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DRY CLEANING APPARATUS

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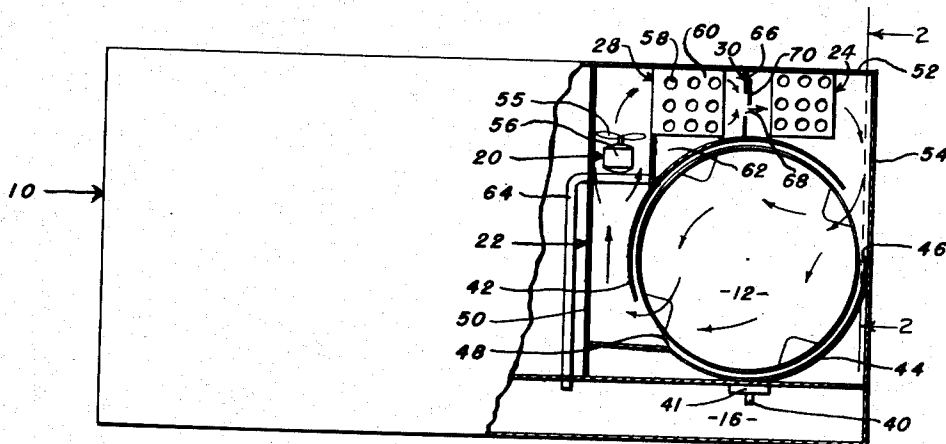


FIG. 1.

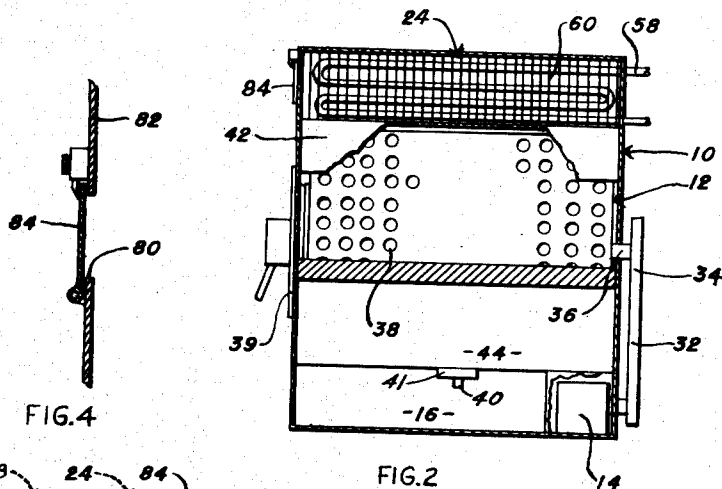


FIG. 2

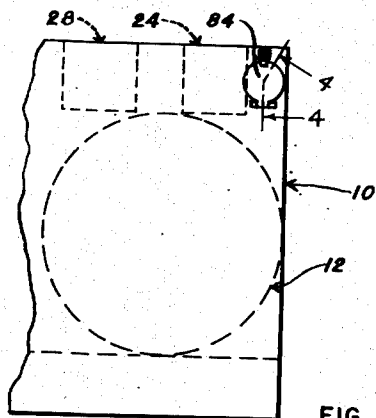


FIG. 3

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## DRY CLEANING APPARATUS

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## 1 Claim. (Cl. 34—77)

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The present invention relates generally to dry cleaning apparatus, and more particularly to an improved form of dry cleaning apparatus incorporating a reclaiming system for its textile cleaning agent.

Modernly, dry cleaning of textiles is generally carried out by means of devices having a textile-holding cylinder, which cylinder is rotated within an airtight housing containing a suitable volatile detergent, such as perchlorethylene, trichloroethylene, gasolene or the like. During rotation of the textile-holding cylinder, the detergent is caused to circulate through the cylinder and the contents thereof, whereby the latter becomes thoroughly saturated. Such rotation cleans the textiles contained in the cylinder. After this cleaning has been accomplished, an important percentage of the detergent will remain within the textiles. Inasmuch as the detergent is expensive and also since its vapors are generally deleterious to humans, it is very important that this detergent be removed. The process of effectuating such recovery is termed "reclaiming." Since the reclaiming operation must take place before one load of textiles can be removed from the cylinder and replaced with another, the total time required for each complete cycle will be directly proportional to the time required in carrying out the reclaiming operation.

It is a major object of the present invention to provide dry cleaning apparatus incorporating a novel reclaiming system which is faster in operation than the reclaiming systems theretofore proposed.

A further object of the present invention is to provide an improved reclaiming system for dry cleaning apparatus utilizing a detergent which in its vapor phase is heavier than air.

It is another object of the present invention to provide a reclaiming system for dry cleaning apparatus which is capable of reclaiming a very high percentage of the detergent contained in the textile-holding cylinder thereof.

An additional object of the present invention is to provide a dry cleaning apparatus which is simple of design and rugged of construction, whereby it may have a long and trouble-free service life.

