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FLUID SEPARATOR

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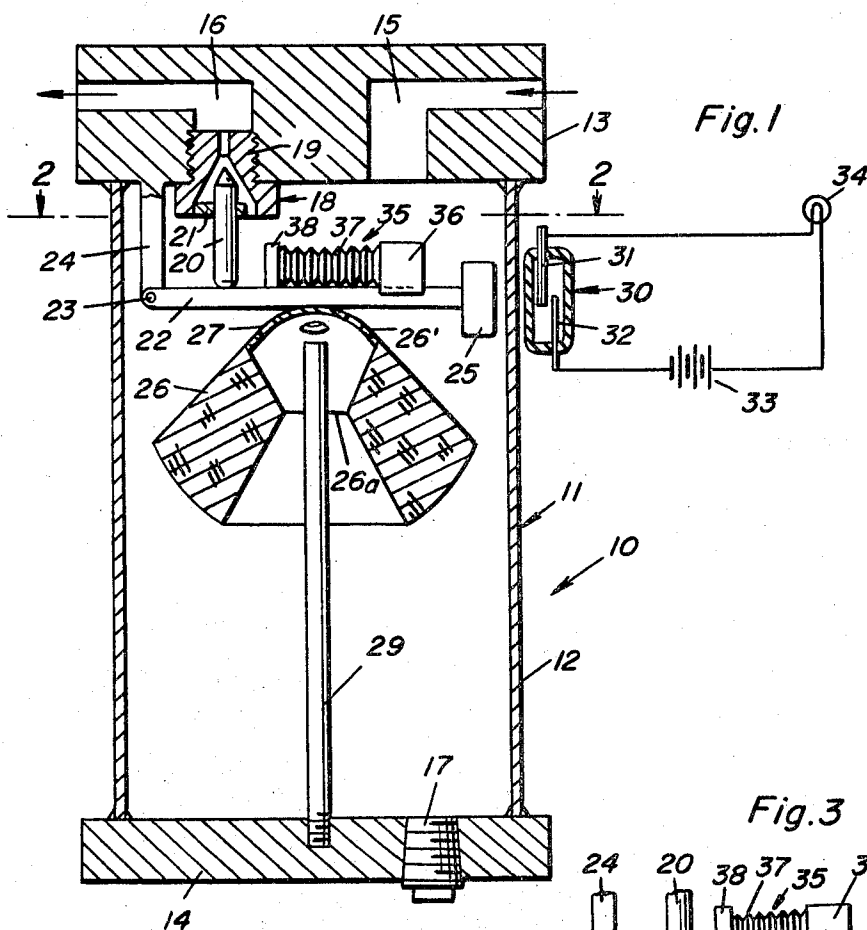


