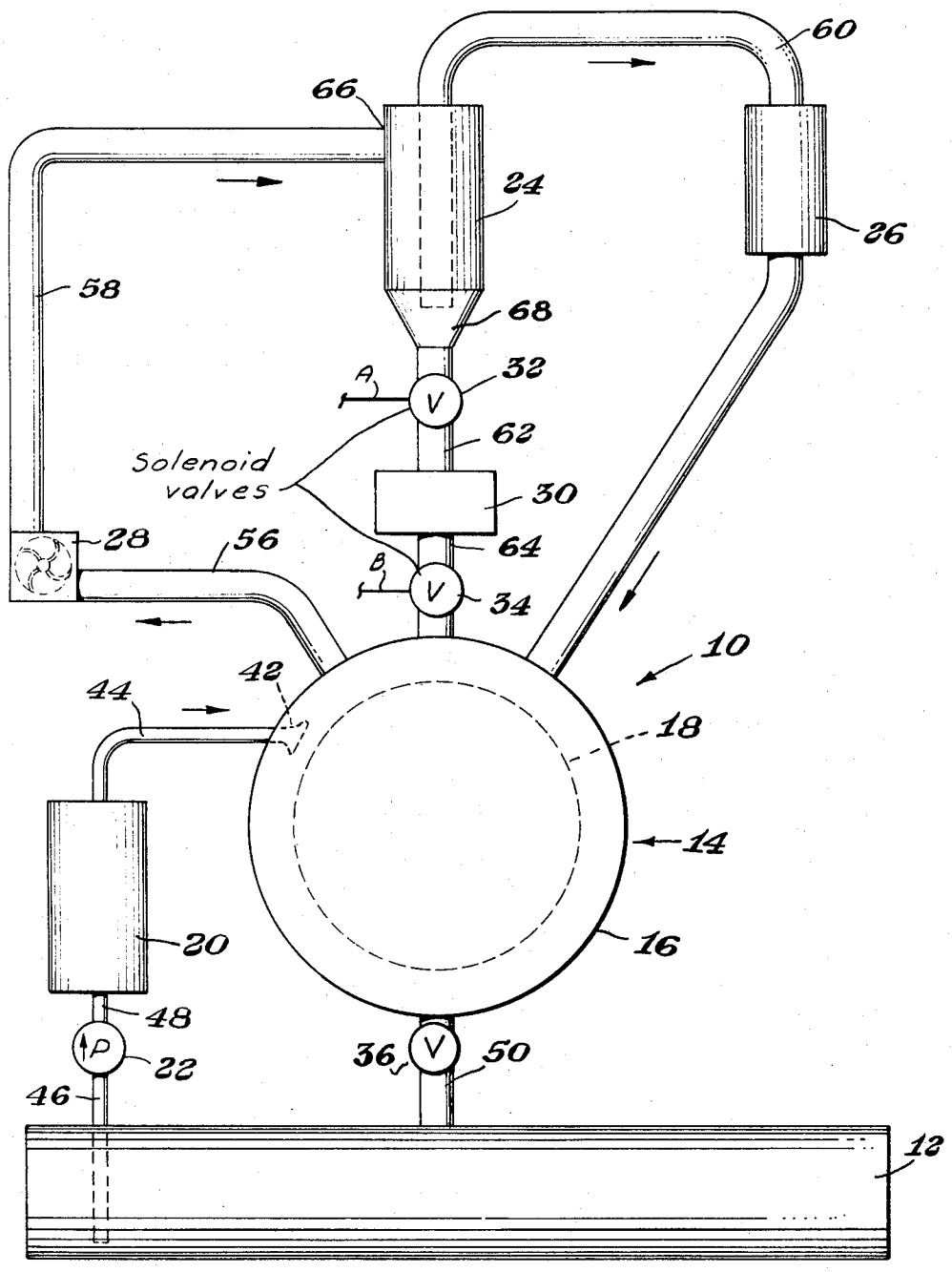
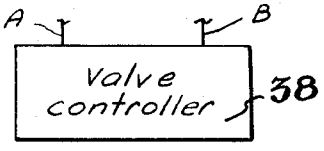
May 21, 1968 H. S. GILBERT 3,384,445

DRY CLEANING METHOD

Filed April 27, 1964





INVENTOR.
Herman S. Gilbert

BY Earl D. Ayers
AGENT

United States Patent Office 3,384,445 Patented May 21, 1968

3,384,445

DRY CLEANING METHOD

Herman S. Gilbert, Angleton, Tex., assignor to The Dow Chemical Company, Midland, Mich., a corporation of Delaware

Filed Apr. 27, 1964, Ser. No. 362,899
6 Claims. (Cl. 8—142)

ABSTRACT OF THE DISCLOSURE

This invention relates to a method of dry cleaning fabrics wherein vaporized solvent from the cleaning operation is extracted, condensed, and stored for use as a solvent rinse before the final solvent extraction and fabric drying part of the cleaning cycle.

