

Dec. 10, 1935.

J. MAHONEY

2,023,534

VENT FOR CLEANING SYSTEMS

Filed Dec. 13, 1934

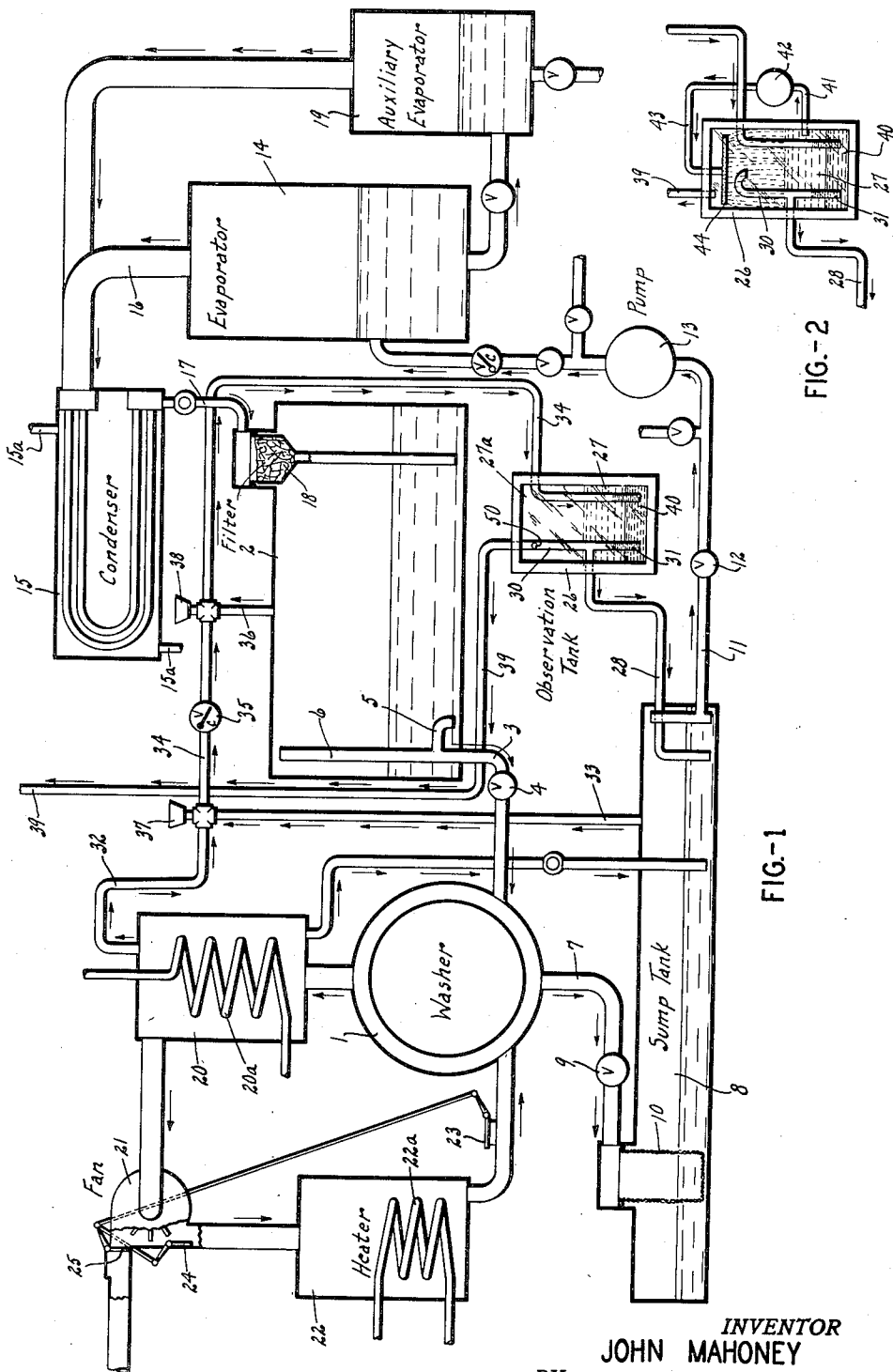


FIG.-2

FIG.-1

INVENTOR
JOHN MAHONEY
BY
Brockett, Hyde, Higley & Meyer
ATTORNEYS

UNITED STATES PATENT OFFICE

2,023,534

VENT FOR CLEANING SYSTEMS

John Mahoney, Lakewood, Ohio, assignor to The American Laundry Machinery Company, Norwood, Ohio, a corporation of Ohio

Application December 13, 1934, Serial No. 757,412

5 Claims. (Cl. 261—7)

My invention relates to vents and more particularly to liquid seal vents for vessels, tanks or systems in which a volatile liquid or solvent is stored or utilized.