Fig. 1

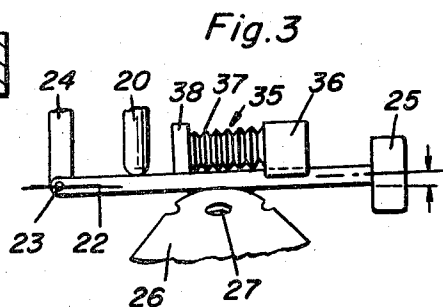


Fig. 3

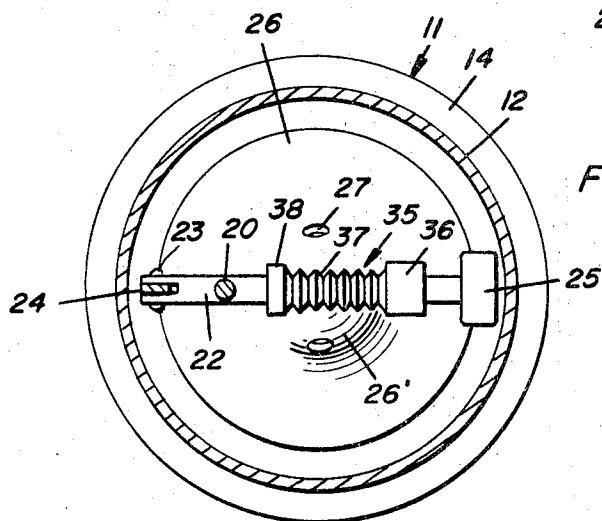


Fig. 2

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1

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ABSTRACT OF THE DISCLOSURE

A separator for fluids of different specific gravities having a liquid container and a valve mechanism for selectively sealing the outlet of the liquid container including an outlet valve vertically moved into and out of the outlet in response to the swinging of a pivotally mounted control arm engaged therewith. The control arm is responsive to the level of a float in contact therewith and includes a pressure responsive shifting weight thereon so as to vary the mechanical advantage derived from the control arm for increasing the sealing pressure of the valve as the fluid pressure within the container increases.

This invention relates to new and useful improvements in separators for fluids having different specific gravities, as for example, in a mixture of water and gasoline, or oil and water, and the like.

The principal object of the invention is to provide a device of the character herein described whereby the lighter fluid in a mixture may be quickly and efficiently separated from the heavier fluid by virtue of their different specific gravities.

Briefly, the device of the invention comprises a container or tank provided at the top thereof with a fluid mixture inlet and with an outlet for separated lighter fluid, a drain for the separated heavier fluid being provided at the bottom of the container. The lighter fluid outlet is equipped with a valve having a vertically swingable actuating arm which responds to rising and falling of a float inside the container. When a fluid mixture is admitted into the tank it becomes separated by gravity so that the lighter fluid rises to the upper portion while the heavier fluid sinks to the lower portion of the container. The outlet valve is normally open to permit the lighter fluid to pass outwardly, until the level of the heavier fluid rises sufficiently for the float to close the valve and thus prevent the heavier fluid from passing outwardly from the container along with the lighter fluid. Signalling means are provided to indicate when this condition has been reached, so that the heavier fluid may be drained from the container.

It will be appreciated that when the outlet valve closes and the fluid mixture still continues to be delivered into the container, the fluid pressure inside the container may rise sufficiently for the unseparated fluid mixture to force its way past the closed valve, whereby the purpose of the separator would be ordinarily defeated. However, a very important feature of the invention resides in the provision of compensating means which responds to an increase in fluid pressure in the container to correspondingly increase the sealing action at the closed valve, thus safeguarding against the possibility of unseparated fluid passing out of the container in the presence of high fluid pressure, even when the valve is closed.

Another important feature of the invention resides in a particular arrangement of the float in the container, which permits the valve mechanism to be efficiently operated even when the device is not situated in a true vertical position.

Other advantages of the invention reside in its simplic-

2

ity of construction, efficient and dependable operation, and in its adaptability to economical manufacture.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a vertical sectional view of the fluid separator of the invention;

FIGURE 2 is a cross-sectional view, taken substantially in the plane of the line 2—2 in FIGURE 1; and

FIGURE 3 is a fragmentary side elevational view showing the action of the valve actuating mechanism.

Referring now to the accompanying drawings in detail, the fluid separator of the invention is designated generally by the reference numeral 10 and embodies in its construction a vertically elongated, closed container or tank 11, including a side wall 12 and upper and lower ends 13, 14, respectively.

The upper end 13 of the container or tank is provided with a fluid mixture inlet 15 and also with an outlet 16 for separated lighter fluid. The separated heavier fluid is adapted to be drained from the tank upon removal of a drain plug 17 in the lower end 14, as will be clearly apparent.

Valve means designated generally by the numeral 18 are provided in the outlet 16, such valve means comprising a valve seat 19 and a cooperating needle 20, the latter being vertically disposed and slidably guided by an apertured bracket 21 which is carried by the seat 19, as illustrated.

The needle 20 of the valve means is actuated by a vertically swingable arm 22 which has one end thereof pivoted as at 23 to a support 24 depending from the upper end 13 of the tank. The other end of the arm 22 carries a permanent magnet 25, the purpose of which will be hereinafter described.

