United States Patent [19]

McKnight

[11] **3,840,340**

[45] **Oct. 8, 1974**

[54] **DETERGENT PRECONDITIONING PROCESS FOR DRY CLEANING**

[76] Inventor: **Eugene A. McKnight,** 647 Town Mountain Rd., 603 Tiara Apt., Asheville, N.C. 28804

[22] Filed: **Mar. 31, 1972**

[21] Appl. No.: **240,211**

[52] **U.S. Cl.** ..... **8/142,** 68/20, 68/13 R

[51] **Int. Cl.** **D06l 1/04**

[58] **Field of Search** ..... 8/142; 68/18 R, 18 C, 18 F, 68/20, 13 R; 252/8.8

[56] **References Cited**

UNITED STATES PATENTS

2,176,894	10/1939	Engels et al.	8/142
3,338,072	8/1967	Brillet	68/20 X
3,583,180	6/1971	Arbogast	68/20 X
3,611,456	10/1971	Hildebrandt	68/18 R X
3,711,414	1/1973	Hewitt	252/8.8 X

OTHER PUBLICATIONS

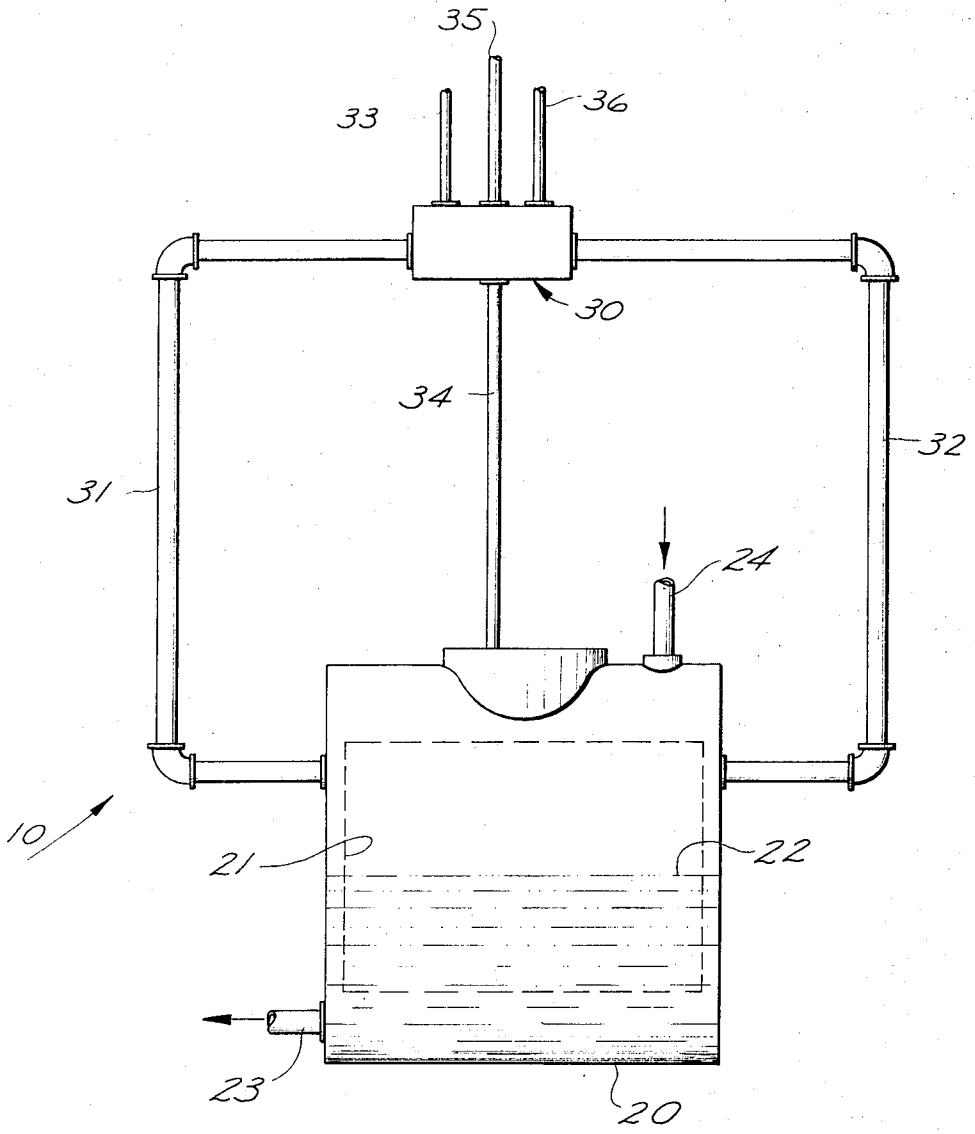
Martin, 1968, Facts and Fallacies About Water–Soluble Soil Removal," text of speech given at Convention of the National Institute of Drycleaning, at Detroit, Mich., March, 1968 National Institute of Drycleaning, Silver Spring, Md.

