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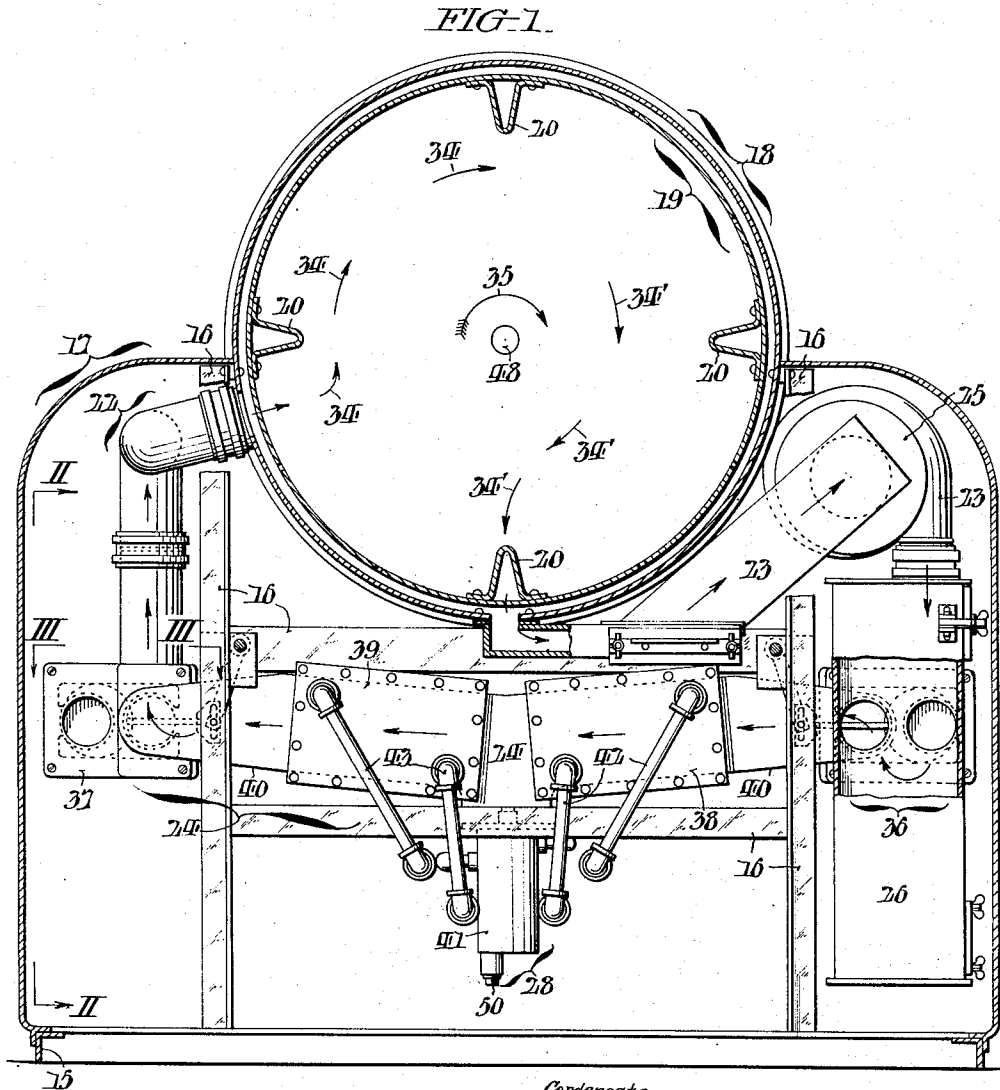
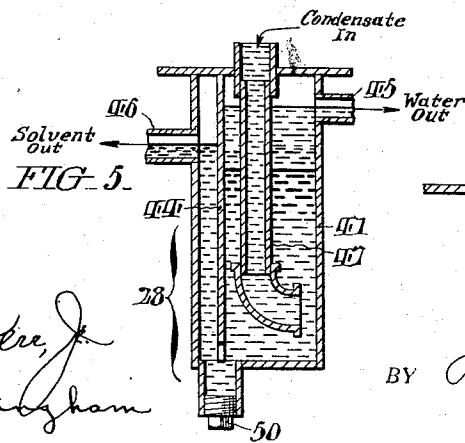
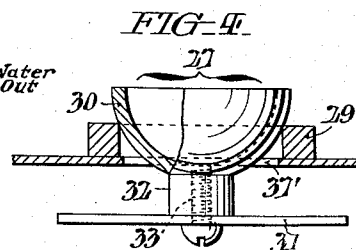
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2,663,950

SOLVENT SAVER RECOVERY APPARATUS

Filed Jan. 15, 1949

2 Sheets-Sheet 1



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FIG. 2.

