July 11, 1972 G. T. HEWITT ET AL 3,676,199

FABRIC CONDITIONING ARTICLE AND USE THEREOF

Filed Oct. 20, 1970

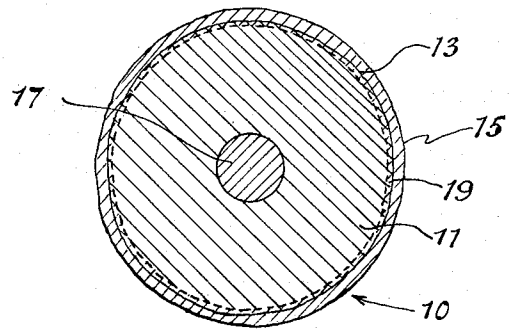


Fig. 1.

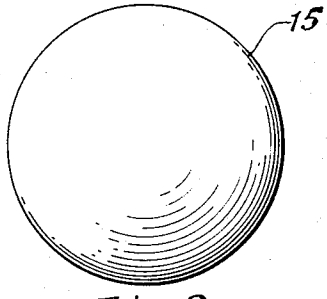


Fig. 2.

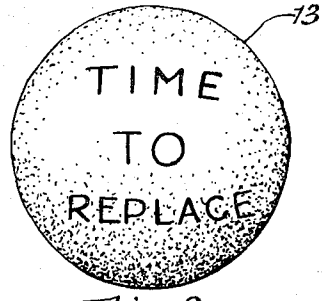


Fig. 3.

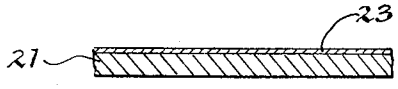
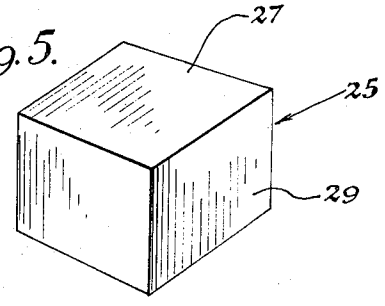


Fig. 4.

Fig. 5.



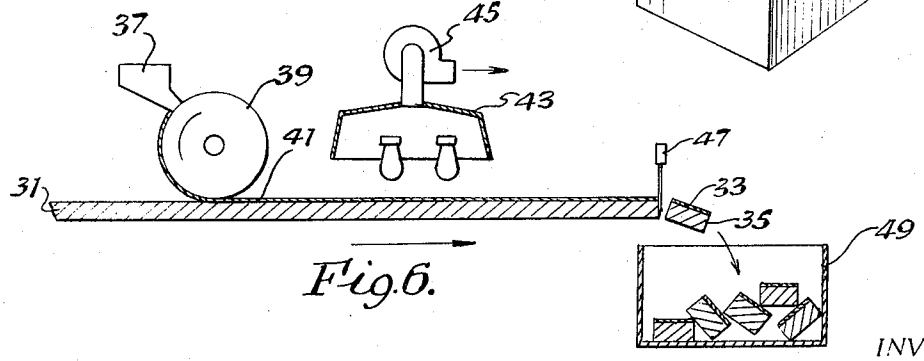


Fig. 6.

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FABRIC CONDITIONING ARTICLE AND USE THEREOF

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U.S. Cl. 117—109 13 Claims

ABSTRACT OF THE DISCLOSURE

A method of treating fibrous materials with a conditioning agent includes tumbling such materials, in a damp and/or heated state, into contact with a form-retaining conditioning article containing a conditioning agent on a surface thereof. Such article is a form-retaining base, e.g., a polystyrene foam sphere, having a conditioning coating on the exterior thereof which is removable upon contact with tumbling laundry in the dryer, and is transferable to the laundry by such contact.

By means of the conditioning treatment, various desirable properties can be imparted to laundry or other fabrics being conditioned but generally the most important effect obtained is softening of the materials and/or making them antistatic.

SUBJECT OF THE INVENTION

This invention relates to an article useful for conditioning fabrics. More particularly, it relates to such articles which are useful in softening fabrics, such as those in washed laundry, in automatic laundry dryers, by contact with the laundry and deposit of conditioning material on the surfaces of the laundry from the conditioning article.

BACKGROUND OF THE INVENTION

Fabrics, yarns, threads, manufactured textile articles, such as clothing and laundry have all been treated, at some stage in the manufacturing process or subsequently, to impart desirable properties to them. Compositions for modifying such items have been deposited on the surfaces thereof as solids, liquids, solutions, dispersions, emulsions, sprays, gases and vapors, at various temperatures and under various conditions, to give to the materials treated any of several desirable properties. Thus, the treated items have been made antibacterial, fire retardant, shrinkproof, antistatic, soil repellent, creaseproof, permanently pressed, water repellent, stain resistant, stiff or soft and combinations of such properties have been imparted to them. They have also been dyed, printed, perfumed, sized, starched and lubricated in such operations.