The tank or container 11 has loosely positioned therein a float 26, which preferably is in the form of a hollow cone having a rounded apex portion 26' in engagement with the underside of the aforementioned arm 22. If desired, the float portion 26' may be provided with a plurality of apertures or passages 27, so that any lighter fluid trapped inside the float may rise through these apertures to the upper portion of the container.

A vertical guide rod 29 is secured in the bottom 14 and extends centrally inside the container 11 into the hollow float 26, so as to sustain the float in proper position to engage the arm 22. It will be noted that the float is provided with a restricted portion 26a which loosely surrounds the guide rod 29, so as to permit the float to move within limits while properly engaging the arm 22 even when the device as a whole may be situated out of a true vertical position. If such deviation in positioning of the device should occur, the float 26 may become slanted or tilted, but engagement of the rounded float portion 26' with the arm 22 will be preserved.

It will be apparent from the foregoing that when a fluid mixture is admitted into the container 11 through the inlet 15, the heavier fluid will sink to the bottom and the lighter fluid will rise to the top. The valve means 18 are normally open so that the lighter fluid may pass outwardly from the container through the outlet 16, until the level of the heavier fluid in the bottom portion of the container rises sufficiently for the float 26 to close the valve means 18 through the medium of the arm 22. When that occurs, the heavier fluid will be prevented from passing outwardly from the container along with the lighter fluid and the heavier fluid may then be drained by removal of the plug 17.

Means are provided for indicating when drainage of the heavier fluid from the container is necessary. These means comprise a magnetically actuated electric switch 30 which is suitably mounted exteriorly of the container 11 adjacent the container sidewall 12, the switch 30 including a pair of contact reeds 31, 32 which are normally separated but are brought together by the magnetic field of the magnet 25 on the arm 22 when the valve means 18 are closed. The two contact reeds 31, 32 of the switch 30 are in circuit with a source of electric current 33 and with a suitable signalling device, such as a lamp 34, so that the signalling device is automatically energized when the reeds 31, 32 are brought in contact with each other by the magnet 25 in the closed position of the valve means 18.

It will be appreciated that when the valve means 18 are closed and a fluid mixture continues to be delivered into the container 11 through the inlet 15, the fluid pressure within the container will be built up, perhaps to a point where unseparated fluid may force its way past the closed valve means 18 and thereby defeat the purpose of the separator. The invention eliminates this possibility by the provision of compensating means designated generally by the numeral 35, which means are responsive to variations in fluid pressure within the container, so as to force the valve needle 20 against the seat 19 with a greater or lesser sealing action.

The compensating means 35 consist of a weight 36 which is slidably positioned on the arm 22 so that it is slidable toward and away from the arm pivot 23. An elongated, longitudinally extensible and contractable bellows 37 has one end thereof suitably connected to the weight 36, while its other end is anchored to a lug 38 fixed to the arm 22. The bellows 37 is hollow and has a quantity of air sealed therein.

Under normal operating conditions when the valve means 18 are open, the fluid pressure inside the tank 11 is relatively low and the bellows 37 are extended or expanded by the air contained therein, so that the weight 36 is relatively distant on the arm 22 from the pivot 23. However, as the valve means 18 become closed and fluid pressure within the container increases, the bellows 37 become compressed, thus causing the weight 36 to slide along the arm 22, closer toward the pivot 23. The mechanical advantage of the lever action provided by the arm 22 is thus changed, so that as the pressure of fluid within the container progressively increases, the float 26 acting through the arm 22 forces the needle valve 20 into a progressively firmer engagement with the seat 19, whereby to safeguard against any possibility of unseparated fluid passing outwardly through the outlet 16 when the fluid pressure in the tank or container is relatively high.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A separator for fluids having different specific gravities, said separator comprising a closed container provided at the top thereof with a fluid mixture inlet and with an outlet for separated lighter fluid, a drain for separated heavier fluid provided at the bottom of said container, valve means in said outlet, a vertically swingable actuating arm for said valve means pivotally mounted at one end thereof in the top portion of the container, a float provided in said container in engagement with the underside of said arm for closing said valve means when the float rises and vice versa, a compensating weight slidable longitudinally on said arm toward and away from the pivot of the latter, and means responsive to variations in pressure of fluid in said container for sliding said

weight, said pressure responsive means comprising bellows mounted on said arm and operatively connected to said weight.

