

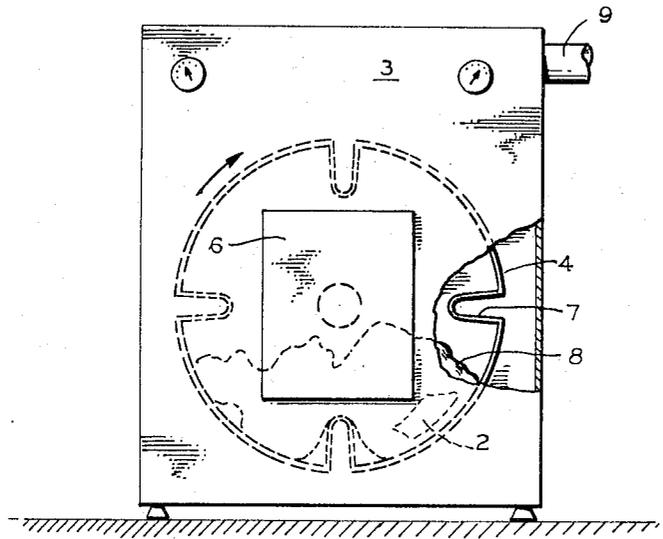
May 6, 1969

C. J. GAISER

3,442,692

METHOD OF CONDITIONING FABRICS

Filed Aug. 13, 1965



INVENTOR
CONRAD J. GAISER
BY *Stanley Bialos*
ATTORNEY

1

2

3,442,692
METHOD OF CONDITIONING FABRICS

Conrad J. Gaiser, 6009 Seaside Walk,
Long Beach, Calif. 90803

Filed Aug. 13, 1965, Ser. No. 479,590

Int. Cl. B44d 1/46

U.S. Cl. 117-120

8 Claims

ABSTRACT OF THE DISCLOSURE

Fabrics are conditioned by commingling the same in a laundry dryer by tumbling them together with a flexible substrate carrying a softening or other modifying agent whereby the agent is transferred to the fabrics.

This invention relates to the conditioning of fabrics by well known types of fabric conditioners such as softening, antistatic, lubricating, bacteriostatic, mildew proofing or moth proofing agents, or agents that may impart several properties to the fabric, such as softeners which also impart antistatic properties.

In laundering, it is common to treat various types of household and garment fabrics, such as wool, cotton, silk or nylon, with agents selected from among the above types to render them soft to the touch and to reduce knotting or wrinkling, and thus facilitate ironing, or to render them free of static, bacteria resistant, to deodorize them or otherwise to condition them. In commercial laundries, this is usually done by introducing a solution or dispersion of the agent from containers during the washing cycle or during rinsing of the fabric with fresh water after it has been washed, particularly in the last rinsing step.

As a result of prior laundering, residual soaps and detergents are present on the fabric. Because the fabric conditioning agents of the character described above are generally cationic and hence are chemically incompatible with the occluded soaps and detergents which are anionic, the fabric conditioning agents suffer loss of effectiveness by mutual precipitation in contact with the residual soap or detergent. Thus, even though it has been the practice to add the agent at the start of the last rinsing step, there is still detergent or soap present especially in the home laundry, and consequently there is no assurance that an effective amount of the agent will remain on the fabric.

Moreover, when the agent is applied from a liquid dispersion or solution, this is uneconomical because the conditioning agents require 16 to 20 times as much solvent, usually water or water-alcohol mixtures, than agent; and this increases shipping and handling costs entailed by the relatively large quantities of solvent that have to be handled. Also, the container and bottling costs are relatively high, and excessive quantities of the liquid containing the agent have to be employed, to render the agent effective.