When laundry has been treated the treatment has generally taken place in the washing machine or after completion of laundering and drying. Thus, laundry has been subjected to terating agents incorporated in the detergent composition employed, the wash water or rinse water. Solvents, powders, pressurized sprays and treating liquids have been applied to washed laundry, either in the washing machine or dryer or after laundering and drying. However, the most prevalent practice for softening laundry and fabrics has utilized a cationic softening agent, which also often has antistatic properties, in solution in the rinse water, from which it is taken up by the laundry to which it is usefully substantive. Efforts have been made to soften laundry in the dryer by applying a softening agent to it from an impregnated flexible carrier, such as a paper, cloth or sponge. For example, in U.S. Pat. 3,442,692, it is mentioned that certain cationic softening agents may be vaporized in the dryer from such carriers

and can be absorbed by the fabrics in the dryer so as to impart softening effects to the laundry. The method described in the patent is accompanied by various disadvantages that mitigate against commercial acceptance thereof in many circumstances. The present invention avoids many of the drawbacks of utilizing such flexible bases impregnated with cationic softening agents. It also provides significant advantages over such a method and represents a real advance in the art of conveniently applying softening and antistatic agents and other conditioners in an automatic laundry dryer to improve the properties of laundry being dried.

Among the principal disadvantages of other methods of conditioning fabrics, the most important are staining of the conditioned laundry, poor conditioning, inconvenience in utilizing and inefficient consumption of conditioning material. Staining sometimes results from the entrapment of a treated flexible item in tumbling clothing and depositing of more conditioning agent on the surfaces of the clothing than is desirable. This may lead to the appearance of greasy spots on the treated laundry or color bodies or metal ions present in the wash water or metal on the washed articles may react with the excess conditioning agent present to produce highly colored deposits on the laundry. Sometimes, to limit such staining, the proportion of active ingredient present in the conditioning composition is diminished but this may result in poor conditioning effects being obtained. Such poor effects may also result from the conditioning material being insufficiently substantive to the fabrics being treated when the conditioning agent is included in the detergent composition or in the rinse water. Although the impregnated paper and cloth articles appear to be convenient to employ, merely being added to the dryer with the damp laundry when drying is commenced, they sometimes become wrapped in the laundry or may be torn during use. Thus, they may be difficult to locate and remove from the dryer. Further disadvantages of other conditioning treatments relate to the necessity for the housewife to watch the operation of the washing machine and add the conditioning agent at a particular point in the washing, as in the final rinse. As to inefficiency of consumption of the conditioning agent, much of the softening or other conditioning composition employed in the wash or rinse water is not removed by the fabrics and is discharged down the drain. When items such as papers, cloths or sponges are impregnated with conditioning compound, even after completion of the drying operation large proportions of such materials may still be found in the conditioning articles. Such disadvantages are overcome or diminished significantly by the present invention.

DESCRIPTION OF THE INVENTION

In accordance with the present invention, a method of treating fibrous materials with a conditioning agent comprises tumbling such materials in a damp and/or heated state in contact with an article which comprises a form-retaining base coated on a surface thereof with a conditioning agent which is removable under the conditions of the tumbling operation, and continuing the tumbling for a period of time long enough to apply to the fibrous materials coatings of the conditioning agent sufficient to satisfactorily condition the materials. The invention also relates to the article employed in conditioning the fibrous material.

In preferred embodiments of the invention, the article may be a form-retaining solid base, such as a rigid foamed plastic, e.g., polystyrene foam, coated over the entire exterior surface thereof with conditioning composition but with the coating penetrating the exterior surface of the rigid article to only a short distance, sufficient to hold the coating to the article until removed by contact with

the fibrous material to be treated. Also, the treated form-retaining article will be employed in an automatic laundry dryer substantially throughout the entire drying cycle, so that it will be subjected to high humidity and high temperature conditions sequentially.

Various objects, details, constructions, operations, uses and advantages of the invention will be apparent from the following description, taken in conjunction with the illustrative drawing of some embodiments thereof, in which drawing:

THE DRAWING

FIG. 1 is a central vertical cross-section of a conditioning article, showing the conditioning coating thereon, minor penetration of the coating into the article and an internal weight utilized to modify the density of the article;

FIG. 2 is an elevation of the article of FIG. 1, before use, showing the conditioning coating thereon;

FIG. 3 is an elevation of the article of FIG. 1, after use, illustrating the surface of the article after wearing away of the coating;

FIG. 4 is a vertical cross-section of another form of conditioning article;

FIG. 5 is a perspective view of another shaped conditioning article, having some surfaces coated with conditioning agent and others uncoated; and

FIG. 6 is a schematic illustration of apparatus employed to coat form-retaining base material with conditioning composition.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1 is shown a conditioning article **10** having form-retaining base **11** with the surface thereof **13** coated with a softening composition **15** designed to be rubbed off onto tumbling articles of laundry coming into contact therewith. Because polystyrene foam, such as that of the base illustrated, is usually so light, the density thereof may be adjusted by emplacement of a weight **17** of heavier material. Such weight is indicated as centrally located but may be molded in or otherwise located off-center, so as to create an eccentrically weighted conditioning article. Numerical **19** indicates penetration of the conditioning composition below the outer surface of the polystyrene foam, such penetration assisting in maintaining the coating **15** intact on form-retaining base portion **13**.