In fabric treating apparatus it is desirable in economical operation to repeatedly utilize the same supply of detergent and to have the detergent equally effective in each operation. In such apparatus means are therefore provided to remove the foreign matter, such as grease and dirt, from the detergent after the treating operation. To prevent the loss of solvent and its contact with moisture in the air, it is also desirable to have the vessel or system as nearly closed to the atmosphere as possible. This is particularly important in treating vessels or systems in which the detergent is carbon tetrachloride, which, especially when hot, reacts with water to form hydrochloric acid which materially weakens the fabric and may even attack the metal parts of the vessel or apparatus in which the fabric is being treated. To avoid the necessity of constructing the vessel or system of excessively strong material and to obviate the possibility of injury to the apparatus or system as the result of abnormal vacuum or pressure conditions, means are preferably provided to permit sufficient vent to the atmosphere to prevent the formation of abnormal vacuum or pressure conditions within the apparatus or system.

It is therefore an object of my invention to provide an improved liquid seal vent for tanks or systems in which a volatile solvent is stored or utilized. Another object of my invention is to provide a liquid seal for tanks, vessels or cleansing systems by means of which air containing the volatile solvent vapors may escape to the atmosphere and the solvent may be condensed and automatically returned to the tank or system. A further object of my invention is to provide a liquid seal vent for cleansing systems in which carbon tetrachloride is utilized as the solvent, by means of which air may be vented to the atmosphere when abnormal pressure conditions exist within the apparatus or system and the condensed solvent may be automatically returned to the vessel or system.

My invention will be better understood by reference to the accompanying drawing in which

Fig. 1 is an elevation illustrating my improved vent as applied to a dry cleaning apparatus; and

Fig. 2 is a similar view, showing a modified form of vent.

The invention is particularly designed for use in conjunction with cleansing systems in which

a volatile solvent, such as carbon tetrachloride, is utilized as the cleansing medium and constitutes an improvement of the vent disclosed in the pending application of Russell A. Hetzer, Ser. No. 658,577, filed February 25, 1933, which has since matured into Patent No. 1,995,065 dated March 19, 1935, to which reference may be had if desirable or necessary.

As illustrated in the drawing, the fabric cleansing system comprises a treating vessel 1 which is provided within its tub with the usual rotatable work containing drum. A storage tank 2 is mounted at a higher level than the treating vessel 1 and, as illustrated, contains a supply of volatile liquid to be utilized in the treating operation. Carbon tetrachloride is preferably utilized as the volatile detergent although other volatile detergents may be employed. The conduit or pipe 3 connects the bottom of the storage tank 2 with the treating compartment 1 and is provided with a valve 4 for regulating the amount of treating medium which passes from the storage tank to the treating compartment.

In order to prevent any water or moisture which may collect and float on the surface of the treating medium within the storage tank 2 from gravitating into the treating compartment 1 through the conduit 3, the portion of the conduit 3 within the tank 2 is provided with two branches 5 and 6. The branch 6 extends upwardly to a point above the level of the treating medium within the storage tank, and the branch 5 is in the form of a 90° elbow having its lower open end but slightly above the bottom of the tank 2. The solvent which is supplied to the treating vessel through the conduit 3 will therefore always flow from the lowermost part of the storage tank. When valve 4 is open for supplying solvent to the treating compartment 1, the treating medium will drain from the storage tank 2 until it has reached a level just slightly below the point of connection of the branch 5 with the branch 6. At this point the flow of the treating medium will stop. As the level of solvent in the storage tank 2 can never drop to the point of the opening of the branch 5, water or moisture floating on the surface of the treating medium will not be drained into the treating compartment.

