May 12, 1942. O. E. ZODER 2,282,413

SAFETY APPARATUS

Original Filed Nov. 18, 1939

FIG. 1.

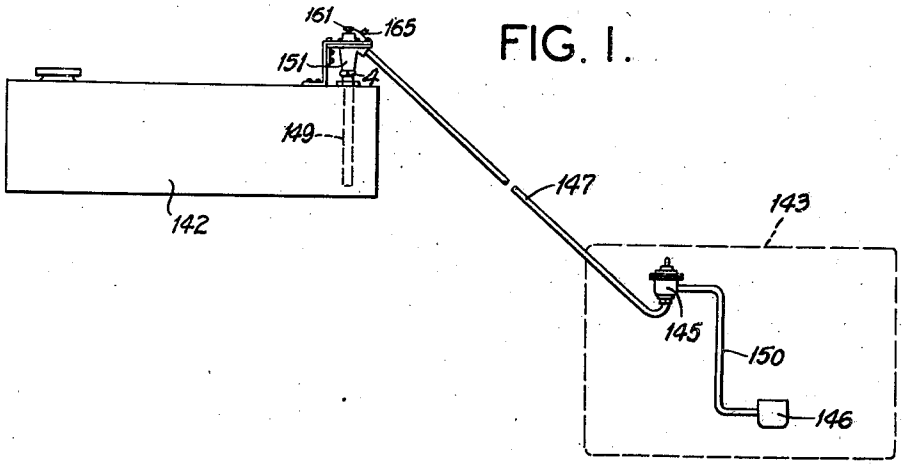


FIG. 2.

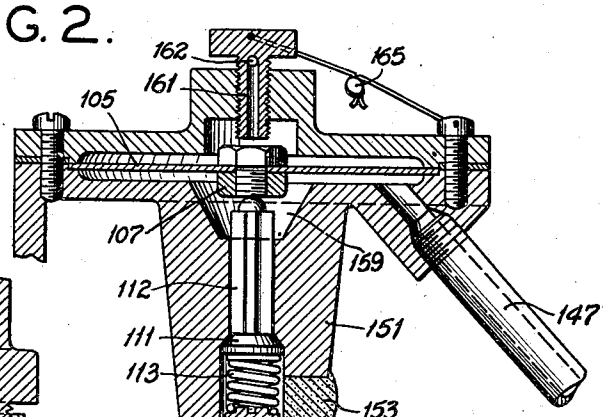


FIG. 3.

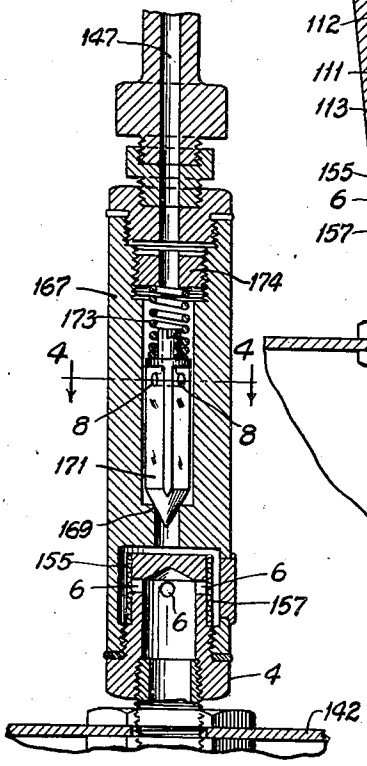
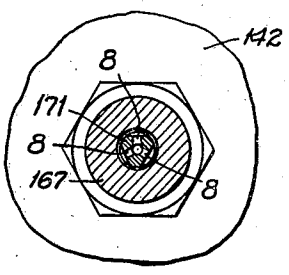


FIG. 4.



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UNITED STATES PATENT OFFICE

2,282,413

SAFETY APPARATUS

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Original application November 18, 1939, Serial No. 305,159, now Patent No. 2,240,277, dated April 29, 1941. Divided and this application May 25, 1940, Serial No. 337,183

3 Claims. (Cl. 137—21)

This invention relates to safety apparatus, and with regard to certain more specific features, to safety apparatus for tanks which carry dangerous fluids, such as inflammables or the like.

