March 19, 1935. R. A. HETZER 1,995,065

VENT FOR GARMENT CLEANING SYSTEMS

Original Filed Aug. 3, 1931

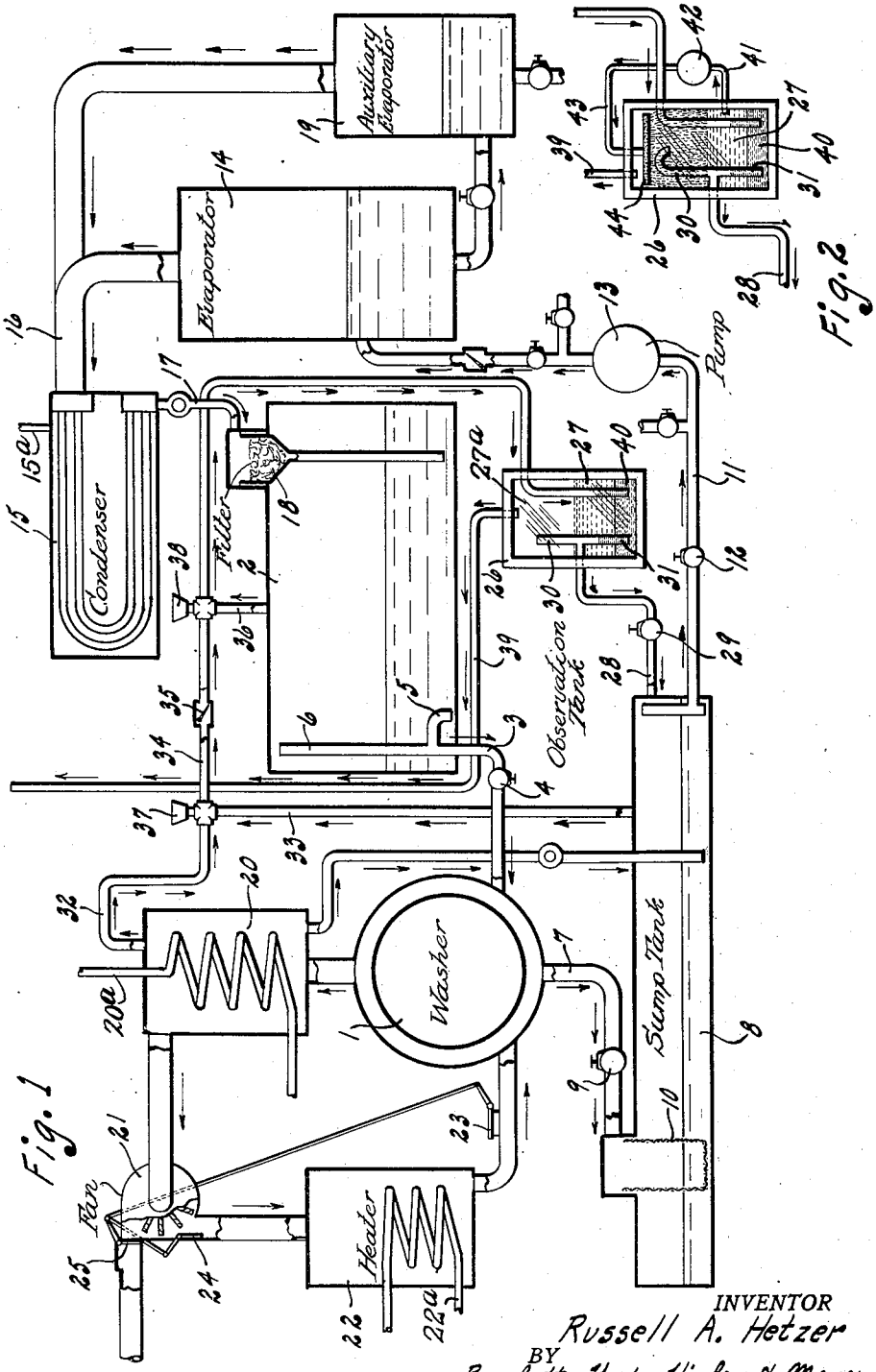


Fig. 1

Fig. 2

INVENTOR
Russell A. Hetzer
BY
Brockett, Hyde, Higley & Meyer
ATTORNEYS

Patented Mar. 19, 1935

1,995,065

UNITED STATES PATENT OFFICE

1,995,065

VENT FOR GARMENT CLEANING SYSTEMS

Russell A. Hetzer, Cincinnati, Ohio, assignor to The American Laundry Machinery Company, Cincinnati, Ohio, a corporation of Ohio

Original application August 3, 1931, Serial No. 554,787. Divided and this application February 25, 1933, Serial No. 658,577

10 Claims. (Cl. 261—7)

My invention relates to method and apparatus for treating fabrics and, particularly, to a method of treating fabrics with a volatile detergent having a low boiling point and to apparatus for removing the foreign matter from the detergent after the treating operation whereby the detergent may be used in subsequent operations with but little loss in the volume thereof together with apparatus for venting the system in such manner that the solvent vapor laden air must pass through a liquid in its travel to the atmosphere which, in addition to sealing the vent to the atmosphere provides an air washing process to remove the solvent vapor from the air by condensation and to collect the solvent for further use.