The present invention is designed to overcome the foregoing problems. Summarizing the same, it comprises incorporation of such type of agent uniformly in a fabric-like substrate, felted or woven, such as paper toweling or scrims, swatches of cloth or absorbent sponge, which may be readily handled and shipped or transported in the dry state. A sheet of the substrate carrying the agent is advantageously placed in any conventional laundry dryer together with washed but still wet fabric which is usually in the form of sheets, garments, pillow cases, etc., and has been thoroughly rinsed so as to be substantially free of detergents or soaps, having gone through the complete wash and rinse cycle. In the rinse cycle, the fabric is rendered damp, although still wet, by centrifugal spin drying.

In the drying cycle, the current of heated drying air or other heated inert gas, and water vapor which evolves from the fabric, cause the agent to vaporize from the substrate and deposit or condense uniformly on the fabric, as the pieces of fabric and the substrate are being simultaneously tumbled or agitated by the internal ribs of the rotating drum or wheel in a conventional laundry dryer. This tumbling action causes the substrate to commingle with all pieces of the washed fabric, thus resulting in all of the fabric pieces being exposed to the agent. Although not as effective because of substantial presence of aforementioned residual soaps or detergents from the washing or rinsing cycle, the substrate carrying the conditioning agent can be introduced optionally during the washing cycle or during any of the rinsing cycles, desirably the last rinse step, and it will still effectively transfer some of the agent to the pieces of wet fabric.

Incorporation of the agent into the substrate can readily be effected by coating a sheet of the substrate with a liquid solution or dispersion of the agent, as by immersion, or by spraying, wringing or pressing out the excess, and then drying the substrate to leave it uniformly impregnated with the agent. The substrate is desirably in the form of cellulosic sheet material, such as conventional perforated paper roll toweling, or in the form of packaged swatches of either paper toweling, or fabric such as flannel, which can be removed one at a time from the package. A special advantage is that by virtue of its simplicity, the impregnated substrate can be readily used by the housewife in the household in conventional laundry and drying appliances, under conventional operating conditions, as well as in commercial laundries.

From the preceding, it is seen that the invention has as its objects, among others, the provision of an improved, simple and economical method and product therefor, for conditioning fabrics by agitating and thoroughly commingling the same with a substrate carrying a conditioning agent for the fabric in a stream of heated gas and water vapor, and which method and product can advantageously be employed in the drying cycle wherein the fabric is substantially free of soaps or detergents. Other objects will become apparent from the following more detailed description.

Reference will now be made to the accompanying single sheet of drawing which is a schematic elevational view of a well known type of household dryer, for a more detailed description of the invention; a portion of the structure being shown broken away.

Any type of conventional conditioning agent heretofore used in the conditioning fabrics can be employed. Such agents are presently marketed as solids, pastes, or liquids as in aqueous or aqueous-alcohol solution or in dispersion form, and they are generally cation-active substances. The substrate is impregnated with such agent as by immersion in a suitable liquid solvent containing the agent, and subsequently removing the agent by evaporation. In the dryer, the agent is distilled from the substrate and redistributed by the heat of the drying gas current and the water vapor leaving the fabric being dried, and subsequently is deposited uniformly on the fabric or fabrics being dried.

As illustrated in the drawing, all that need be done is to introduce a relatively small sheet 2 of the substrate carrying the conditioning agent, into a conventional dryer chamber or enclosure 3 having a conventional rotatable dryer drum or agitator 4 and door 6, and in which ribs 7 on the drum effect thorough commingling of the pieces of washed but damp fabric 8 with the substrate. Vent 9 is provided, allowing escape of drying gas and water vapor.

The normal drying time of about 40 to 60 minutes and the normal drying temperatures of about 120° F. to 190° F. commonly employed for laundry drying are satis-

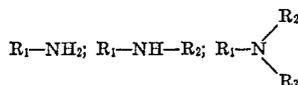
factory. By the time the fabric pieces have been dried most of the conditioning agent has been transferred from the substrate to the fabric and is uniformly deposited thereon. After the conditioning treatment, the dried pieces of fabric are removed from the dryer and handled in the customary manner, such as ironing.