Primary Examiner—Benjamin R. Padgett
Assistant Examiner—E. A. Miller

[57] **ABSTRACT**

A method for enhancing the removal of water-soluble soil during dry cleaning, which contemplates the application of a preconditioning treatment to the goods to be cleaned before the dry cleaning thereof, but in the same equipment in which the dry cleaning treatment will be performed. Preconditioning consists of treating the goods with a mixture of water and detergent which has been substantially vaporized prior to introduction into the dry cleaning equipment. A predetermined water moisture level is established inside the dry cleaning equipment through introduction therein of the water and detergent mixture and maintained throughout the preconditioning treatment and the dry cleaning treatment following. Concentrated detergent in amounts based upon the weight of the goods to be cleaned is introduced into the dry cleaning equipment during the preconditioning treatment of the goods to insure the availability of sufficient detergent for the preconditioning treatment in those instances in which a pre-existing moisture level in the dry cleaning equipment would not require the addition of sufficient water and detergent mixture to provide the needed detergent by that means. Special treatment agents may be introduced into the dry cleaning equipment to achieve some desired effect and include the water-soluble type in which case they are introduced with the preconditioning treatment, or the solvent-soluble type, introduced with the solvent dry cleaning treatment.

2 Claims, 1 Drawing Figure


35
33
36
30
34
32
31
24
10
21
22
23
20

DETERGENT PRECONDITIONING PROCESS FOR DRY CLEANING

BACKGROUND OF THE INVENTION

This invention relates to a dry cleaning process that utilizes a preconditioning treatment whereby a water and detergent mixture that has been atomized into substantially a vapor form is applied to the goods to be cleaned under conditions whereby the water moisture content inside the dry cleaning equipment is established and maintained at a predetermined level; after which the goods are subjected to the dry cleaning treatment in a solvent dry cleaning composition while maintaining said predetermined water moisture content throughout.

Heretofore, dry cleaning treatments have included various methods for enhancing water-soluble soil removal from the goods to be cleaned. Mainly, such methods have consisted of introducing into the dry cleaning solvent measured quantities of water and detergent, the latter being selected, among other considerations, for its compatibility with the dry cleaning solvent composition and its efficacy in promoting soil removal and soil suspension. Relative humidity units or other moisture detecting devices have been used to control the water moisture content associated with the goods during dry cleaning, thereby controlling the moisture level in the goods themselves. These developments lead to improved water-soluble soil removal with a corresponding improvement in the overall dry cleaning treatment but failed to prove entirely satisfactory in many respects.

Ordinarily the dry cleaning treatment is performed on goods as a batch process, utilizing a washing apparatus having a rotatable drum therein to receive a load or "batch" of goods and work the load through a dry cleaning solvent composition to effect solvent cleaning thereof aided by continuous solvent filtration. Following this cleaning treatment a part of the solvent composition is removed from the washing apparatus, purified and recycled for a subsequent washing cycle. Maximum efficiency and economy in the dry cleaning process is realized, generally, by reducing the washing cycle to the minimum time necessary for effective solvent cleaning, yet to realize this result, water-soluble soil removal is diminished because the shorter solvent washing cycle shortens also the time during which the goods are acted upon by the detergent and water introduced into the solvent as hereintofore mentioned. Action of the detergent and water is further hindered by the diluting effect of the dry cleaning solvent composition as well as the insulating and retarding action thereof. Accordingly, results experienced from present dry cleaning treatment, relative to water-soluble soil removal, fail to meet minimum results of routine water and detergent laundering and remain substantially unsatisfactory.