In fabric treating machines, it is desirable to be able to repeatedly use the same detergent and to have the detergent equally effective in each operation, or to use the same supply of detergent over and over in rapid succession. This is made possible by the apparatus provided for removing the foreign matter from the detergent after the treating operation. It is also desirable to have the entire circulating system as nearly closed to the outside atmosphere as possible to prevent loss of the volatile detergent into the atmosphere and to have means provided for removing the solvent from the solvent vapor laden air that passes to the atmosphere during the various operations that take place in the apparatus. However, means are preferably provided for giving sufficient access to the atmosphere to prevent the formation of excess vacuum or pressure conditions within the apparatus to obviate the possibility of injury to the apparatus due to such conditions.

The apparatus for carrying out this method of treating fabrics is the same as that disclosed in my previous application Serial No. 462,061, filed June 18, 1930, to which reference may be had for details hereinafter disclosed and comprises a storage tank for holding a supply of the treating solvent, a fabric treating compartment wherein the treating operation takes place, a sump tank in which the solvent is collected after the fabric treating operation, a fan for circulating air through the treating compartment and thence through a condenser, an evaporator and then another condenser, an air heater, and means for selectively eliminating the air heater and passing relatively cold atmospheric air through the apparatus, and means for extracting all foreign matter, including moisture and oils, from the solvent after each treating operation. Together with the above apparatus, a vent system is provided as well as apparatus for subjecting the solvent vapor laden air normally vented from the apparatus to a washing process to remove the solvent vapor from the air by condensation and collect the solvent from the air for further use.

This application is a division of application Serial No. 554,787, filed August 3, 1931.

Various objects and advantageous features of my invention will be seen in the following description and one embodiment thereof may be seen in the accompanying drawing wherein similar characters of reference designate corresponding parts, and wherein:

Fig. 1 is a diagrammatic view of the apparatus employed in conjunction with the hereinafter disclosed method of treating fabrics; and Fig. 2 is a fragmentary view showing a modified form of apparatus for providing a liquid seal in the air vents of the apparatus and for providing a means for removing the solvent from the solvent laden air and collecting such solvent for further use.

In the drawing, I have shown an apparatus for treating fabrics together with a means for supplying a volatile detergent to a treating compartment, removing the detergent from the washer after the treating operation, means for removing the foreign matter from the detergent and transferring it to a supply tank ready for use in a subsequent operation, and means for drying and deodorizing the fabrics in the treating compartment, comprising a fabric treating compartment 1 that is, as is well known, provided on its interior with the usual rotatable goods container which is driven in alternately reverse directions by a motor or power unit operatively connected to the goods container by the usual speed reduction mechanism as is customary in these devices. A storage tank 2 is preferably mounted at a higher level than the treating compartment 1 and provides a means for providing a supply of the volatile liquid to be used in the treating operations, this liquid being preferably although not necessarily carbon tetrachloride. As shown, 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 quantity 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, one of which extends upwardly

to a point adjacent the top of the tank 2 whereby it is always above the level of the top surface of the treating medium within the storage tank, and the other of which takes the form of a 90° elbow having its lower open end but slightly above the bottom of the tank 2 whereby the medium flowing out of the storage tank through the conduit 3 always flows from the lowermost part of the tank. Therefore, valve 4 being open for filling 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 siphon effect will be broken and the flow of the treating medium will stop. Thus the level of the contents of the storage tank 2 can never therefore drop to the point of the opening of the branch 5 and water or moisture floating on the surface of the treating medium will not be drained into the treating compartment.

A conduit 7 leads from the bottom of the treating compartment 1 to a sump tank 8 located below the compartment and is provided with a valve 9 for controlling the flow of treating medium from a treating compartment to the sump tank. Filter means 10 are provided at the delivery end of the conduit 7 through which the medium passing from the treating compartment into the sump tank must necessarily flow. This provides a means for catching and retaining any particles of foreign matter above a given size.

The used treating medium is renovated by drawing the used treating medium from the sump tank 8 through a conduit 11 under the control of a valve 12 by means of a pump 13 and forcing the used medium into an evaporator 14 from which the vaporized treating medium passes to a condenser 15 by way of a conduit 16. The condenser 15 is provided with conduits 15*a* 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 water or other 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 for evaporating any treating medium not vaporized by the evaporator 14 and for vaporizing any treating medium in the sludge that deposits in the bottom of the evaportor 14.