A drain conduit 7 provided with valve 9 leads from the bottom of the treating compartment 1 to a sump tank 8 located below the compartment. Filter means 10 are provided at the delivery end of the conduit 7 for separating particles of foreign matter.

In renovating the used treating medium, it is

first drawn from the sump tank 8 through a conduit 11, under the control of a valve 12, by means of a pump 13, and is forced into an evaporator 14. The solvent is then vaporized, the vapors being passed to a condenser 15 by way of a conduit 16. The condenser 15 is provided with conduits 15a for passing a suitable cooling medium through the condenser. The condensed liquid or treating medium is then delivered to a point adjacent the bottom of the storage tank 2 by way of a conduit 17 and a filter 18. An auxiliary evaporator 19, having operative connection with the evaporator 14 and condenser 15, is provided to operate in conjunction with the evaporator 14. Any treating medium not vaporized in the evaporator 14 and the treating medium remaining in the sludge that deposits in the bottom of the evaporator 14 may thus be recovered.

In addition to the apparatus for recirculating and renovating the treating medium, suitable means are provided for drying and deodorizing the fabric in the treating compartment before removal of the fabric. This apparatus comprises a condenser 20 provided with a cooling coil 20a, a fan 21 and an air heater 22 provided with a steam coil 22a, all connected in a circuit with the treating compartment I. The circuit is provided with suitable valves 23, 24 and 25. When valves 23 and 25 are closed and valve 24 is open, heated air may be repeatedly passed through the treating compartment in a closed circuit to dry the fabric and when valves 23 and 25 are open and valve 24 is closed, atmospheric air may be drawn into the treating compartment and discharged to the atmosphere to deodorize the fabric, the condenser 20 serving to reclaim any treating medium carried away from the fabric by the circulation of air therethrough.

In accordance with my invention, an improved vent is provided for relieving abnormal pressure conditions existing within the vessel or system by means of which the air, laden with solvent vapors which otherwise would escape from the apparatus, is subjected to a washing process which condenses the vapors, and the condensed solvent is automatically returned to the vessel or system. This means comprises a receptacle or tank 26, together with a novel arrangement of venting conduits leading from the various parts of the apparatus to the tank or receptacle 26, where the air is subjected to the washing operation and from which it is vented to the atmosphere. In accordance with my invention, the tank or receptacle 26 contains a liquid 27 which has less specific gravity and is substantially insoluble in the volatile solvent, or a liquid in which the volatile solvent utilized will stratify as a lower layer. For instance, water may be utilized as the washing medium when carbon tetrachloride is utilized as the treating solvent in the vessel or system. Other liquids of the type specified may be of course employed, such as methyl or ethyl alcohol, although I prefer to utilize water because it is inexpensive and non-inflammable.

In the vent pipe arrangement, a conduit 28, always open, extends from a position below the minimum level of liquid which is always maintained in the sump tank 8, to the interior of the tank or receptacle 26. The conduit 28 terminates in a T-connection, one end 30 of which extends to a point above the liquid in the receptacle or tank 26 and the other end 31 of which extends to a point just above the bottom of the receptacle or tank. A conduit 32 leads from the

condenser 20 to the top of the sump tank 8 by way of a conduit 33, and a conduit 34 having a check valve 35 therein leads from the joiner of the conduits 32 and 33 to a point adjacent the bottom of the tank or receptacle 26. This conduit 34 has a connection with the storage tank 2 by way of a conduit 36. Suitable vacuum breakers 37 and 38 are provided in this system of vent conduits for relieving vacuum conditions within any part of the apparatus. A conduit 39 leads from the top of the tank or receptacle 26 to the atmosphere.