The invention is an improvement upon the invention disclosed in my United States Patent No. 2,194,348, dated March 19, 1940, for Safety apparatus.

The invention is a division of the invention disclosed in my United States patent application Serial No. 305,159, filed November 18, 1939, for Safety apparatus, now Patent No. 2,240,277, granted April 29, 1941.

Among the several objects of the invention may be noted the provision of means for cutting off dangerous liquid under certain conditions, wherein failure of operation may quickly be rectified; and the provision of a simple form of safety apparatus adapted to avoid an emptying syphoning action on tanks under abnormal conditions. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which are shown several of various possible embodiments of the invention,

Fig. 1 is a diagram showing an application of the invention;

Fig. 2 is an enlarged vertical section of a part of the invention shown in Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing an alternative form of the invention; and,

Fig. 4 is an enlarged horizontal section taken on line 4—4 of Fig. 3.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

Referring now more particularly to Fig. 1, there is shown an apparatus wherein there is danger of the formation of a syphon suction effect between an elevated fuel tank and a low point of use of the fuel. For example, at numeral 142 is shown a fuel tank and at numeral 143 an engine having a pump 145 and carburetor 146. The pump sucks fuel from the tank and delivers it to the carburetor of the engine. The particular circumstances involved in this embodiment are that the tank 142 is above the level of the pump 145, although the invention is susceptible to variation in this respect, as will later appear. The circumstances in which a tank is at a substantial elevation occur quite often in the case of boats in which the engine, including the pump and carburetor, is at a relatively low elevation.

It sometimes occurs that the pump 145 has leaky valves and the float valve of the carburetor leaks or sticks. Hence, when the engine 143 stops, say at night, a syphon action occurs through the line 147 which connects the tank 142 and the pump 145, and through the line 150 connecting the pump 145 and carburetor 146. This causes the carburetor bowl to overflow continuously, liquid being drawn from the tank 142 which floods the boat with fuel and provides a serious fire hazard. Furthermore, lines such as 147 are sometimes in locations where they become disconnected by accident or develop leaks at low points, thus causing the syphoning action which empties the tank 142 into the boat.

The form of the invention shown overcomes the above difficulty. At 149 is shown the suction line in the tank 142 which reaches to a point near the bottom, and on the outside of this line is attached a body 151 in which is a fusible plug 153 which fuses in case of fire. This relieves tank pressure and prevents an explosion. In the body 151 is also a passage 155 (wherein is used a strainer 157) leading up to a chamber 159 under a diaphragm 105. The chamber 159 connects with the suction line 147 which passes down to a point below the tank 142.

The diaphragm 105 has an anvil 107 which presses a valve 111. The stem portion 112 of the valve is of polygonal shape permitting passage of fluid when the valve is open. A spring 113 normally presses the valve 111 to its seat but suction in the line 147 depresses the diaphragm 105 to open the valve. This spring 113 reacts against an adjusting screw 163 having a screw driver slot 2 for adjusting purposes. The screw 163 is threaded through the end of a hollow cap 4 which communicates with the interior of the body 151 by means of opening 6.

An air vent screw 161 serves to lead in air above the diaphragm 105. If the diaphragm leaks, the the operator breaks the seal 165 so that he may screw down 161. This depresses the broken diaphragm 105 to open valve 111 and at the same time closes port 162. Hence, in emergency, gasoline may be drawn out over line 147. The broken seal 165 permits an inspector to determine that repairs are needed.

Suction in the line 147 is that which draws down the diaphragm 105 (when unbroken) to

open the valve 111 against the action of spring 113 and draws liquid from the tank over line 149. It will be seen that the action of the diaphragm 105 must overcome the reaction of the spring 113. The strength of the spring 113 must be great enough to close the valve 111 against the suction action on the diaphragm 105 which is equal to the greatest negative syphon head in line 147. Since the syphon heads of substantially varying amounts may be met with, the screw abutment 163 is employed to adjust the spring 113 so that the syphon head falls just short of deflecting the diaphragm 105 downwardly enough to open the valve 111, but when the pump 145 starts and adds its negative suction head to the negative syphon head, the diaphragm 105 is depressed to open the valve 111 against the spring 113.