BACKGROUND OF THE INVENTION

This invention relates to an apparatus and method for cleaning fabrics by dry cleaning, and particularly to coin operated dry cleaning apparatus and a method of operating such apparatus.

In so-called dry cleaning operations clothes or other fabrics are usually cleaned by agitating them while passing a non-aqueous solvent through them which often contains a detergent or soap and then extracting the solvent.

The removed soils are either suspended or dissolved in the solvent used in the cleaning operation. Suspended materials are removed from the solvent by filtering, while dissolved soils are removed either by adsorption on activated carbon, by using so-called sweetener powders to change the fatty acids to soaps or by distilling the solvent.

While distilling the solvent is a desirable way to separate non-volatile matter from the solvent, it is not really practical from an economic standpoint to distill all the solvent used between each cleaning operation.

In the most widely used types of coin operated dry cleaning equipment, for example, up to 55 gallons or even more of solvent is used during each cycle of operation. It is too expensive in such a highly competitive business to distill all of the solvent which is used during each cycle of operation. As a substitute it is known to distill a small fraction of the solvent used during each cycle on an indiscriminate basis to remove at least part of the non-volatile materials from the solvent and slow the build up of non-volatile materials in the solvent.

However, the amount of non-volatile material which is in the solvent continues to build up and often causes the supposedly cleaned fabric to have a bad or unpleasant odor.

Accordingly, a principal object of this invention is to provide an improved, economical method and apparatus for reducing the amount of non-volatile materials in fabric which is dry cleaned.

Another object of this invention is to provide an improved, simple to operate, economical apparatus and method for removing non-volatile materials from dry cleaned fabrics.

In accoradnce with this invention there is provided means and a method for condensing the solvent vapors which are removed from the wash wheel assembly during the extraction part of the cleaning cycle, storing the condensed solvent vapor and then using it as a final rinse for the fabric being cleaned. Thus, the solvent used in the final rinse is free of non-volatile material when it is applied. It is essential, however, that the rinsing with distilled solvent be accomplished immediately before or during the final spin extraction and while the clothing is still saturated with solvent, but prior to the drying cycle in the machine. The rinse solvent therefore sharply reduces the amount of non-volatile material remaining in the fabric being cleaned, with the result that the cleaned fabric is both cleaner and has a better odor than if non-distilled solvent were used in the rinsing operation.

The invention, as well as additional objects and advantages thereof, will best be understood when the following detailed description is read in connection with the accompanying drawing, in which:

The single figure shows, in simplified diagrammatical form, apparatus in accordance with this invention.

Referring to the drawing, there is shown dry cleaning apparatus, indicated generally by the numeral **10**, which comprises a base tank **12**, a wash wheel assembly **14** including an outer housing **16** and rotatable wash wheel **18**, a filter **20**, pump **22**, condenser **24**, heater **26**, blower **28**, solvent reservoir **30**, and solenoid controlled valves **32**, **34**.

The filter **20** is coupled to a spray nozzle **42** within the housing **16** of the wash wheel assembly **14** by a hollow tube **44**. The filter **20** is also coupled to the base tank **12** through hollow conduits **46**, **48** and the pump **22**.

A drain tube **50** having a valve **36** incorporated therein is coupled between the base tank **12** and the wash wheel assembly **14** and provides means for draining solvent from within the housing **16** of the wash wheel assembly.

A gas and solevnt vapor circulation system is provided which includes the condenser **24**, heater **26**, solvent reservoir **30**, valves **32**, **34**, and interconnecting tubing **56**, **58**, **60**, **62**, **64**.

The tubing **56**, blower **28** and tubing **58** connect the wash wheel housing **16** to the input **66** of the condenser **24**. The tubing **60** extends from within the condenser **24** through the heater **26** and back into the wash wheel housing **16**. The condensate output end **68** of the condenser **24** is coupled through the line **62** and valve **32** to the condensed solvent reservoir **30**. The reservoir **30** is coupled through the line **64** and valve **34** to the upper part of the wash wheel housing **16**. The valve controller **38** coupled, as at A and B, to the solenoid valves **32**, **34**, actuates the valves **36**, **38** to provide a flow of solvent into and out of reservoir **30** at appropriate times during the machine cycle.