In FIGS. 2 and 3 are shown views of the same conditioning article, before and after use. The message indicating that the coating of conditioning agent has been removed may be printed onto the polystyrene or other substrate before coating and is largely obscured by the conditioning composition until that composition is sufficiently removed to warrant replacement of the article.

In FIGS. 4 and 5 are shown views of other shapes of conditioning articles, both of which are only partially coated with conditioning composition. Thus, in FIG. 4 is shown a slab of form-retaining base material **21** covered with fabric softener composition **23** on an upper surface thereof. In FIG. 5 there is illustrated a paperboard cube or box **25**, so constructed as to be form-retaining, which has antistatic composition on surface **27** and another different conditioning composition on surface **29**. Both may be applied simultaneously during treatment of fabric or other material to be conditioned.

In FIG. 6 there is shown a schematic representation of the coating of a continuous slab stock **31** of polystyrene foam or other suitable substrate with fabric conditioning composition to produce a coating **33** on the base **35**. As illustrated, the solvent solution or dispersion of fabric conditioner is fed from trough **37** onto roll **39** and thence onto slab stock **31** to form a liquid cover **41** thereon, which cover will be of sufficient viscosity so as not excessively to penetrate the surface of the slab stock but to penetrate into it sufficiently so that on solidification it may be firmly held thereto. The coated stock is then moved rapidly under drying apparatus **43** in which heat and air are directed onto the surface of the coating composition, causing rapid evaporation of the solvent and creation of a solid deposit of coating on the slab stock. The arrow indicates the flow of air past suction blower **45**, which air removes solvent with it. A cutting knife is shown schematically at **47** and separates the continuous coated strip into individual articles for use in conditioning fabrics. These drop into a storage bin **49** and upon completion of cooling and setting to final condition, they are removed therefrom and are ready for use.

A central concept of the present invention is to have a conditioning agent or composition for fabrics, their constituent materials or products made from them, coated onto a form-retaining article which is employed as a means for effectively transmitting that coating to the material to be treated. By using such an article in an automatic dryer or similar device, in which material to be conditioned is being tumbled, good, even distribution of conditioning agent over the surface is obtained. Because of the form-retaining nature of the article, it does not become distorted, rolled up, folded or readily buried or smothered in laundry or other material being conditioned. The coating does not crack or flake off the substrate readily, because there is no excessive straining, caused by folding and bending of the substrate. Because the coating composition is present only at the surface of the base material, it is not wasted by being lodged in inaccessible portions thereof. These advantages and many more result from employing the present products in accordance with this invention.

The bases to be coated with conditioning composition may be of a wide variety of materials and constructions. Generally, it will be preferred that these be light weight, so that the calculated density of the geometric shape described will be on the order of from 0.01 gram/cubic centimeter to 2 grams/cubic centimeter, preferably from 0.2 to 0.5 gram/cubic centimeter. The form-retaining substrate material may be either natural or synthetic. Various woods, such as balsa wood and other light weight woods, composition boards made from cellulosic materials, e.g., pressed board, ply woods, resin-treated woods and paperboards, light weight minerals and rocks, e.g., vermiculite, rottenstone, talc, preferably surface treated to increase strength, and synthetic organic polymeric plastics, preferably foamed plastics, e.g., polyurethane, polyester, polystyrene, polyvinyl chloride or nylon foams, may be used. Perforated or expanded metals may also be used, providing that suitable means are present for assisting in holding the coating material to the metal and preventing it from cracking or flaking off. Hollow items may be employed, with only the exterior surfaces being coated with conditioning composition. Such items may be formed by folding, molding, cementing, fusing, stapling, interlocking or otherwise connecting the various parts thereof to make the final desired shape. Generally, to facilitate contact with tumbling fabrics and easiest application of conditioning agent to the surfaces of such fabrics in an even manner, it is preferred to have a minimum of sharp corners on the coated article and the curves will generally be convex. Although the base should be form-retaining so as to avoid the various disadvantages of flexible substrates for conditioning agent, it is not necessary that it be absolutely rigid. Thus, although the rigid form of the plastics is that which will generally be employed, a limited amount of surface flexibility can be tolerated, as in a rubber ball, of either natural or synthetic rubber, since under the conditions of application of the conditioning composition, such a structure will not undergo significantly great or objectionable distortion. Also, unlike sheets of paper or cloth or conventional sponges, even after a slight change of shape of the base, it will quickly return to its form. Such a form-retaining base may have the density thereof modified by hollowing or adding thereto of weights, usually internally located, so as to provide

a final product which will be of the right overall density to make best contact with tumbling items to be treated. Also, in normal automatic laundry dryer operation, to promote best contact in the dryer with the treated articles, the base will have a volume from 5 cubic centimeters to 500 cubic centimeters, preferably from 10 to 100 cubic centimeters. Such sizes appear to tumble best with the laundry and make for most efficient coating of it. They also allow easier locating and recovery of the exhausted conditioning article after use, compared to very small particles or beads of material. Nevertheless, it will be clear that different sizes may be employed.