A modified form of the Fig. 2 construction is shown in Fig. 3 wherein no diaphragm is used. In this case a body 167 is provided with a valve seat 169 closed upstream by a valve 171. The valve is normally seated by means of a spring 173, the tension of which may be adjusted by the hollow screw 174. Numeral 147 again indicates the line which passes to the pump 145 at the lower elevation. Suction in the line 147 results in opening the valve 171 against the action of the spring 173. In this case the spring 173 is made strong enough so that the syphon head falls just short of opening the valve 171, but so that when the added suction head of the pump 145 is applied the valve will open.

The valve seat 169 is of steep taper of the order of 60°, in order to obtain a substantial unit pressure on the valve seat for a given spring pressure from spring 173.

It will be noted from Figs. 3 and 4 that the valve 171 is also polygonal in form, except that its upper portion where liquid is led through passages 8.

In some instances the tank 142 may be below the engine E, or at least at a point such that during part of the time its liquid level goes below that of the engine. In this event there will be no syphoning action toward the engine at least part of the time. In such cases the present apparatus simply functions as a safety shut-off valve. As such it avoids the necessity for a hand-operated shut-off valve.

Another use of the valve is at a point adjacent to the pump 145, where the fuel tank is elevated. In this event the valve does not act as a means to prevent syphoning but stops off or supports the liquid head which would otherwise be applied to pump 145 and carburetor 146. In boats where the tank 142 is on a high deck, trouble is often encountered due to too much head pressure on relatively delicate carbureter valves and by placing the present construction at the base of this head, the excessive pressure may be kept off the pump. It still allows the pump to meter out fluid by causing opening of valve 111 or 171.

In the case of the valve 111, the pump 145 would need to draw it open against the pressure of the spring 113 and the applied liquid head. In the case of the valve 171, the spring 173 would be adjusted to hold against the liquid head, but to open against the liquid head plus the suction head of the pump.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Safety apparatus comprising a hollow body having movable separating means dividing it into two compartments, said body having a liquid inlet on one side of the separating means and having a liquid suction outlet upon the same side of said means, a valve seating downstream between the inlet and the outlet, a spring normally biasing said valve to a seat, adjustable backing means for the spring, said movable means being arranged to open the valve upon suction occurring in said outlet, the compartment on the other side of the movable means having an atmospheric connection, and means for simultaneously closing said atmospheric connection and moving the movable means to open the valve by manual adjustment from the exterior of the device.

2. Safety apparatus comprising a hollow body, a flexible diaphragm dividing the body into two compartments, one of said compartments having a liquid inlet and a suction outlet, a valve between the inlet and the outlet, said valve being normally seated but adapted to be unseated by deflection of the diaphragm in response to suction at said outlet, means on the other side of the diaphragm providing an atmosphere connection, said means being adjustable to close said connection and to deflect the diaphragm to open the valve when desired, whereby under punctured conditions of the diaphragm air leakage into the suction outlet is prevented and said outlet is maintained in direct connection with the inlet independent of said diaphragm.

3. Safety apparatus for liquid containers, comprising a tank for liquid, means forming a liquid passage from a point near the bottom of the tank to a lower exterior point, whereby a two-limbed syphon is formed with a relatively short limb inside the tank and a longer limb outside, adapted to produce a continuous suction syphon head tending to withdraw liquid from the tank, a suction pump in the outer limb adapted intermittently to produce a suction head in addition to the syphon head, a control valve in said passage, a movable diaphragm exposed to the sum of the effects of said syphon and suction heads and operatively connected to the valve and adapted to open it in response to the sum of the heads of the syphon and pump when the pump operates, means biasing the valve shut against merely the syphon head but releasing the valve to open in response to said action of the diaphragm in response to the sum of the suction and syphon heads, means providing a substantially large outlet in said liquid passage on the tank side of said valve, and a fusible plug in said outlet.

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