Compounds which act as conditioning agents fall into two classes, those practically useful and those impractical to use. The following discussion describes the practically useful class of these compounds, all of which function because of their substantivity to fabrics. For the purpose of this invention, these are collectively described as fabric conditioning agents, and it is not the intention to limit this invention to any specific agent or chemical species.

The most effective fabric conditioners are cationics. However, some anionics such as calcium and magnesium salts of ordinary fatty acids of 14 to 18 carbon atoms chain length are also effective but turn yellow with age. Some of the amphoteric molecules are also effective, probably because their positive charge attaches them to the fabric. Specifically, the requirements for a fabric softener are, (1) one or more hydrophobic side chains of 14 to 18 carbon atoms in chain length; and (2) a positively charged end to serve as a point of attachment to the negatively charged molecule of the fiber.

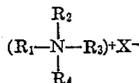
Typical fabric conditioners include:

(a) Primary, secondary, and tertiary amines and their water soluble or water dispersible salts. For example:



where R_1 and/or R_2 may be an alkyl group of 16 to 18 carbon atoms or any equivalent group with comparable hydrophobicity.

(b) A quaternary nitrogen-containing base or salt. For example:



where X may be any one of the following groups: OH^- , Cl^- , Br^- , HSO_3^- , SO_4^- or similar negative radicles, and where R_1 and R_2 may be as in (a) above and R_3 and R_4 are methyl or ethyl groups.

- (c) Alkyl imidazolines and imidazoles.
- (d) Alkyl pyridine and piperidine salts.
- (e) Alkyl sulfonium salts.
- (f) Alkyl phosphonium salts.
- (g) Esters of amino acids.
- (h) Esters of amino alcohols.
- (i) Alkyl guanidines and their salts.

All of the above are effective as softening agents. Effective softening and antistatic agents are quaternary ammonium chlorides or bromides, and alkyl imidazolium chlorides or bromides. Suitable as antistatic agents are alkyl dibenzyl ammonium chlorides and alkyl amines. Alkyl dimethyl benzylammonium chlorides and dodecyl trimethyl ammonium chloride are desirable bacteriostatic agents.

As previously related, it is immaterial what the conditioning agent is as long as it is substantive to the fabric upon which it is deposited, and will vaporize under the flow of drying air and steam generated from the washed fabric as it is being dried.

The amount of conditioning agent incorporated in the substrate should be sufficient to be effective, while substantial excess thereof, serves no purpose, and is thus uneconomical. The actual amount is variable and depends on the characteristics of the agent employed. About 1.0 to 10.0 grams of the agent carried in a sheet of approximately 105 square inches of dry conventional paper toweling or flannel fabric, introduced into the dryer with the fabric to be dried, will usually suffice for the normal

household dryer in which the usual load of 5 to 10 lbs. of fabric is dried in about 40 to 60 minutes under normal drying conditions of about 120° F. to 190° F. In commercial laundries having greater dryer capacity, more substrate sheets carrying the agent are proportionately incorporated with the fabric pieces in the dryer.

All of the aforementioned agents are soluble or dispersible in water or in water-alcohol (desirably isopropyl alcohol for economy) solvents. To incorporate the same into the woven or felted substrate, all that is required, as previously related, is to immerse the substrate in a solution or dispersion of the agent having a concentration sufficient to provide the desired amount of agent on the substrate, or to coat the substrate with the liquid carrying the agent by any conventional coating roll applicator which meters the coating onto the substrate, and then remove the solvent from the substrate by drying either at ambient temperature or by oven drying. The resultant treated substrate can then be distributed in perforated roll form from which individual sheets can be readily detached, with each sheet carrying a desired predetermined amount of agent, or it can be packaged in the form of a stack of individual separated sheets each carrying such amount of agent.