The conditioning agents which may be used to coat the base may be any of the wide variety of materials or mixtures thereof, such as were previously described at the beginning of this specification. Of a special interest are those which act to soften fabrics and make them more pliable and less scratchy to the touch and the skin of the wearer. Various softening compounds, useful in the treatment of items made of synthetic fabrics, are also antistatic agents, acting to nullify the annoying electric shocks often experienced by the wearers of such clothing. The treatment of laundry also prevents from adhering electrostatically to other such items, as it is removed from the dryer or as it is folded or otherwise treated afterward. In addition to softening and antistatic agents, the conditioning compositions may contain other compounds for imparting to the treated laundry or fabrics other desirable properties, such as antibacterial, anti-mildew, brightening and perfuming effects, etc. In some applications, various conditioning agents may be combined in the same composition and in other applications separate conditioning agents or compositions may be applied to the fabrics by differently coated portions of the base article as it tumbles into contact with the fabrics.

Of the fabric softeners and antistatic agents, there may be employed a wide variety, including nonionic, anionic and cationic substances. These are usually surface active materials and may be employed individually or in compositions with other such materials. Extensive research in this area has been undertaken in the laboratories of the Research and Development Department of the present inventors' assignee company and excellent fabric treating compositions for use in the present and other applications have been discovered. Thus, when some such compositions are mentioned herein they are not necessarily claimed as contributions of the inventors but instead, are illustrations of the useful materials that may be used in conjunction with their invention.

Among the nonionic fabric softeners and antistatic agents that may be used are poly-lower alkoxy lower alkylene glycols, the block copolymers of different lower alkylene glycols, the higher fatty alcohol esters of poly-lower alkylene glycols, the higher fatty alcohol ethers of poly-lower alkylene glycols, similar compounds wherein triols such as glycerol and polyols such as pentaerythritol are substituted for the glycol moiety, and other known nonionic conditioning agents containing balanced hydrophilic and lipophilic groups which contribute to their surface activity and conditioning properties. The lower alkylene and lower alkoxy groups are generally from 2 to 5 carbon atoms content and the higher fatty groups are of 10 to 20, preferably from 12 to 18 carbon atoms. The molecular weights of the various polymeric portions of molecules are usually at least 150 and preferably are from 300 to 25,000, although in suitable circumstances higher and lower weight polymeric portions are also applicable. Also of use are the amides, including the alkanolamides, e.g., the higher fatty amides and higher fatty acid mono- and di-lower alkanolamides, wherein carbon contents are as previously indicated.

The anionic conditioning agents may be any of the various surface active anionic softeners and antistatic agents, including the water soluble sodium, potassium, ammonium or magnesium salts of the well known synthetic anionic organic detergents, such as higher fatty alcohol sulfates, the higher fatty alcohol sulfonates, the linear higher alkyl benzene sulfonates, the higher fatty acyl taurides and isethionates, the higher fatty acid monoglyceride sulfates and the higher fatty acid sarcosides and glycines. Generally, the cation of such compounds will be an alkali metal or other water-solubilizing radical or element and in the lipophilic portion of the molecule, the anionic portion, the higher fatty or higher acyl groups will be of 10 to 20 carbon atoms, preferably of 12 to 18 carbon atoms. In addition to the synthetic organic detergents, primarily of the sulfated and sulfonated types, other corresponding materials which are available, such as the phosphates and borates, may be used. Also of great interest is the softening activity of the usual soaps, which are ordinarily referred to as water soluble, being the alkali metal, ammonium or substituted ammonium soaps of higher fatty acids, e.g., sodium stearate, triethanolamine laurate.

Of the cationic softening agents the most preferred are the water soluble quaternary ammonium salts but corresponding quaternary phosphonium salts and related materials can also be useful. The quaternary ammonium compounds constitute a known class of fabric softeners and have been described at length in the literature as being useful for this purpose. Such compounds are also mentioned in the U.S. patent previously referred to herein. Therefore, a lengthy compilation is not considered to be required. They will usually contain a plurality of lower alkyl groups on the quaternary nitrogen and one or two higher alkyl or equivalent groups thereon. The salt-forming ion will preferably be a halide, such as chloride or bromide, but may also be any other such useful solubilizing group, including iodide, acetate, benzoate, saccharinate, methosulfate, ethosulfate and bisulfate. Among preferred examples of such cationic compounds of the quaternary type are cetyl trimethyl ammonium bromide, dimethyl dilauryl ammonium chloride, diethyl distearyl ammonium chloride, dimethyl di-(hydrogenated tallow alkyl) ammonium chloride, stearyl dimethyl benzyl ammonium chloride and lauryl methyl dibenzyl ammonium bromide. Also useful are various other cationics, such as alkyl pyridine salts, alkyl imidazolines, higher alkyl amines, of the primary, secondary or tertiary types and higher alkyl guanidine salts, e.g., 1-methyl-1-stearyl aminoethyl-2-stearyl imidazolinium methosulfate, stearyl pyridinium halides, cetyl isoquinolinium bromide and alkyl morpholinium chlorides. In the aforementioned cases, lower alkyl is of 1 to 5 carbon atoms and higher alkyl is of 10 to 20 carbon atoms. Mixtures of the nonionic conditioning agents may be employed in conjunction with either the anionic or cationic softeners or antistatic agents and with a wide variety of other conditioners. Generally, however, mixtures of anionics and cationics will be avoided, because of objectionable interaction. However, amphoteric conditioners may also be used.

