocation of said pump when the supply of liquid has reached a predetermined level, said means comprising interengageable co-operating friction elements normally out of engagement with each other and an eccentrically positioned weight secured to the inertia actuated means for biasing the reciprocating element of said pump when the supply of liquid exceeds a predetermined level.

3. In a device of the class described, the combination of a casing adapted to receive a liquid; a cylinder within the casing; a plunger movable within the cylinder and forming therewith a pump chamber; inlet and outlet conduits to said chamber; an inlet valve in the inlet conduit and an outlet valve in the outlet conduit; means for causing movement of the plunger; and friction members adapted to retard movement of the plunger when the supply of liquid in the casing has reached a predetermined level; one of said members being secured to the cylinder and the other of said friction members being secured to said plunger, and an eccentrically positioned weighted element secured to the plunger moving means, said element having a specific density less than that of the liquid in said casing and adapted to bias the plunger of the pump when a liquid in the casing exceeds a predetermined level.

4. In a device of the class described, the combination of a casing adapted to receive a liquid; a cylinder within the casing; a plunger movable within the cylinder and forming therewith a pump chamber; inlet and outlet conduits to said chamber; an inlet valve in the inlet conduit and an outlet valve in the outlet conduit; means for causing movement of the plunger, said plunger having a normal vertical movement but adapted to be biased to one side when the supply of liquid in the casing has exceeded a predetermined value, and means which become operative when the plunger is biased, whereby the movement of the plunger is retarded.

In testimony whereof, we affix our signatures.

CHESTER H. BRASELTON.
FRED B. MacLAREN.