EXAMPLE I

As a typical example illustrative of the invention, a conventional paper towel of about 105 square inches in size was immersed and squeezed in a dispersion of 2.0 grams of dimethyl, di(hydrogenated tallow), ammonium chloride (a quaternary ammonium compound known as "Arquad 2HD-75" by Armour Chemical Company) in 7.0 cc. of water and 1.5 cc. of isopropanol, prepared at 18° C. After all the liquid had been absorbed, and the paper towel was dried at ambient temperature, 2.0 grams of the agent were distributed uniformly in the substrate. Such dry substrate carrying the agent was then introduced into a conventional household clothes dryer ("Kenmore" gas dryer) with an approximate 8 lb. load of damp fabrics (towels and linens) which had been spin-dried by centrifugation in the washer. During a conventional drying cycle of about 50 minutes under conventional drying temperature of about 150° F., the substrate was thoroughly tumbled around with the fabric by the drying agitator.

During such treatment, sufficient of the agent vaporized from the substrate into the carrier gas stream, namely, heated air and steam generated from the fabric, and deposited on the fabric pieces rendering them noticeably softer, antistatic and fluffier. In the dryer, the imparted lubricating effect and the freedom from static reduced knotting and binding thereby substantially reducing wrinkling. The antistatic qualities remained with the fabric pieces until they were rewashed, thus rendering them more comfortable to wear; and because of the softening, the need for ironing was minimized and ironing was made easier.

EXAMPLE II

50 grams of the aforementioned quaternary ammonium compound of Example I, were dispersed in 15 cc. of isopropyl alcohol and 70 cc. of water at 75° C. Ten conventional sheets of perforated paper toweling, each of 120 square inches were folded along the perforations into a pad which was pressed into this dispersion, and was squeezed and worked until all the solution was evenly dispersed throughout the pad.

The pad was then unfolded and hung on a wash line to dry. Drying took about 10 hours at ambient temperature. After the drying, the impregnated sheets were very flexible, translucent and had a waxy feel. Checking the dry weight of the towels established that each sheet had picked up approximately 5 grams of the conditioning agent.

Over a period of several weeks, these impregnated towels were employed for conditioning fabrics by adding

5

one towel to a conventional gas heated (Kenmore) clothes dryer with each load of approximately 8 lbs. of freshly laundered clothes to be dried; the drying temperature being about 150° F., and the time about 50 minutes. After the drying, the clothes were removed and in each instance were softer, had fewer wrinkles, showed no electrostatic charge and ironed more easily. Each removed paper towel was intact, and had lost about 80 percent of the agent. In such condition, it was found useful as a dust cloth to render surfaces, such as phonograph records, antistatic.

In the case where the conditioning agent is a softening agent only or a softening and antistatic agent combination, the substrate therefor need not be discarded after the drying cycle because there still remains a sufficient amount of the agent thereon which enables the substrate to be employed advantageously as a dusting or cleaning cloth, particularly when the substrate carrier is of relatively soft material such as flannel.

I claim:

1. The method of conditioning fabrics which comprises commingling pieces of damp fabric by tumbling said pieces under heat in a laundry dryer together with a flexible substrate carrying a conditioning agent to effect transfer of the conditioning agent to the fabric while being dried.

2. The method of claim 1 wherein the substrate is paper.

6

3. The method of claim 1 wherein the substrate is cloth.

4. The method of claim 1 wherein the agent is a softening and antistatic agent.

5. The method of claim 1 wherein the agent is an antistatic agent.

6. The method of claim 1 wherein the agent is a bacteriostatic agent.

7. The method of claim 1 wherein the substrate is a dry paper sheet carrying an amount of agent of about 1.0 to 10.0 grams per 105 square inches.

8. The method of claim 1 wherein the fabric pieces are rinsed substantially free of detergents or soaps and rendered damp by centrifugal spinning thereof prior to being dried in said laundry dryer.

References Cited

UNITED STATES PATENTS

2,734,830	2/1956	Hagge et al.	
3,033,704	5/1962	Sherrill et al.	
3,227,614	1/1966	Scheuer	----- 117—138.5

ALFRED L. LEAVITT, *Primary Examiner*.

J. A. BELL, *Assistant Examiner*.

U.S. Cl. X.R.

8—120, 149.2; 117—138.5, 139.5, 154