To improve the properties of the conditioning agents, either physically or chemically, various other substances may be incorporated with them. Thus, as is taught in other patent applications filed by us or our co-workers in the Research and Development Department of our assignee company, different materials may be combined with the conditioning agents to improve their softening properties, softening points, water solubility, resistance to cracking and flaking, and hardness and to make them non-staining and readily removable from treated fabrics. It is most desirable that the final softening composition be easily applied to the substrate, of desired viscosity to promote partial entrance into the substrate but to maintain most of the softening material exterior to the surface thereof, and of excellent softening properties, yet readily and completely removable from the treated fabric upon washing. Certainly, spotting or staining of the treated laundry is to be avoided.

Generally, the conditioning agent is chosen and modifiers, if desired, are employed with it to obtain the most desirable physical characteristics that will allow a coated

article to be prepared easily, shipped and stored at ordinary temperatures and used effectively after storage, with good dissolving and/or softening action under dryer conditions to obtain best transfer of conditioning agent. It has been found that waxy appearing coating compositions are best and preferably, the conditioning agents chosen are those of this nature and are sufficiently hard in and of themselves to be employed without modifiers. When other materials are used in the coating compositions, they will preferably comprise a minor proportion thereof and ordinarily from 50 to 100%, preferably from 80 to 100% of the coating composition will be active conditionnig agent.

The thickness of the coating applied to the surface of the treating article will generally be in the range of from 0.0005 to 0.5 centimeter but the extremes of this range are only rarely useful. Normally the thickness will be from 0.002 to 0.3 cm. and preferably between 0.01 to 0.1 cm. Such thickness is that external to the outer surface of the object coated. A porous or rough surfaced object or one having indentations therein may have some of the applied conditioning agent penetrate below the surface to a sufficient depth to hold the external coating firmly to the surface and prevent its cracking or flaking off from the surface during use. Thus, a minor proportion of the external thickness of conditioning composition may be present below the surface. Usually it will be desired to keep this proportion as small as feasible because the conditioning composition below the surface of the base will often be unavailable for application to laundry and will be wasted. Usually the subsurface proportion of coating composition will be from 10 to 30% of that exterior to the base. In terms of weights applied, the conditioning composition will usually be employed in the range of 0.0005 to .5 gram/square centimeter of base surface, preferably from 0.002 to 0.3 g./sq. cm. and most preferably from 0.01 to 0.1 g./sq. cm.

So that the conditioning composition may have best utility under the conditions of operation of a normal home automatic laundry dryer it should be at least partially water soluble or dispersible at a temperature within the normal operating range of a dryer. Also, it should be form-retaining at temperatures below 30° C., so that it does not run off the substrate in storage, where temperatures may be above that point. In the dryer, initially the hot air blown through the damp or wet clothing will be much reduced in temperature, due to the evaporation of moisture from the clothing and the dropping of the surface temperature of the clothing to the wet bulb temperature. Under such conditions, when the temperature may drop as low as 10° C. the initial removal of conditioning agent from the treating article may be in part due to softening of the article by the presence of the moisture in the clothing. Subsequently, as the temperature in the dryer increases, the coated article becomes warmed and softened so that to make rubbing off of the conditioning agent onto the laundry easier. With the types of bases described and of the sizes mentioned the small quantities of conditioning agent abraded onto the clothing are then spread over the clothing by a combination of moisture and heat effects, together with the rubbing effects of other fabrics touching the points at which the conditioner has been applied. Such action is so fast that there is little opportunity for the deposit of too much conditioning agent, providing that it does not flake off from the treating article.

The manufacture of the present fabric treating article is relatively simple when the considerations for making a successful product, previously mentioned, are kept in mind. The appropriate conditioning composition is prepared as a solution, emulsion, dispersion or sprayable composition or as is now often preferred, as a melt. The use of melts and their advantages are described in an application filed the same day as the present application by Mr. P. J. Falivene, entitled Process for the Manufacture of Fabric Conditioning Article. When melts are employed, soon after application the surface is cooled and the melt is solidified. When solutions are employed, the solvent contents thereof will normally be from 20 to 80%, preferably around 20 to 40%, it being kept in mind that it is not necessary to completely dissolve the conditioning composition. If considered desirable, the viscosity of the coating composition may be adjusted by temperature regulation or thickeners may be added to it, providing that they have no adverse effects on the laundry being conditioned. The application of the conditioning composition is made to the desired depth on the base employed either in a single step or in a plurality of repeated steps wherein, following each application, the melt is cooled or the solvent is evaporated, to form a dry and form-retaining coating on the base. Penetration of the rough surface of the base may be regulated by adjusting the composition viscosity or by modifying the base surface to include depressions or other structures in which coating composition may find gripping contact. In some cases, as when polymeric plastic foams are being used, any very rough edges thereof which might tend to be held to tumbling laundry may be removed before application of the coating composition.