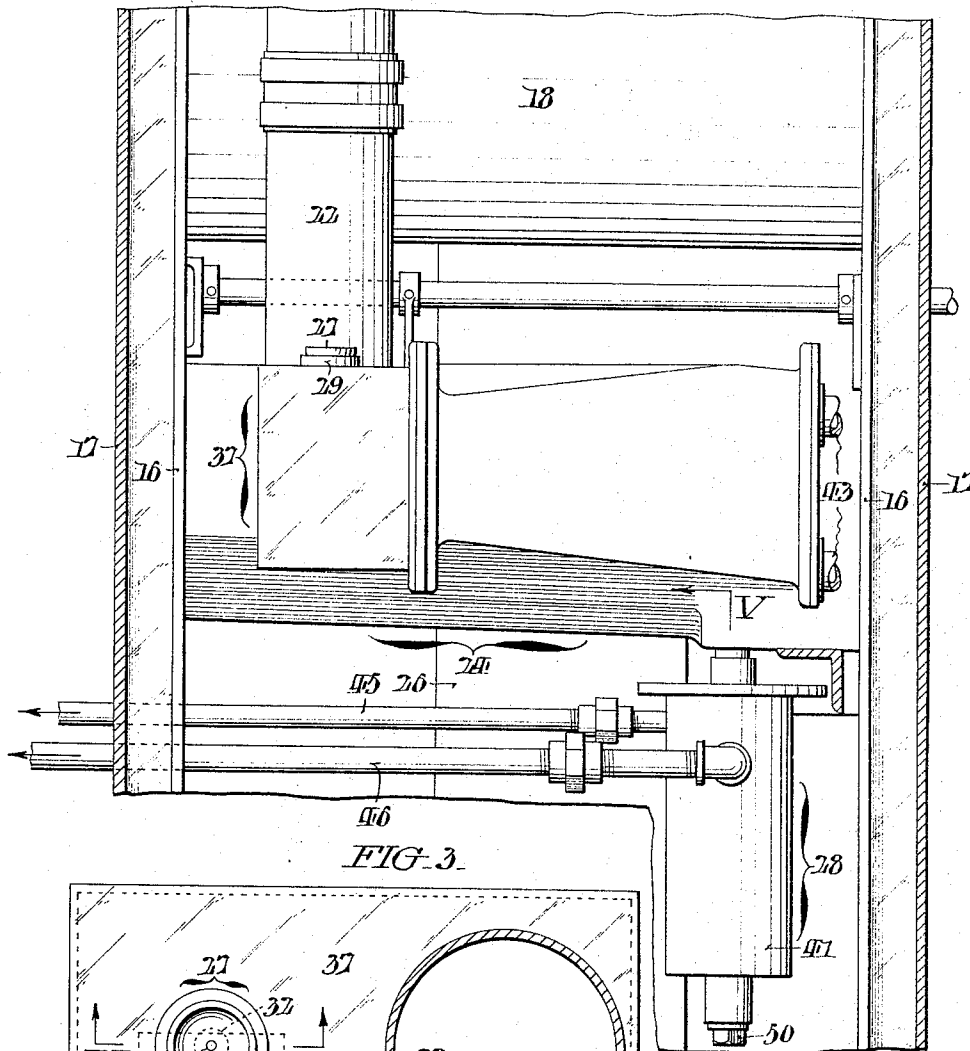
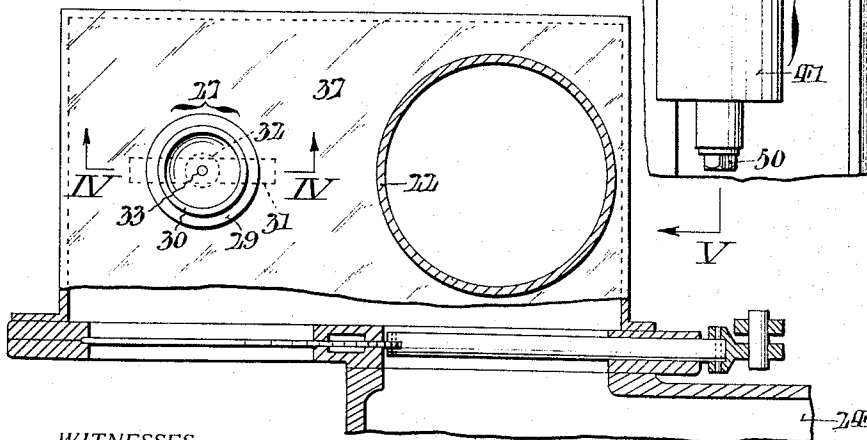