In the operation of this part of the apparatus, as the solvent indicated by the numeral 40 accumulates in the tank or receptacle 26 due to the condensing action, the combined level of the washing liquid and solvent tends to rise above the point at which the conduit 28 connects with the T-connection within the tank or receptacle. When the level of the combined liquid and solvent rises to a sufficient extent above the T-connection, the solvent 40 flows out of the receptacle from the lower end 31 of the branch into the conduit 28, and thence into the sump tank 8, under pressure of the head of liquid in the receptacle 26 until the level of solvent in the vertical portion of the T-connection drops below the point at which the conduit 28 communicates therewith. The siphon effect is then broken by the admission of air through the open branch 30 and no further liquid flows. The head of washing liquid in the receptacle 26 is just enough to maintain a given amount of solvent 40 within the receptacle and to prevent removal of anything but the solvent 40 or treating medium. Because of the importance of maintaining a given amount of washing liquid 27 in the receptacle, it may be provided with a sight glass 27a or other means for indicating the level of combined liquid and treating medium.

The operation of my improved vent as applied to a cleansing system will now be apparent. When the treating medium or solvent for a washing operation is admitted to the treating compartment I from the storage tank 2, the air which this treating medium or solvent displaces in the treating compartment I has become vapor laden and some of this vapor, which will not all be condensed in the condenser 20, passes with the air upwardly through the condenser 20 into the conduit 32 past check valve 35 through conduit 36 into the storage tank 2, thus equalizing the pressure in the storage tank. Should a condition exist where the pressure in the conduits 32, 34 and 36 is greater than is required to equalize pressure in the storage tank 2, the additional vapor laden air will be conducted to the receptacle 26 where it will bubble up through the liquid 27 and the vapor contained therein will be condensed and collect at the bottom in the form of the pure solvent 40. The air will pass out at the top of the receptacle through conduit 39 to the atmosphere.

Similarly, when the treating medium is drained from the treating compartment I into the sump tank 8, it displaces a quantity of air in the sump tank, which is saturated with solvent vapor, and which passes upwardly through the conduit 33 through the conduit 32 into the condenser 20 thence downwardly into the treating compartment I to equalize the vacuum condition which was affected by the draining of the solvent. As in the former case, should an excess pressure condition exist, that excess pressure is relieved by passage of the vapor laden air through the conduit 34 past the check valve 35 and into the re-

ceptacle 25, where the solvent vapors are removed by the liquid 27 and the free air passes to the atmosphere.

When the treating solvent is pumped from the sump tank to the evaporator 14 for the purpose of renovation, a quantity of air which is vapor laden due to its contact with the solvent and part of which is non-condensable in the condenser 15, passes upwardly to the conduit 16, through the condenser 15, downwardly through the conduit 17 into the storage tank 2 and thence bubbles up through the contents of the storage tank. In order to relieve abnormal pressure conditions in the storage tank this air laden with solvent vapors is passed through conduits 36 and 34 into the receptacle 26 where the vapor is removed by the liquid 27 and the free air passes into the atmosphere. The passage of the vapor laden air from the conduit 36 toward the conduit 32 is prevented by the check valve 35.

During the renovation process, the hot vapor passes from the evaporator 14 into the condenser 15 where the vapors are condensed and the purified solvent drains into the storage tank 2. The vapor laden air which is displaced in the storage tank 2 passes upwardly through the conduit 36, thence through conduit 34 to the receptacle 26, where the vapors are removed and the free air passes to the atmosphere. Again, in this case, the vapor laden air from the conduit 36 is prevented from passing into the conduit 32 by the check valve 35.

Referring to Fig. 2, I have shown the modified form of my invention wherein the washing apparatus hereinbefore described is provided with a spray device or atomizer for delivering the air washing liquid at the top of the tank or receptacle 26. In this arrangement, a conduit 41 is connected to the tank or receptacle 26 and extends into the liquid 27, the point of entrance of the conduit being at such a height that it will at no time be in connection with the solvent 40. The other end of the conduit 41 is connected to a pump 42 and another conduit 43 leads from the pump 42 to the top of the tank or receptacle 26 where it extends into the space above the liquid 27 and is joined to a spray device or atomizer 44. Otherwise the air washing apparatus is the same as that hereinbefore described.

The construction of the drain pipe for removing solvent from the receptacle 26 is particularly important where the spray device or atomizer forms a part of the apparatus. For example, the arrangement of the drain with the end 30 of the T-connection terminating below the spray head 44 will insure that a space will be provided between the liquid level and the head 44 in which a spray of condensing liquid may be effectively maintained.