A method of applying a coating to a single surface of an object which is to serve as a conditioning article is illustrated in FIG. 6. Modifications of this method may be employed wherein coating is applied to the bottom of the strip of plastic so as to limit penetration. Also, combinations of roll coating, dip coating, and spray coating may be used. The main consideration will be to make sure that the coating conditions, drying and/or cooling, composition viscosity and base characteristics will be such as to result in the desired thickness and penetration by the coating composition. Generally, the temperature of cooling gas will be ambient, preferably from 10 to 30° C. and cooling or solvent-removing air flow will be high, usually at a velocity of from 1 to 10 feet per second past the surface of the coated base. Care will be exercised to prevent impregnation of the article being coated or penetration into a hollow interior portion thereof of coating composition, since such composition will usually be unavailable for conditioning action, due to its inaccessibility. Although for simplicity of illustration, the coating process illustrated is an automatic one involving the coating of continuous strips of base material and subsequent dividing of this into suitable lengths, modifications of the process, as mentioned above, may be employed for coating materials of various shapes. Thus, spheres may be rolled or tumbled in a shallow melt or solution of conditioning composition, repeatedly dried or cooled and re-treated. In some cases they may be attached to a wire and led through a melt or solution of conditioning composition, providing that conditions are so regulated as to prevent impregnation.

The use of the present compositions is simple and trouble free. In fact, one of the main advantages of the present articles is that they may be employed by untrained housewives to condition laundry conveniently and accurately. Thus, it is only necessary that the housewife remove one or more of the treating articles from a package and add it to the dryer with the laundry to be dried. To obtain combination conditioning effects one may use a mixture of different conditioning articles, a hybrid composition on a single article or articles having different conditioners on different parts thereof. Preferably, the addition of the articles will be after the laundry has been placed in the dryer and immediately before dryer operation begins. The invention is particularly intended for use in home automatic laundry dryers of the types wherein a heated forced air blast is directed into a revolving drum containing tumbling laundry. However, it is also useful in commercial and industrial dryers and tumbling equipment operating under similar conditions. While it is normally intended that both heat and circulating air should be used, in some circumstances, it may be unnecessary to

employ either of these. Sometimes, it may be sufficient to tumble the laundry into contact with the treating article, even without drying air or heat. In such cases, drying may be conducted subsequently. A tumbling motion of the laundry in the revolving drum is important, however. If the drum is too full, so that the laundry merely spins around with the drum, even with the present treating articles, it might be that contact of the conditioning composition with the fabric to be treated would be maintained too long in one place, which could lead to staining or spotting with certain compositions. To prevent this, and to be sure of maintaining a relative tumbling action between the laundry and the conditioning article, wherein the moving laundry rubs against the conditioning article, the load of wash in a home dryer will normally be from 4 to 10 pounds, dry weight, so that it does not fill the entire dryer and prevent tumbling. Such weights of laundry will generally occupy from 10 to 70% of the volume of the dryer and preferably will occupy from 30 to 60% thereof. In addition to the free volume in the dryer, the speed of rotation of the drum is of importance. To get good relative tumbling effects between the article and the laundry, this should be at about 20 to 100 revolutions per minute and preferably is about 40 to 80 revolutions per minute. At such conditions, laundry is moved quickly past the conditioning article and excellent transfer of conditioning agent is obtainable. Drying will usually take from 5 minutes to 2 hours, generally between 20 minutes and 1 hour when the drying gas employed is circulated frequently, with changes of volume of gas in the dryer drum at the rate of about 5 to 50 per minute and with the gas temperature being at 10° C. to 90° C., preferably from 50 to 90° C.

The presence of flights or other interruptions on the smooth internal wall of the revolving drum assists in creating a good tumbling effect. This is of importance because the height from which laundry or conditioning article is dropped, and its weight, affect the force with which contact is made between article and laundry and affect the amount of conditioning agent rubbed off onto the laundry. As would be expected, the longer the tumbling continues, the more evenly distributed will be the conditioning agent and the more will have been applied. Yet, even if distribution is not perfectly even, good conditioning effects are obtained due to the softening of the fibers at a sufficient number of points so that the overall effect is a softness from the interposition of softening points at which the fabric is pliable.

After completion of the softening operation, the conditioning article is removed and examined. If sufficient softener remains, the article may be employed again, until complete removal of the coating. To obtain different levels of conditioning activity or different conditioning effects, a plurality of treating articles may be used at one time or sequentially. After consumption of the coating, the bases may be disposed of or if desired, may be re-coated. Coating compositions of the types described herein may be marketed in appropriate solvents or in other systems to allow the user to recoat the bases, if desired.

The following examples are provided to illustrate various embodiments of the invention. Unless otherwise in dicated, all parts are by weight, temperatures are in ° C. and measurements are in the metric system.

EXAMPLE 1

Foamed polystyrene spheres having a diameter of 4 cm., cut from a slab of styrofoam board, are dip coated by repeated rapid immersions in an aqueous alcoholic solution-suspension of a block copolymer of ethylene oxide and propylene oxide, having a molecular weight of about 2,000, sold as Pluronic F–127 by Wyandotte Chemical Company, sodium tallow alcohol sulfate slurry, which comprises 28% of active ingredient, 6% of sodium sulfate and 66% of water, and ethanol (SD40 alcohol). The proportions of ingredients employed are 2:1:1. The coated spheres made are of a density of about 0.2 gram/cubic centimeter, due to containing an internal weight to adjust density. Before coating, the polystyrene balls are smoothed down, using a fine sandpaper or buffing brush so as to remove any rough edges thereon which might become entangled in laundry to be conditioned. The total thickness of the coating deposited is about 0.2 cm. and it is applied over the entire surfaces of the polystyrene spheres. The weights of conditioning composition applied range from 6 to 12 grams, with the average being about 9 grams. Coating is effected by repeatedly quickly dipping the spheres into a container full of conditioning composition, removing them and evaporating solvent off by heating and blowing with air at room temperature.