FIG. 3.



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SOLVENT SAVER RECOVERY APPARATUS

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4 Claims. (Cl. 34—51)

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This invention relates to apparatus for the recovery of volatile solvents from clothes or textile materials that have been treated with such solvents, or from any article or material that absorbs, adsorbs, or retains such solvent.

My invention is particularly useful for recovering dry-cleaning solvents such as carbon tetrachloride, trichlorethylene or perchlorethylene, whose vapors are generally unflammable, or any other volatile, grease-removing, solvents.

More specifically my present invention enables the freeing of clothes or fabrics of solvent odor remaining after the solvent in them has been removed as far as practicable. The apparatus is basically similar in construction and operation to that shown in a prior application filed by me on February 21, 1947, under Serial No. 730,179, now Patent No. 2,539,407 and the instant case may be considered or regarded as a modification thereof, as well as involving a novel process of de-odorizing the clothes or textile materials.

The primary object of the present invention is to provide an apparatus of the type above referred to in which the air, whether vapor laden or clean, is deflected into more effective operational contact with the material in the rotary drum.

Another object of this invention is the provision of an apparatus in which the operational flow of the air through the work laden drum is deflected into a more intimate and permeative contact with the material or work through more than 180° of the rotation thereof.

A further object of this invention is to provide an apparatus of the type mentioned in which the effectiveness of the operational flow of the air is by providing means whereby initial or impact high pressure air is utilized in the system without disturbing the operation of the water separator, which depends for its efficient operation upon properly balancing the solvent and water levels therein.

Still further objects with ancillary advantages will become apparent from the following detailed description of an illustrative embodiment of my present invention as shown by the accompanying drawings, in which:

Fig. 1 is a vertical sectional view showing more particularly the improved positioning of the inlet and outlet conduits.

Fig. 2 is a partial sectional view taken as indicated by the arrows II—II in Fig. 1, and showing details of the connections to the water and solvent separator, and with a pressure relief valve operatively connected thereto.

Fig. 3 is a larger scale horizontal sectional view

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taken as indicated by the arrows III—III in Fig. 1 and showing the relief valve more in detail.

Fig. 4 is a sectional view taken as indicated by the arrows IV—IV in Fig. 3 and showing further details of the relief valve.

Fig. 5 is a transverse sectional view taken as indicated by the arrows V—V in Fig. 2 and showing more clearly the construction of the solvent and water separator.

In order to facilitate description of the invention shown, the drawings are briefly explained as comprising the following principal parts:

A base 15 supporting a frame 16; a casing 17 enclosing the frame 16; a cylindrical treating chamber 18 mounted on the frame 16; a perforate rotary tumbling-drum 19 having longitudinal radial blades 20, within the treating chamber 18; inlet and outlet conduits or ducts 22 and 23 connected to the chamber 18; an air-conditioning conduit 24 containing heating and cooling elements—not indicated; a fan blower 25; a lint trap 26; and a water and solvent separator 28 connected to the bottom of the air-treatment conduit 24. Since the base 15, the supporting frame 16, the casing 17, the treating chamber 18 and the perforate rotary tumbling-drum 19 structurally and operationally correspond with the analogous parts described in the above identified patent, it is deemed unnecessary to burden the present application with further explanation thereof. The parts just referred to are significant primarily as a background setting in explaining the present improvements which mainly center around the positioning of the inlet and outlet conduits or ducts 22 and 23 and the provision of means to supply an uninterrupted flow of air thereto.