In addition to the hereinbefore described apparatus for recirculating and renovating the treating medium, suitable apparatus is provided for deodorizing and drying the fabric in the treating compartment as a part of the treating operation and before removal of the fabric therefrom. This apparatus comprises a condenser 20 provided with a cooling coil 20*a*, a fan 21 and an air heater 22 provided with a steam coil 22*a*, all connected in a circuit with the treating compartment 1, the circuit being under the control of suitable valves 23, 24 and 25 whereby heated or atmospheric air may be selectively passed through the treating compartment and the fabric therein to dry and 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, a suitable means is provided in combination with the above described apparatus for subjecting the treating medium laden air normally vented from the apparatus to a washing process for removing the treating medium therefrom. 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. The tank or receptacle 26 is adapted to contain a supply of liquid 27, for instance, water, which forms the air washing medium.

In the vent pipe arrangement, a conduit 28 leads from the sump tank 8 and from a point above the liquid therein to the interior of the tank or receptacle 26, the conduit 28 terminating in a T-connection one end 30 of which extends to a point above the liquid in the receptacle or tank 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 upper side of the sump tank 8 by way of a conduit 33 and a conduit 34 having a check valve 35 therein leads from the joinder 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 and after the solvent indicated by the numeral 40 accumulates in the tank or receptacle 26 due to a condensing action, the combined level of liquid and solvent tends to rise above the point at which the conduit 28 connects with the T-connection within the tank or receptacle. Then, assuming the conduit 28 to be open, 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 T-connection drops below the point at which the conduit 28 communicates therewith. The siphon effect is then overcome by the admission of air through the open branch 30 and no further liquid flows. In this way, washing liquid can never be drawn through the conduit 28 and delivered to the sump tank. The head of washing liquid in the receptacle is just enough to maintain a given amount of solvent 40 within the receptacle and to prevent the removal of anything but the pure solvent 40 or treating medium which is formed by condensation of vapor in the saturated air venting from the apparatus through the tank or receptacle and which accumulates in the bottom thereof in the form of substantially pure solvent or treating medium which in this instance is heavier than the washing liquid.

The valve 29 may be placed in the conduit 28 to control the flow of the solvent from the receptacle 26 to the sump tank 8. In this case the attention of the operator is required. When the contents of the receptacle has risen to a point just below the upper end 30 of the branch pipe in the receptacle, the operator must open the valve and allow the contents to drain into the sump tank.

As above stated the level within the branch pipe will drop until it has reached a point below the T-connection and the flow of solvent 40 will then stop. The operator will then close the valve 29.

Because of the importance of maintaining the given amount of liquid 27 in the receptacle it may be provided with a sight glass 27*a* or other means for indicating the level of the combined liquid and treating medium.

During the operation of this apparatus, when the treating medium or solvent for a washing operation is admitted to the treating compartment 1 from the storage tank 2, the air which this treating medium or solvent displaces in the treating compartment 1 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, such additional vapor laden air will be conducted to the receptable 26, the valve 29 being closed, 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 1 into the sump tank 8, the quantity thus drained displaces the quantity of air in the sump tank which is saturated with a solvent vapor and which passes upwardly through the conduit 33 through the conduit 32 into the condenser 20 thence downwardly into the treating compartment 1 to equalize the vacuum condition which was effected 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, the valve 29 being closed, past the check valve into the receptacle 26 wherein the vapor is 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 thence bubbling up through the contents of the storage tank passes through conduit 36 through conduit 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 now pure 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 as before stated 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 Figure 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.

With the above construction I have provided a venting arrangement in combination with apparatus for treating fabrics and renovating the used treating medium whereby it may be employed over and over again, which venting arrangement tends to equalize the vapor pressure throughout the system and which in the case of the development of excessive pressure conducts the vapor laden air through a washing process which removes the vapor and allows only free air to pass into the atmosphere.

I have provided a means to prevent formation of vacuum at any point in the system. In this connection the vacuum breakers 37 and 38 of the type to admit air to the system but ineffective as pressure release means are so set that at the end of the day when the system has cooled down and there is a tendency to produce a vacuum, the contents of the receptacle 26 will not be drawn upwardly through the conduit 34 into the system.

One advantage of such an apparatus results in the immense saving in treating medium that would otherwise pass to the atmosphere and be totally lost. Various other advantageous features will be readily apparent.