In use, one such conditioning article is added to a home automatic laundry dryer of the horizontal axis flighted tumbling drum type after addition of an 8 pound wash load of mixed laundry, which is approximately 50% synthetic and 50% cotton or rayon in content. The synthetics employed include nylon, polyester-cotton blends and other synthetics, of which the nylons are most prone to electrostatic effects. Some of the materials are resin coated, permanently pressed items. Immediately after addition of the conditioning sphere, the operation of the dryer commences and drying air at a temperature of 70° C. is forced through the dryer at the rate of 200 cubic feet per minute, with the drum rotating at a speed of about 60 r.p.m. Initially the temperature of the damp laundry is low, approximately 20° C., but after most of the drying has been completed, it increases to almost 70° C. The conditioning coating on the surface thereof softens a little initially, due to the action of water and some heat in contact with it and when the temperature of the sphere becomes appreciably warmer the coating becomes plastic. This occurs at about 60° C. but for similar compositions, with their hardnesses or waxy characteristics adjusted by modifying of proportions or adding modifying chemicals, the plastic range in which the composition becomes soft enough to be readily removed by tumbling laundry is usually within the 40 to 90° C. range, preferably from 50 to 80° C.

After 50 minutes of drying, the machine is turned off and the laundry is removed. It is satisfactorily dry, possesses no electrostatic activity and feels soft to the touch, compared to a similar load not treated by the mehod of this invenion. The clothing treated in the dryer exhibits no spots or stains from excessive contact with conditioning agent. The styrene ball is readily located among the laundry and is removed. Upon examination, it appears that approximately 2 grams of softening chemical have been removed from the surface, indicating that the ball can be used again. Upon repeated use, more softener is removed and eventually, the ball is almost completely bare of surface softening agent. However, examination of the undersurface shows that approximately 2 grams of softener remain there, having being prevented from contacting the tumbling laundry.

When, instead of the combination of anionic and nonionic softening agents being employed, an equivalent proportion of each is used separately, so that two to three grams of softening agent are applied to the conditioning article, good softening effects and no spotting or staining are noted. In the case of the anionic softening agent, the addition of approximately 10% of paraffin or higher fatty monoglyceride aids in preventing flaking off of softening agent during tumbling in the dryer. Also, aiding in such effect is the sub-surface conditioning agent in the closed cell polystyrene sphere, which coheres with the external material.

Similar effects are obtained by employing other shapes of form-retaining bases made from other light weight materials, e.g., paperboard, wood, minerals and other synthetic organic plastics. Also, when other anionic or nonionic softeners and antistatic agents are used, such as the higher fatty acid soaps, the monoglyceride sulfates, linear

alkyl benzene sulfonates or the higher ethers and esters of polyoxyethylene glycol, good conditioning effects are also obtained.

EXAMPLE 2

3 grams of a quaternary ammonium chloride softening and antistatic agent of the type known as Arquad, a product of Armour Chemical Company, are applied to both major surfaces of a slab of foamed rigid polyurethane of approximately twice the surface area of the spheres described in Example 1 and to other bases of similar surface areas, including paperboard cubes, polystyrene foam spheres and balsa wood dics. Applications to the latter three types of structures are by repeated sprayings. The particular quaternary compound employed is dimethyl, di(hydrogenated tallow alkyl) ammonium chloride and it is present in the solution-suspension with approximately 40% of the total weight being aqueous alcoholic solvent, of which 80% is water and 20% is isopropanol. The major surfaces of the various bases are coated with the conditioning composition and the solvent is quickly evaporated off. In a similar manner, for comparative purposes, a similar weight of conditioning composition is applied to a paper towel of corresponding area, using both sides of the towel. In the various cases, except where the paper towel has been impregnated with softening agent, the pentration of such agent below the external surface of the base is held to about 20% of that outside the base surface. In the paper towel, the coating composition completely impregnates it and the internal conditioning agent is more than half the thickness of the external deposit on the base.

The various conditioning articles are tested by being added to loads of laundry processed in the same washing machine and dryer, in a manner described in Example 1. After completion of treatment, the paper towel impregnated with softening composition is difficult to locate and is sometimes finally found in creased and folded condition buried inside an item of laundry. On the other hand the form-retaining articles made according to the present invention are readily located and are not entrapped with particular pieces of laundry. Conditioning effects obtained are about the same, despite the entrapment of the paper article, if that entrapment occurs in the latter part of the conditioning process but a significant difference is noted between the "control" and "experimental" methods, in that the laundry treated with the paper towel item sometimes exhibits greasy or waxy spotting and discoloration, due to deposits of large quantities of conditioning agent on the laundry during the period when trapped and in some cases due to reaction with metal in the laundry. The severe staining obtained from the treated paper towel, even if occurring only occasionally, is bad enough to make such a product unacceptable to the houswife, inasmuch as the stain is very difficult to remove and often requires dry cleaning, which is sometimes unsuccessful. Furthermore, the items of the present invention are more economical because the substrate is not impregnated with softener and therefore, the loss thereof due to inaccessibility can be minimized, whereas that loss in the impregnated paper towel is usually greater. Even when much thinner coatings of conditioner are applied to the toweling and the areas thereof are increased greatly, some staining still results on occasions.