While in Fig. 2 the pipes 28, 39 and particularly those portions of said pipes which are within the vessel 26, are shown as separate pipes, it is obvious that from the physical standpoint they can actually be parts of the same continuous piece of pipe, with an opening 50 through the wall of said pipe to the gas space above the liquid within vessel 26, as shown in Fig. 1, all as will be readily understood.

From the foregoing specification it will be apparent that I have provided an improved liquid seal vent by means of which abnormal pressure conditions within a vessel or system may be relieved and whereby the volatile solvent may be condensed and returned to the vessel or system.

It will also be seen that my improved vent is

automatic in operation and may be so constructed that only comparatively pure solvent will be returned to the system. This is very important because if water is employed as the washing medium it is essential that the water should be kept out of the system.

To those skilled in the art many modifications of and widely different embodiments and applications of my invention will suggest themselves without departing from the spirit and scope thereof. My disclosure and description are purely illustrative and are not to be in any sense limiting.

What I claim is:

1. A liquid seal vent for tanks or systems in which a volatile solvent is stored or utilized, comprising a receptacle containing a condensing liquid having a lower specific gravity than the volatile solvent and from which the volatile solvent will stratify, a vent from the upper portion of said receptacle, a conduit leading from the tank or system and terminating below the condensing liquid in the receptacle, whereby volatile solvent vapors escaping from said tank or system will be condensed and will settle below the condensing liquid in the receptacle, and means for automatically returning condensed liquid back to the tank or system after a predetermined amount has collected in said receptacle.

2. A liquid seal for tanks or systems in which a volatile solvent is being stored or utilized comprising a receptacle containing a condensing liquid having a lower specific gravity and in which the volatile solvent is not more than slightly soluble, a vent in the upper portion of said receptacle and a conduit leading from the tank or system and terminating below said liquid, whereby volatile solvent vapors escaping from the tank or system will be condensed and will settle beneath the liquid in the receptacle and the air will escape to the atmosphere, automatic means for conducting solvent back to said tank or system when a predetermined amount has collected in said receptacle, and automatic means for terminating the flow when the solvent has fallen to a predetermined level.

3. A liquid seal for tanks or systems in which a volatile solvent is stored or utilized comprising a receptacle containing a condensing liquid having a lower specific gravity than the solvent and in which the volatile solvent is not more than slightly soluble, a vent in the upper portion of said receptacle and a conduit leading from the tank or system and terminating below the condensing liquid in the receptacle, whereby volatile solvent vapors escaping from said tank or system will be condensed and will form a layer below the condensing liquid and the air will pass to the atmosphere, and means for automatically returning the solvent back to the tank or system comprising an open conduit extending from below the liquid in the tank or system having a vertical connection extending vertically in said receptacle, one end of which terminates near the bottom of the receptacle and the other end of which terminates above the condensing liquid in said receptacle.

4. A liquid seal for tanks or systems in which carbon tetrachloride is being stored or utilized comprising a receptacle containing water, a vent leading from the upper portion of said receptacle, a conduit leading from the tank or system and terminating below the water in the receptacle, whereby when excess pressure exists in said tank or system air containing carbon tetrachloride

may escape from the tank or system through the water in the receptacle and the carbon tetrachloride vapors will be condensed and will settle below the water, and means for automatically returning the condensed carbon tetrachloride back to the tank or system after a predetermined amount has collected in said receptacle.

5. A liquid seal for tanks or systems in which carbon tetrachloride is being stored or utilized comprising a receptacle containing water, a vent in the upper portion of said receptacle and a conduit leading from the tank or system and terminating below the water in the receptacle,

whereby when excess pressure conditions exist in said tank or system air containing carbon tetrachloride vapors may escape from the tank or system through the water in the receptacle and the carbon tetrachloride will be condensed and will settle below the water, automatic means for conducting the condensed carbon tetrachloride to said tank or system when a predetermined amount has collected in said receptacle, and automatic means for terminating the flow of carbon tetrachloride when it has fallen to a predetermined level.

JOHN MAHONEY.