Hitherto in the art, the inlet and outlet conduits 22 and 23 have been positioned diametrically opposite one another, and either vertically or horizontally directed. According to the present invention, the outlet conduit 23 connects into the treating chamber 18 at a point which is considerably more than 180° from the point where the inlet conduit 22 connects into said chamber, computing said angle of more than 180° away from the inlet conduit 22 in the direction of rotation of the perforate rotary tumbling-drum 19. The operational effect of this relative positioning of the inlet and outlet conduits 22 and 23 is indicated by the arrows 34, which designate the flow of the air current discharged from the inlet conduit 22, incident to rotation of the drum 19 in the direction designated by the arrow 35. The air current is clearly in operative contact

with the work content of the drum 19 much longer than would be the case with the known devices of the prior art. It will be obvious that the outlet conduit 23 can be positioned further from the inlet duct 22, in the direction of rotation of the drum 19, by minor structural changes. However, I have found by experimentation that highly advantageous results are obtained if their angular relationship is approximately 270°.

The effectiveness of this increased amount of operational contact between the air current and the work content of the tumbling drum 19 is further intensified by maintaining a positive and substantial pressure in the air circulating system so that the discharge from the inlet duct 22 is effectively dispersed into the contents of the drum 19. The initial impact pressure which builds up in the air circulating system is greater than the equilibrium running pressure. A pressure-relief means 27 is provided in order to utilize a high pressure and at the same time to protect the operation of the water and solvent separator 28; as will be explained more fully hereinafter. The outlet conduit 23, which includes the blower fan 25, discharges into the lint trap 26 which is operationally and structurally similar to the lint trap shown in the above identified patent. The lint trap 26 on its discharge side is connected to a gate valve 36 of conventional type which may be controllably vented to the atmosphere, or into the air-conditioning conduit 24 to which it is connected at one end. A similar gate valve 37 is mounted on the other end of the air-treatment conduit 24 and likewise may be controllably vented to the atmosphere, or into the inlet conduit 22. The air conditioning conduit 24 is similar to the conditioning duct shown in the aforementioned patent and has mounted therein a cooling element in the area designated by the numeral 38 and a heating member mounted therein in the area marked by the numeral 39. Pipes 42 are connected to the cooling element and conduct the cooling medium in a well known manner. Similarly, pipes 43 are connected to the heating member 39. It will be noted from the drawings that the air-conditioning conduit 24 has upwardly inclined end portions 40; and that the water and solvent separator 28 is dependently connected to said conduit at the lower medial portion thereof. The water and solvent separator 28 is of conventional design and identical with a similar device shown in the above referred to prior patent; that is to say, said separator 28 comprises a body portion 41 having a depending wall or baffle 44, an upper or water discharge orifice 45 on one side thereof, and a lower solvent discharge outlet 46 on the other side of said baffle 44. A pipe 47 from the underside of the air-conditioning conduit 24 discharges into the lower portion of the separator 28 and a removable drain plug 50 is provided in the bottom portion of said separator 28. As is well understood in the art, this separator 28 operates on the principle that the heavier solvent will sink to the bottom of the separator 28 and pass under the lower edge of the baffle 44 to find its own level in the space between the body portion 41 and the baffle 44. It will likewise also be clear that excessive pressure in the separator 28 will interfere with, and destroy, the operation of said separator 28. Therefore it is desirable, as pointed out above, to protect the separator and at the same time accommodate high initial pressures which build up in the system from time to time.

The pressure-relief means is preferably in the

form of a gravity-influenced lift-valve 27, shown to best advantage in Fig. 4, and it is conveniently located on the air treatment conduit 24 at the end of the latter occupied by gate valve 37 to automatically take care of any excess pressure developing such as would adversely affect the operation of the separator 28. The valve 27, preferably consists of a substantially annular seat 29 mounted concentrically with an orifice 37' in the top wall of the conduit 24, and a concave-convex gravity-influenced closure element 30, having a dependent lift-limiting member or diametral bar of predetermined weight 31, attached to its underside, with interposition of a pendent axial portion in the form of a spacer collar 32, by a lock screw 33. It is to be noted that by varying the weight of the member 31, the lift of the closure element 30 can be adjustably controlled.