2. A float actuated valve mechanism adapted to be disposed in a container receiving fluid therein under pressure, said mechanism comprising a vertically swingable arm pivotally mounted at one end thereof, an outlet valve actuated by said arm, a float operatively engaging the underside of said arm and causing said valve to close when the float rises and vice versa, a compensating weight slidable longitudinally on said arm toward and away from its pivot, and means responsive to variations in pressure of fluid in a container for sliding said weight, said pressure responsive means comprising bellows mounted on said arm and operatively engaging said weight.

3. A float actuated valve mechanism adapted to be disposed in a container receiving fluid therein under pressure, said mechanism comprising a vertically swingable arm pivotally mounted at one end thereof, an outlet valve actuated by said arm, a float operatively engaging the underside of said arm and causing said valve to close when the float rises and vice versa, a compensating weight slidable longitudinally on said arm toward and away from its pivot, and means responsive to variations in pressure of fluid in a container for sliding said weight, said pressure responsive means comprising elongated and longitudinally expansible and contractable bellows having one end thereof mounted on said arm and its other end connected to said weight, said bellows being hollow and contracting under increased pressure to slide said weight toward the pivot of said arm.

4. A float actuated valve mechanism adapted to be disposed in a container receiving fluid therein under pressure, said mechanism comprising a valve, a float, mechanical advantage control means operatively connecting said float to said valve whereby a rising of the float will effect a closing movement of the valve and vice versa, and pressure responsive means for increasing the mechanical advantage of said control means as the pressure increases and decreasing the mechanical advantage of said control means as the pressure decreases, said control means comprising an elongated lever pivotally mounted at one end thereof, said valve engaging said lever outward of the pivot for movement with the lever, said float engaging said lever outward of the valve for movement of the lever, said pressure responsive means comprising a weight on the lever outward of the valve and means for shifting the weight inwardly toward the pivot and valve relative to the float upon an increase in pressure, and outward away from the pivot and valve, relative to the float, upon a decrease in pressure.

5. The device of claim 4 wherein said means for shifting the weight comprises longitudinally expansible and contractable bellows having a first end thereof secured to the lever and the second end thereof connected to the weight.

6. A separator for fluids having different specific gravities, said separator comprising a closed container provided at the top thereof with a fluid mixture inlet and with an outlet for separated lighter fluid, a drain for separated heavier fluid provided at the bottom of said container, valve means in said outlet, a vertically swingable actuating arm for said valve means pivotally mounted at one end thereof in the top portion of the container, a float provided in said container in engagement with the underside of said arm for closing said valve means when the float rises and vice versa, said float being positioned loosely within said container and having an inverted conical configuration with a rounded apex portion, and an elongated guide rod projecting upwardly from the bottom of the container into the conical interior of the float, said guide rod terminating freely below said arm, the apex portion of said float completely overlying the free upper end of said guide rod and being free relative to said rod for

5

upward movement of the float therefrom, said rod being of a thickness, relative to said float, as to enable an angular displacement of the float relative to said rod so as to maintain a generally horizontal orientation of the float upon an angular movement of the container from the horizontal, the rounded apex of said float maintaining the desired biasing contact with the arm.

7. The device of claim 6 together with a magnet provided at the free end of said arm, a magnetically actuated switch positioned exteriorly of said container for actuation by said magnet, and a signalling device in circuit with said switch and with a source of electric current.

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