What I claim is:

1. In an apparatus of the class described, a liquid seal vent, including a liquid seal receptacle, a condensing liquid in said receptacle lighter than the detergent liquid, means for draining the detergent liquid from said receptacle from a low point, a vent pipe having its delivery end terminating below the level of said condensing liquid, an open vent from said receptacle to the atmosphere, and means for continuously removing the condensing liquid from said receptacle and re-delivering it thereto in the form of a spray through which vented air must pass after passage through the body of said condensing liquid.

2. A liquid seal vent for tanks or systems in which a volatile solvent is being stored or utilized comprising a receptacle, a detergent condensing liquid in said receptacle for removing detergent from vented gases, said liquid being lighter than the liquid detergent whereby detergent condensate passes to the bottom of said container, means for draining the detergent condensate from said receptacle, a vent pipe leading from the tank or system to said receptacle and terminating below the level of the condensing liquid therein, an open vent from said receptacle to the atmosphere, and means for continuously removing condensing liquid from the receptacle and re-delivering it thereto in the form of a spray through which vented gases must pass after passing through the body of said condensing liquid.

3. In an apparatus of the class described, a compartment containing a volatile detergent, means for closing said compartment against free communication with the atmosphere while providing a pressure release vent therefor, comprising a receptacle, a detergent condensing liquid in

said receptacle for removing detergent from vented gases, said liquid being lighter than the liquid detergent whereby detergent condensate passes to the bottom of said container, means for draining the detergent condensate from said receptacle, a vent pipe leading from said treating compartment to said receptacle and terminating below the level of the condensing liquid therein, the said detergent drain means being arranged to maintain liquid in the container below a predetermined level and provide for an open space between the top of such liquid and the upper side of the receptacle, a vent pipe leading from such space to the atmosphere, and means for continuously removing the condensing liquid from said receptacle and re-delivering it thereto in the form of a spray through which vented gases must pass after passing through the body of such condensing liquid.

4. A liquid seal vent comprising a receptacle for liquid, a drain from said receptacle communicating therewith at a low point, an arm on said drain opening into said receptacle at a point permanently above the level of liquid therein, said arm communicating with said drain at a point above that at which the drain communicates with the receptacle, the point at which the arm communicates with said drain being such that the flow of liquid ceases when the level of liquid falls below said point, a vent pipe adapted to deliver vapor to said receptacle below the level of liquid therein, and an open vent from said receptacle to the atmosphere.

5. 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, a conduit leading from the tank or system and terminating below the condensing liquid in the receptacle whereby the volatile solvent will be condensed and will form a layer below the condensing liquid and the air will escape to the atmosphere, and means for conducting the condensed solvent back to the tank or system after a predetermined amount has collected in said receptacle.

6. 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, a conduit leading from the tank or system and terminating below said liquid, whereby condensed carbon tetrachloride will settle below the water and air will escape to the atmosphere and means for conducting condensed liquid back to the tank or system after a predetermined amount has collected in said receptacle.

7. 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, 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.

8. 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, a conduit leading from the tank or system and terminating below the liquid in the receptacle, whereby volatile solvent vapors escaping from said tank or system will be condensed and will settle below the liquid in said receptacle, and means for conducting the condensed solvent back to the tank or system comprising a conduit having a vertical connection extending in said receptacle one end of which terminates near the bottom of said receptacle and the other end of which terminates above the condensing liquid in the receptacle.

9. A liquid seal for cleansing systems in which carbon tetrachloride is employed as the solvent comprising a receptacle containing water, a vent in the upper part of the receptacle, a conduit through which carbon tetrachloride vapors may be passed below the water in the receptacle, thereby providing means for condensing the vapors and forming a layer of carbon tetrachloride beneath the water, and a conduit having a T-connection extending vertically in said receptacle, one end of which terminates in the layer of condensed carbon tetrachloride and the other end of which extends above the water thereby providing automatic means for causing carbon tetrachloride to flow into the conduit leading back to the system when a predetermined amount accumulates in the receptacle and automatically causing a termination of the flow of the carbon tetrachloride when it falls to a predetermined level.

10. A liquid seal for cleansing systems in which carbon tetrachloride is employed as a solvent comprising a receptacle containing water, a vent in the upper part of the receptacle, a conduit through which carbon tetrachloride vapors may be conducted below the water in the receptacle, thereby condensing vapors and forming a layer of carbon tetrachloride beneath the water and allowing the air to escape to the atmosphere, a conduit having a T-connection extending vertically in said receptacle, one end of which terminates in the layer of condensed carbon tetrachloride and the other end of which extends above the water and terminates in a substantially U-shaped bend, thereby providing automatic means for causing condensed carbon tetrachloride to flow into the conduit leading back to the system when a predetermined amount accumulates in the receptacle and automatically causing a termination of the flow of the carbon tetrachloride when it falls to a predetermined level, and means for conducting water from the lower portion of the receptacle and spraying it in the path of the air leaving the receptacle.

RUSSELL A. HETZER.