In the ordinary dry cleaning apparatus, the detergent reclaiming operation is carried out at a high temperature; hence, at the completion of a dry cleaning operation the contents of the textile-holding cylinder may retain sufficient heat to endanger the person who removes such contents from the cylinder. Additionally, if the tex-

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tiles removed from the textile-holding cylinder are at a high temperature when removed therefrom, they tend to become easily wrinkled.

It is yet further intention of the present invention to provide dry cleaning apparatus incorporating unique and extremely simple means for cooling the contents of its textile-holding cylinder after each reclaiming operation.

Other objects and advantages of the present invention will become apparent from the following detailed description of a preferred embodiment thereof, when taken in conjunction with the accompanying drawing wherein:

Figure 1 is a longitudinal sectional view of a preferred form of dry cleaning apparatus embodying the present invention.

Figure 2 is a vertical sectional view taken along lines 2—2 of Figure 1.

Figure 3 is a fragmentary elevational view showing a detail of the apparatus disclosed in Figures 1 and 2; and,

Figure 4 is a fragmentary enlarged vertical sectional view taken along lines 4—4 of Figure 3.

Referring to the drawings, the preferred form of dry cleaning apparatus utilizing a reclaiming system embodying the present invention will include a substantially airtight housing 10 wherein is rotatably mounted a perforate textile-holding cylinder 12 adapted to be rotated about a horizontal axis, as by a motor 14. The lower portion of the housing 10 may define a reservoir 16 for a body of detergent 18, which detergent is adapted to be forcefully circulated through the interior of the cylinder 12 during the cleaning operation by suitable means (not shown). At the completion of the cleaning operation, the reclaiming operation takes place. This latter operation utilizes a fan means 20 adapted to effect a forced draft within a passage 22 interconnecting opposite sides of the cylinder 12, as indicated by the directional arrows in Figure 1. Disposed within the passage 22 is a means 24 adapted to heat the fluid passing into one side of the cylinder so as to effect a change of the detergent contained by the textiles (not shown) therewithin from its liquid to its vapor phase. Also disposed within the passage 22 is a cooling means 28 adapted to effect condensation of the detergent vaporized by the heating means 24. The detergent so condensed is returned to the reservoir 16. Orifice means 30 is also disposed within the passage 22 for reasons to be set forth hereinafter.

More particularly, the housing 10 may be rectangular in shape and enclosed in its left side are suitable pump means for forcefully circulating

detergent through the textile-holding cylinder 12 as the latter is being rotated by the electric motor 14. The electric motor 14 is shown connected to the cylinder by an endless belt 32 having engagement with a pulley 34 carried by a supporting shaft 36. The preferred form of cylinder 12 is formed with a plurality of apertures 38 around its periphery, which apertures permit the free passage of detergent therethrough. Additionally, the preferred form of cylinder is provided with a door 39 at its end opposite the pulley 34, which door permits access therinto for inserting and removing the textiles. The bottom of the cylinder is shown connected to the reservoir 16 by a drain pipe 40 wherein is mounted a dump valve 41.

The cylinder 12 is seen to be substantially encompassed by an upper shield 42 and a lower shield 44, which shields may conveniently be formed of sheet metal. The vertical spaces separating the shields are seen to define an axially extending elongated inlet opening 46 at one side of the cylinder, and a similar outlet opening 48 opposite the inlet opening. The inlet and outlet openings lie at opposite ends of the passage 22 and are interconnected thereby. This passage may be defined by the upper shield 42, a partition wall 50, and housing cover 52, the end wall 54 of the housing and the lower shield 44.

The fan means 20 may conveniently comprise a suitable axial flow type fan 55 which is driven by an electric motor 56. The heating means 24 may consist of a plurality of horizontally disposed coils 58, which coils are interconnected by a number of vertical fins 60. Steam or other heated fluid is adapted to be circulated through the coils 58 whereby the latter will be heated. The cooling means, or condenser 28, will preferably be similar in construction to the heater 24. However, a cooling medium, such as cold water, is adapted to be circulated therethrough. A collecting tray 62 is shown mounted below the condenser 28, which tray is connected to the reservoir 16 by a pipe 64.

The orifice means 30 will preferably be interposed between the heating means 24 and the condenser 28, and comprises a vertical plate 66 wherein is formed an orifice 68. The size of the orifice 68 is adapted to be varied by means of a gate element 70 movably mounted by the plate 66.

In operation, the textiles in the cylinder 12 are first cleaned in the manner described hereinbefore. Thereafter, the fan means 20 is actuated whereby circulation of the vaporized detergent and any air remaining within the cylinder 12 and the passage 22 is caused to occur, as indicated by the directional arrows in Figure 1. Steam is admitted to the heater 24 while cold water is forced through the condenser 28. As a result, the fluid forced through the heater 24 will be heated before it enters the inlet opening 46. The heated fluid will vaporize the liquid detergent contained in the textiles, which vaporized detergent will be forced out of the opposite side of the cylinder, through the outlet opening 48, and into the left side of the passage 22. The vaporized detergent will then be drawn upwardly past the fan means 20 and through the condenser 28. Exposure of the vaporized detergent to the cold surfaces of the condenser will cause the major portion thereof to be condensed and fall into the collecting tray 62, from which tray it will be transferred through pipe 64 to the reservoir 16.