Attempts have been made toward the use of a preconditioning treatment whereby water is applied to the goods in separate preconditioning equipment to bring them up to a predetermined moisture level. Although the results of such attempts have been impressive, the added time and labor associated with the twostep preconditioning and dry cleaning process, requiring separate preconditioning equipment, has overbalanced any benefits realized.

SUMMARY OF THE INVENTION

With the foregoing in mind, the present invention provides an improved method for removing water-soluble soil during a dry cleaning process. The dry cleaning process contemplated for practice of this invention includes that commonly regarded as the commercial dry cleaning process, whereby goods subject to damage by regular detergent and water laundering are washed by a dry cleaning solvent composition. The washing is normally performed in washing apparatus of the automatic washer-extractor type; however, practice of this invention is not limited to equipment of this type nor to the commercial dry cleaning process as that process is commonly regarded. Contemplated also is the dry cleaning process and equipment adapted for self-service, coin operated dry cleaning treatments and the industrial applications of dry cleaning treatments, the latter of which has been receiving increased interest from that portion of the textile and garment industry that has heretofore relied upon wet processing of goods in an aqueous medium. The improved method includes a preconditioning treatment performed, preferably, in the same equipment in which the dry cleaning treatment is to be performed which treatment includes submitting the goods to a water and detergent mixture that has been atomized to form a spray and is applied under conditions whereby the amount of water moisture present is detected, established and maintained at a predetermined level; which, through the combined action of the water and detergent, decreases the time within which the water moisture content of the goods reaches equilibrium with the surrounding water moisture level; which treatment is performed before the goods are exposed to the dry cleaning solvent composition; which treatment can be used to add special treatment agents to the cleaning process, including those agents that are limited to applications in an aqueous medium; and which treatment does not require additional treating equipment nor add an excessive amount of time to the overall dry cleaning cycle.

Generally, the present invention contemplates the use of a detergent, either non-ionic, anionic or cationic, in water for preconditioning in a dry cleaning system. In a batch dry cleaning system, to be described hereinafter, preconditioning in separate equipment with water alone is known; however, this is believed to be the first time that a preconditioning treatment using detergent and water has been used and the first time that the preconditioning treatment as contemplated herein has been performed in the same equipment in which the goods are to be washed by a dry cleaning solvent composition.

In a preferred embodiment of the invention, goods (which term is broadly defined to include without limitation finished garments, woven and non-woven fabric, yarns, filaments and fibers) that are to be dry cleaned are first subjected to a treatment with a mixture of water and detergent which has been substantially vaporized by means of an atomizing unit. Addition of the water and detergent mixture is based upon the moisture level preexisting in the dry cleaning equipment so that the moisture content in the goods to be cleaned is established and maintained at a predetermined level to promote removal of water-soluble soil. A measured quantity of concentrated detergent is also introduced to insure the availability of sufficient detergent for the

preconditioning and dry cleaning treatments. Accordingly, concentrated action of the detergent is accomplished without the insulating, retarding and diluting action of the dry cleaning solvent composition. It is believed that one of the major benefits resulting from preconditioning with detergent and water before injection of the dry cleaning solvent is that such preconditioning speeds up the time in which the water moisture content in the goods reaches a state of equilibrium with the surrounding water moisture level, which decreases the time in which the water moisture content in the goods is established at the level considered suitable for maximum water-soluble soil removal. This reduction in time is believed to result from, among other things, a reduction of surface tensions by the detergent. Furthermore, preconditioning with water and detergent is believed to promote the action of detergency whereby soil, both the water-soluble and solvent-soluble type, is deflocculated and kept in suspension so that it can be washed away before it can be redeposited on the goods being cleaned.

Following the preconditioning treatment as hereinbefore described, the goods are washed by a dry cleaning solvent composition while maintaining a predetermined water moisture level throughout the dry cleaning process. A greater degree of cleanliness is thus attained due primarily to the greater degree of water-soluble soil removal.