In operation, as filtered solvent is pumped by means of the pump **22** through the nozzle **42** and onto the load of fabric (not shown) which is being tumbled by the rotating wash wheel **18**, the solvent which has passed through or impinged on the fabric being cleaned usually returns from the housing **16** to the base tank **12** through the line **50** and valve **36**. The valve **36** may be partly or completely closed for at least part of the wash cycle in order to keep a solvent inventory in the wash wheel.

Following the wash cycle, the wash wheel **18** is rotated at a rapid rate as is well known in the art to extract the solvent from the fabric load. Simultaneously, gas and solvent vapors are drawn from the housing **16** by means of the blower **28** through the lines **56**, **58**. The vapors and gas from the line **58** are passed through the condenser **24**, the solvent liquefying into droplets and dropping through the tube **62** and thence into the solvent reservoir **30**, the valve **34** being closed and the valve **32** being open.

The uncondensed gas and vapors leave the condenser **24** through the line **60**, passing through the heater **26** before returning to the wash wheel assembly **14**, as is well known in the dry cleaning art. As the heated air reenters the wash wheel housing **16** additional solvent in the fabric is vaporized and withdrawn from the wash wheel assembly through the line **56** as described above.

After the extraction operation, the distilled solvent from the solvent reservoir is dispersed, by opening the valve **34**, for example, into the wash wheel **18** and onto the fabric being cleaned. This distilled solvent acts as a rinse for the fabric being cleaned, thus diluting the

amount of non-volatile material which remained in the fabric after the first extraction operation.

The amount of distilled solvent which is available for use as a rinse may be increased by operating the blower **28** and condenser **24** throughout the washing cycle as well as during the solvent extraction or spinning cycles of the cleaning operation.

As illustrated in the drawing, a direct gravity flow of the distilled solvent in the reservoir **30** to the wash wheel **18** occurs. The rapid spinning of the wash wheel will provide about the same effect as though the solvent were sprayed from the nozzle **42**.

However, the solvent reservoir **30** (about 1 gallon capacity) may, if desired be located below the wash wheel (or elsewhere) and the rinse solvent be pumped into the wash wheel by means of a separate pump and a suitable nozzle.

This invention provides an economical to construct and operate means and method of substantially reducing the non-volatile material remaining in fabric after it is dry cleaned.

What is claimed is:

1. In a method of dry cleaning wherein fabrics are cleaned by imparting motion to said fabric while contacting said fabric with liquid solvent, extracting a substantial amount of said solvent from said fabric by centrifugal force, heating the remaining solvent to vaporize it, flowing said vapor away from said fabrics to dry said fabrics, then followed by aerating said fabrics, the steps of condensing vapors from said solvent which contacts said fabric and accumulating a predetermined volume of condensed solvent, and then utilizing said condensed solvent to rinse said fabric before finally extracting the solvent from the fabric by centrifugal force, heating the solvent and flowing vaporized solvent away from the fabric.

2. In a method of dry cleaning wherein fabrics are cleaned by tumbling said fabric while contacting said fabric with liquid solvent, extracting a substantial amount of said solvent from said fabric by centrifugal force, heating the remaining solvent to vaporize it, flowing said vapor away from said fabrics to dry said fabrics, then followed by aerating said fabrics, the steps of condensing solvent vapors which are flowed away from said fabric and accumulating a predetermined volume of condensed solvent, and then applying said condensed solvent to said fabric as a rinse before finally extracting the solvent from the fabric by centrifugal force, heating the solvent and flowing vaporized solvent away from the fabric.

3. A method in accordance with claim **1**, wherein said fabric is aerated after it is dried.

4. A method in accordance with claim **1**, wherein said solvent vapors are condensed and accumulated during the entire cleaning, and solvent extraction and drying cycles of the dry cleaning operation.

5. A method in accordance with claim **1**, wherein said solvent vapors are condensed and accumulated only during the solvent extraction and drying cycles of the dry cleaning operation.

6. A method of dry cleaning fabrics with a liquid non-aqueous solvent which comprises contracting said fabrics with a quantity of said solvent at least sufficient to saturate said fabric, agitating said saturated fabric, extracting a substantial amount of said solvent from said fabric by centrifugal force, condensing vapors from the solvent which contacts said fabric and accumulating a predetermined volume thereof, utilizing said condensed solvent to rinse said fabric, and finally heating said solvent and flowing vaporized solvent away from the fabric until said fabric is substantially solvent free, and then aerating said fabric.

References Cited

UNITED STATES PATENTS

2,831,332	4/1958	Ross	8—142
2,979,375	4/1961	Kircher	8—142

FOREIGN PATENTS

514,126	6/1955	Canada.

LEON D. ROSDOL, *Primary Examiner.*

MAYER WEINBLATT, *Examiner.*