The portion of the vaporized detergent which

is not condensed by the condenser 28 will pass through the orifice 68 and enter the confines of the heater 24. Exposure of the vaporized detergent to the heated surface thereof will raise its temperature, as well as the temperature of the air with which it is mixed, several degrees. As stated previously, this heated fluid is then forced through the inlet opening 46 and into the cylinder 12, whereby it may effect the vaporization of the liquid detergent remaining in the textiles. Preferably, the cylinder 12 will be caused to undergo rotation during this operation, so as to constantly expose different surfaces of the textiles to the heated fluid. It has been found especially effective to cause the direction of rotation of the cylinder to reverse periodically.

It should be particularly noted that the positioning of the orifice means 30 between the condenser 28 and the heater 24 greatly reduces the time required to reclaim the liquid detergent contained by the textiles. This is true because such positioning reduces the velocity of the combined air and vaporized detergent mixture being forced through the passage 22 on the inlet (or left in the drawings) side of the orifice means. As a result, the density of this mixture will be appreciably greater on the inlet side of the orifice means than on the discharge (or right in the drawings) side thereof. Such increased density and decrease in velocity accelerates the rate of condensation of the vaporized detergent within the condenser.

Despite the fact that the velocity of flow of the heated mixture is reduced adjacent the condenser, the volume of the mixture being forced through the passage 22 is not reduced by the provision of the orifice means 30. Furthermore, because of the positioning of the orifice means before the heater 24, the velocity of the heated mixture entering the cylinder 12 through the inlet opening 46 will be increased as compared to the velocity it would have in the absence of an orifice means. Such increased velocity aids this mixture in penetrating the textiles so as to effect the rapid vaporization of the liquid detergent remaining therein.

After the desired quantity of detergent has been recovered, the textiles may be removed from within the cylinder 12. It will be apparent, however, that these textiles, as well as the elements of the apparatus adjacent thereto, will exist at a high temperature, whereby the person effecting such removal is liable to receive annoying, if not injurious, burns. Additionally, such textiles, being heated, will tend to be easily wrinkled after such removal so as to require extensive pressing. Referring now to Figure 3, these disadvantages can be eliminated by the provisions of means for admitting outside air into the cylinder after the detergent has been recovered, but before the textiles are removed.

The preferred manner of admitting outside air utilizes an opening 80 formed in one side wall 82 of the housing 10, and a removable cover 84 therefor. It will be observed that the opening 80 is formed between the discharge side of the orifice 68 and the inlet 46. This is necessary since it is contemplated that the pressure at this point will exist at less than atmospheric pressure, while the pressure on the inlet side of the orifice 68 will be higher than atmospheric pressure. Before the cover 84 is removed, the flow of steam to the heater should be cut off and preferably replaced with a flow of cold water. The fan means 20 is then placed in operation. With the cover 84 thus removed, the flow of cool air may pass through

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the cylinder 12 and its contents. After a short time, the textiles will be cooled sufficiently that they may be safely removed. It should also be noted that the positioning of the opening 80 at a point in the passage 22 existing at lower than atmospheric pressure prevents the loss of any vaporized detergents remaining within the housing 10.

It has been determined that the aforescribed apparatus is especially adapted for use with a detergent, such as perchlorethylene, which is heavier than air in its vapor phase. This is true because the outlet opening 48 is located adjacent the lower portion of the cylinder 12. Since the detergent vaporized within the cylinder is heavier than air, its vapors will collect at the bottom portion of the cylinder, from which point they may be readily drawn through the outlet opening.

While there has been shown and described hereinbefore what is at present considered to be the preferred form of the present invention, it will be apparent to those skilled in the art that various changes and modifications may be made thereto without departing from the spirit of the invention or the scope of the appended claim.

I claim:

Dry cleaning apparatus for use with a volatile detergent, comprising: a generally rectangular substantially air-tight housing; a perforated textile-holding cylinder mounted within said housing for rotation about a horizontal axis; a semi-circular upper shield and a semi-circular lower shield, said shields being separated and their adjoining edges defining diametrically spaced inlet and outlet openings at the upper and lower portions, respectively, of said cylinder; a

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vertical passage in said housing adjacent said cylinder and extending upwardly from said outlet; a condenser disposed adjacent the upper portion of said vertical passage and above said cylinder; a collecting tray below said condenser for removing condensate formed thereby; a heating coil horizontally spaced from said condenser so as to define a horizontal passage therebetween; a downwardly extending vertical passage connecting said heating coil and said inlet; fan means disposed in said first mentioned vertical passage for effecting fluid circulation through said passages, cylinder, heating coil and condenser; an opening formed in said housing permitting communication between said second-mentioned vertical passage and the atmosphere; a removable cover for said opening; a vertical plate extending through an intermediate portion of said horizontal passage; and an orifice opening formed in said plate for reducing the fluid velocity between said condenser and said orifice without substantially reducing the fluid velocity on the opposite side of said orifice.

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