DESCRIPTION OF THE DRAWING

The foregoing and other features and advantages of the invention will be in part evident and in part pointed out hereinafter in the following description of an illustrative embodiment thereof, which should be read in conjunction with the accompanying drawing, which represents a block diagram showing schematically apparatus for practice of the improved dry cleaning process.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The washing apparatus **10** shown in the drawing includes a cleaning tank **20** wherein a rotatable drum **21** agitates goods (not shown) through dry cleaning solvent composition **22** to effect chemical cleaning thereof. An outlet pipe **23** draws the solvent composition **22** from the tank **20** following a dry cleaning cycle, delivers the solvent to apparatus (not shown) for purification thereof, after which it is returned to the cleaning tank **20** by an inlet pipe **24** for a subsequent cleaning cycle.

The washing apparatus as herein described is illustrative of equipment readily available to the dry cleaning industry, commonly referred to as an automatic washer-extractor, and requires no detailed description. It is emphasized again, however, that practice of the present invention is not limited to equipment of the automatic washer-extractor type and may include other types of equipment and other dry cleaning processes.

Apparatus illustrative of the type used to practice the present invention in its preferred embodiment, in addition to the basic washing apparatus described in the two previous paragraphs, includes a water detecting unit, atomizing units and control means, represented schematically in the drawing and referred to, generally, as a preconditioning unit **30.** The water detecting unit may be either the "Relative Humidity" type or the Conductivity type, both of which are well known in the industry. The preferred embodiment uses a "Relative Humidity" type water detecting unit which includes a vapor circulation means (not shown). Vapors are drawn by said means from the cleaning tank **20** through an outlet pipe **31,** circulated through the water detecting unit, and returned to the cleaning tank **20** by an inlet pipe **32.** A supply pipe **33,** fed by a stock solution of approximately 10 percent detergent in water (not shown), has a valve therein operated by the control means and responsive to the water detecting unit to add the water and detergent mixture to the cleaning tank **20** responsive to the quantity of water moisture measured therein by the water detecting unit. The water control means is preset to establish and maintain a predetermined water level in the cleaning tank **20** based on the nature of the goods that are to be cleaned and their preexisting moisture content. The water and detergent mixture passes through an atomizing unit before being introduced as a vapor into the cleaning tank **20** by an inlet pipe **34** inter-connecting the preconditioning unit **30** with said cleaning tank. Addition of the water can also be accomplished, however, by injecting steam directly into the cleaning tank **20** or by pumping water directly therein.

Concentrated detergent is added to the cleaning tank **20** in similar fashion, whereby a metered quantity is fed from a detergent supply pipe **35** to an atomizer unit. In the atomizer unit it is substantially vaporized and transmitted therefrom into the cleaning tank **20** through an inlet pipe such as the inlet pipe **34.** The detergent itself can be any non-ionic, anionic or cationic detergent, depending upon the goods to be cleaned, the dry cleaning solvent composition to be used, and the soil to be removed. The selection of a specific detergent and the quantity to be used is based upon factors similar to those discussed in the preceding sentence and is a well known procedure in the dry cleaning industry.

The preconditioning unit **30** also provides for the introduction of controlled amounts of selected treatment agents by means of a supply pipe **36,** through the preconditioning unit **30** and the inlet pipe **34** to the cleaning chamber **20** at preselected times to accomplish some desired effect ancillary to the cleansing action. For example and without limitation: dyeing of all forms, including full dyeing, topping, cross dyeing and bleaching and finishing treatments, including modification of the goods'to feel, softness and other physical characteristics as well as modification of the goods' properties such as by water-proofing, moth-proofing, flame-proofing, or the like. One of the advantages found to exist in connection herewith is that the selected treatment agents may consist of water-soluble agents, in which case they would be added during the preconditioning portion of the dry cleaning cycle or they may consist of solvent-soluble agents, in which case they would be added during the solvent dry cleaning portion of the process. For purposes of illustration only, a water-soluble moth-proofing treatment agent may be introduced to the goods during the preconditioning treatment thereof to impart moth-proof properties thereto. Addition of a water-soluble, moth-proofing agent to the aqueous medium avoids use of the more expensive solvent-soluble moth-proofing agent presently used in connection with the solvent medium.