Instead of the particular quarternary ammonium salts mentioned, other cationic compounds having softening properties may also be used, such as cetyl trimethyl ammonium bromide, trimethyl amine and stearyl pyridine. Such materials may be applied to the various bases by the most convenient of the methods described in the preceding specification.

The present invention has been described with respect to various illustrations and examples thereof but it is not to be construed as being limited to these. It will be evident to one of skill in the art that equivalents may be substituted for elements and steps in the invention without departing from the spirit of the invention or going outside the scope thereof.

What is claimed is:

1. A method of treating laundry with conditioning agent which comprises tumbling the laundry in a damp state in contact with an article which includes a form-retaining base coated on a surface thereof with a conditioning agent which is removable under the conditions of operation and is transferable to the laundry, and continuing the tumbling to transfer to the laundry a conditioning quantity of the conditioning agent.

2. A method according to claim 1 wherein the conditioning article comprises a fabric softening agent and/or an antistatic agent in a coating composition present at an external surface of the article and not completely impregnating it, and the conditioning takes place in an automatic laundry dryer.

3. A method according to claim 2 wherein the form-retaining base is of a light weight material, has a surface sufficiently porous so as to allow limited penetration of the conditioning agent to bind it to the base and prevent flaking off thereof during dryer operation, is sufficiently rigid to prevent distortions upon contact with the laundry which could cause flaking off of conditioning agent from a smooth base surface, and is light weight so as to be readily tumbled with the laundry in an automatic dryer.

4. A method according to claim 3 wherein the conditioning operation takes place at a temperature in the range of 10° C. to 90° C., with a first part of the conditioning being at a lower temperature than the final conditioning, due to the presence of excess moisture in the laundry being treated, so that the treating composition is removed from the conditioning article during the operation of the dryer by contact of the article surface coating with laundry when the coating is softened by a combination of softening actions due to the presence of moisture and heat in contact with the conditioning article surface.

5. A method according to claim 4 wherein the drying takes place in a tumbling drum, filled in tumbling state with from 10 to 70% of its volume of laundry, the drum is rotating at a speed of from 20 to 100 revolutions per minute, the temperature of the drying gas employed is from 50 to 90° C., the time of drying is from 5 minutes to 2 hours, the volume of the form-retaining base is from 5 to 500 cubic centimeters and the coating of conditioning agent is 0.0005 to 0.5 g./sq. cm.

6. A method according to claim 5 wherein the fabric softening article is a polystyrene foam ball coated with from 0.002 to 0.3 gram per square centimeter of cationic quaternary ammonium salt softening agent composition.

7. An article for treating fibrous materials under such conditions as obtained in an automatic laundry dryer to condition them which comprises a form-retaining base and a coating on an external surface of such base, which coating is removable upon contact with tumbling laundry in a damp state and is transferable to the laundry so as to coat and condition it.

8. An article according to claim 7 the coating comprises a fabric softening agent and/or an antistatic agent in a coating composition which is present at the surface of the article and does not completely impregnate it.

9. An article according to claim 8 wherein the form-reaining base is of a light weight solid material, of a volume of 5 to 500 cc., so as to be readily tumbled with the laundry in an automatic laundry dryer, has a surface which allows limited penetration of the conditioning agent, sufficient to bind the external conditioning agent thereto and prevent flaking off thereof during dryer operation, and is sufficiently rigid to prevent dis-

tortions thereof upon contact with tumbling laundry which would cause flaking off of conditioning agent from a smooth base surface, and the conditioning agent coating is from 0.0005 to 0.5 g./sq. cm. thereon.

10. An article according to claim **9** wherein the base is of a volume of 10 to 100 cc., the coating is from 0.002 to 0.3 gram per square centimeter and a minor proportion of such coating is internal of the surface of the form-retaining base.

11. An article according to claim **10** wherein the form-retaining base comprises polystyrene foam.

12. An article according to claim **11** wherein the surface of the polystyrene foam is non-adherent to tumbling laundry after removal of conditioning coating.

13. An article according to claim **12** wherein the coating composition comprises a cationic quaternary ammonium salt fabric softening agent, the polystyrene foam base is in the shape of a sphere and the volume thereof is from 10 to 100 cubic centimeters.

References Cited

UNITED STATES PATENTS

3,442,692	5/1969	Gaiser	117—139.5 CQ X
2,788,297	4/1957	Louis	117—109 X
3,335,022	8/1967	Sincock	117—138,8 E X
2,876,127	3/1959	Ware	117—139.5 CQ X
2,778,748	1/1957	Rowe et al.	117—138.8 E
2,817,604	12/1957	Louis	117—109 X
2,825,299	3/1958	Herman	117—109 X
2,880,118	3/1959	Taylor	117—109 X
3,361,688	1/1968	Bonitz et al.	117—100 C X

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