Having described the structural features of my improved apparatus, the operation thereof is as follows:

Assuming that a load of previously cleaned and solvent treated clothes, but which still contain a quantity of residual solvent, has been loaded into the perforate tumbling drum 19 in accordance with conventional procedure, the cylindrical treating chamber 18 is closed and said drum is set in rotary motion, in the direction indicated by the arrow 35 in Fig. 1. Now it will be readily apparent that the longitudinal radial blades 29, incidental to rotation of the drum 19, will cause the clothes contained therein to follow the direction of such rotation at least to a level about or above the air inlet duct 22, with subsequent tumbling of said clothes to the bottom level of said drum 19. The incoming air is then caused to flow in the direction indicated by the arrows 34 and 34' with a distinctive operative advantage, due to the clothes or work in the rotary drum 19 following such rotary motion by aid of the left-hand or ascending radial blades 29 to, at least, a height or level vertically above the axis of rotation 47 of said drum as viewed in Fig. 1, and then tumbling over, or dropping down, to the right-hand of said axis as indicated by the arrows 34', whereby said flow is caused to deflect inwardly and sinuously downward, as indicated by said arrows 34'. Furthermore, it will be readily understood that the air, entering by way of conduit 22 into the treating chamber 18, is drawn in and spread out within said chamber by aid of the mass of work moving away from the air inlet of said chamber 18 and, as such air passes or is drawn over the axis of rotation 48, it will be positively deflected inwardly and downwardly with a larger or longer contact with the work than has been heretofore attainable with similar apparatus.

It is also to be particularly noted that whenever the treating chamber 18 is closed after the insertion of fresh clothes, there will be a volume of cold or room temperature air sealed in the chamber 18. Immediately the chamber 18 is closed and the fan blower 25 turned on, this cool air expands on being heated which produces a momentary impact pressure condition. This impact pressure is applied at the inlet opening 22; at separator 28 and at the lift-valve 27. The lift-valve 27 is so constructed and arranged and weighted as to permit the impact pressure to reach as high a value as possible without producing a pressure which would adversely affect the operation of the separator 28. This is ac-

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complished by permitting high pressure air to escape through the valve 27 into the casing 17.

While my invention has been described in detail it is obvious that changes will suggest themselves, in adapting said invention to other than the disclosed usage, but it is to be understood that all such changes are contemplated as fall within the scope of the following claims.

I claim:

1. In apparatus for recovering solvents from material treated therewith, a treating chamber with an air inlet port at one side thereof and an air outlet port at the bottom; a perforate tumbling drum for the material rotatively supported within the chamber; a conditioning conduit extending horizontally beneath the chamber with one end thereof connected to the air inlet port of the chamber; an air blower with its pressure side connected to the opposite end of the conduit; a duct leading from the air outlet port of the chamber to the suction side of the blower; cooling means and heating means within the conduit; a gravitational separator connected to the conduit between the heating and cooling means to receive the condensate recovered from the air by the cooling and separate entrained water therefrom; and an automatically operative relief valve disposed in the conduit between the heated zone of the latter and the air inlet side of the chamber, said valve being weighted so as to open only when the pressure within the chamber exceeds a definite value such as would adversely effect the operation of the separator.

2. Apparatus characterized as in claim 1, wherein the relief valve comprises a closure element which is adapted to engage downwardly into an apertured seat in the top of the conduit and which has a pendent portion with a diametral

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stop bar to limit by contact with the inside of the conduit top the extent of valve opening.

3. Solvent recovery apparatus according to claim 1, further including normally closed valves in the conduit capable of being opened manually for entry and exhaust of outside air into and from the apparatus by means of the pump upon completion of the extraction cycle.

4. Solvent recovery apparatus according to claim 1, further including normally closed valves respectively at opposite ends of the conduit capable of being opened manually for entry and exhaust of outside air into and from the apparatus by means of the pump upon completion of the extracting cycle.

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