Having described a preferred system in which the improved dry cleaning process is performed, practice of the process contemplates, after loading the goods to be cleaned into rotatable drum **21**, rotation of said drum **21** for a period of approximately 5 minutes prior to introduction of the dry cleaning solvent composition **22** into the cleaning tank **20.** During this approximately 5 minute interval, the relative humidity moisture detector is pulling vapors from cleaning tank **20** through vapor outlet pipe **31**, detecting the moisture content thereof and returning the vapors to the cleaning tank by means of vapor inlet pipe **32.** According to the vapor content detected and the moisture content in the goods to be cleaned, additional water will be introduced into the cleaning tank **20** by introduction of the water and detergent mixture to establish and maintain a predetermined moisture level. At the same time a measured quantity of detergent is introduced in substantially vaporized from into the cleaning tank **20** whereby it, in combination with the detergent introduced in the water and detergent mixture, acts upon the goods in concentrated form without the inhibiting and restraining effect of the solvent dry cleaning composition.

Water in detergent preconditioning causes the water moisture content of the goods to reach a state of equilibrium with the surrounding water moisture level more quickly due, primarily, to the reduction in surface tensions resulting from action of the detergent. Detergent in water preconditioning enhances the detergency action whereby greater soil removal and a greater soil suspension is experienced following the normal washing by the dry cleaning solvent composition.

Following the preconditioning treatment, a dry cleaning solvent composition is introduced into the cleaning tank **20** and the goods agitated therethrough by rotation of the rotatable drum **21,** whereby the goods are subjected to a normal washing treatment. During the washing treatment, vapor from the cleaning tank **20** continues to be circulated through the water detecting unit as hereinbefore described. Additions of the water and detergent mixture are made when necessary to establish and maintain the water moisture content at a predetermined level in the cleaning tank **20,** whereby the goods, seeking to establish equilibrium therewith, establish and maintain a predetermined water moisture content. As a result, goods cleaned by the process as disclosed herein have a higher degree of water-soluble soil removal thereby resulting in a cleaner and brighter appearance, which appearance is achieved without the need of a separate preconditioning step nor the use of separate preconditioning equipment, and without increasing the overall cleaning time in a measurable amount relative to the greatly improved results.

Dry cleaning machines of the automatic washer-extractor type are commonly equipped with an air circulating means whereby the goods, subsequent to the dry cleaning treatment, are dried in the machine. The goods are tumbled by rotation of the rotatable drum while drying air is circulated therethrough by the air circulating means. Introduction of a mixture of approximately 10 percent detergent in water that has been atomized to form a detergent and water vapor reduces static electricity that builds up in the goods during the drying cycle, which also reduces the migration and accumulation of lint on the goods, a problem normally encountered during drying treatments of this type. Moreover, introduction of the detergent and water vapor mixture reduces the hazards of fire by reducing free lint in the circulation of air and it hastens moisture regain in the goods whereby there is less waiting time following the dry cleaning process before the goods are ready for reuse.

While a preferred embodiment of the invention has been specifically shown and described, this was for purposes of illustration only, and not for purposes of limitation, the scope of the invention being in accordance with the following claims.

That which is claimed is:

1. A method of dry cleaning textiles using a washing apparatus having a cleaning tank with a rotatable drum therein to continuously work said textiles within said cleaning tank, said method comprising the steps of:

detecting the moisture content of the textiles in said rotatable drum with a water detecting unit, which unit has continuously circulated therethrough vapors from said cleaning tank;

subjecting said textiles while tumbling same in said rotatable drum to a pre-conditioning treatment, which treatment consists of introducing controlled amounts of water and detergent into said cleaning tank, relative to the moisture content detected therein by said water detecting unit, to establish and maintain a pre-determined moisture level in said textiles for optimum water soluble soil removal therefrom and allow a concentrated action upon said textiles by said detergent, thereby decreasing the time in which the water moisture content in the textiles is established at the level for maximum water-soluble soil removal and promoting the action of detergency for more effective soil removal; followed by

introducing a dry cleaning solvent composition into said cleaning tank and agitating the textiles in said rotatable drum therein to effect solvent cleansing thereof; while

continuing to detect the moisture content of said textiles with said water detection unit; and

maintaining said moisture at said predetermined level for optimum water-solvent soil removal throughout the cleaning of said textiles.

2. A method as defined in claim **1,** further comprising the steps of:

drying said textile following the solvent cleansing thereof and while in said washing apparatus; and

introducing, during the drying thereof, additional water and detergent in a spray to reduce the buildup of static electricity in said textiles and to reduce the migration and accumulation of lint thereon.

* * * * *