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METHOD OF FULLING AND SCOURING WOOL

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19 Claims. (Cl. 26—19)

This invention relates to the finishing of woolen textiles. More particularly, the invention relates to improved media for the fulling and scouring of woolen materials and to methods of fulling and scouring employing the new media.

Fulling is one of the most important operations in the finishing of woolen materials and results in a woolen material losing its open structure thereby acquiring a compact, substantial appearance and feel. All of the factors necessary for satisfactory fulling are not fully understood but it is known that the fibers must be wet as dry fibers do not full, and it is known that there must be movement of the fibers relative to each other under such conditions that undue mechanical damage does not result.

Prior to this invention, an aqueous alkaline soap solution was the only medium generally considered to give completely satisfactory results in fulling. The soap acts as a wetting agent for the wool fibers and permits working of the fibers without undue mechanical damage. The use of soap also allows the securing operation, necessary to remove the mineral or other oils placed on the wool for spinning, to be partially combined with fulling so that a clear water wash and rinse is generally all that is needed, following the fulling operation, to result in a clean fabric. In other words, the soap acts as both a fulling and scouring agent or, as it is called in this specification, a fullscouring agent.

Even though a fullscouring agent comprising soap gives satisfactory results, it has been found that numerous unexpected advantages can result from the use of a synthetic fullscouring agent and according to this invention there is employed in fullscouring an aqueous mixture of synthetic surface active agents comprising a detergent which is characterized by being more hydrophilic than lipophilic and a wool plasticizer which is characterized by being more lipophilic than hydrophilic.

One major advantage of employing the fullscouring media of this invention is that they permit fulling and scouring under neutral or acid conditions. While wool can withstand reasonably strong acid treatment without material damage, it is relatively sensitive to strong alkalis and the fact that prior art methods employing an aqueous alkaline soap solution for fullscouring cause material damage to the wool fibers is well recognized. By employing neutral or acid conditions and the new fullscouring media of this invention, alkaline damage to the wool can be completely eliminated.

Another important advantage of this invention is that it permits a material reduction in the number of operations necessary for the finishing of woolen materials. The conventional operations performed in textile finishing are as follow: (1) Doubling the cloth and sewing the salvages together or "tacking," (2) fullscouring, (3) acidifying, (4) detacking and opening the cloth to full width, (5) carbonizing, (6) retacking, (7) dry milling, (8) rinsing, and (9) dyeing. This invention, however, permits the cloth to be fullscoured subsequent to carbonization while still in an acid condition and since it has been found that the wool oil normally present in the

textile material does not interfere, practically speaking, with the carbonizing step the only operations necessary are: (1) carbonizing, (2) tacking, (3) dry milling, (4) fullscouring and (5) dyeing. It can be seen that by such a procedure the textile material is never in an alkaline condition so that the neutralizing step is eliminated; those treatments which are performed on the cloth in open width are segregated from those which require the cloth to be folded, thus eliminating "piece meal" handling; and the need for an additional rinsing prior to dyeing is eliminated. By thus reducing the number of operations performed on the woolen material, the entire finishing procedure is materially accelerated. It will be understood, however, that the fullscouring agents of this invention can be employed, if desired, in finishing procedures that are conventional except for the use of the new agents.

A further advantage of this invention is that the woolen fabrics are more amenable to level dyeing at a subsequent stage in finishing. Fullscouring with an alkaline soap solution is notorious for its deleterious effect on dye absorption early in the dyeing cycle in that it favors differential pick-up of the dye with ultimate unlevelness of shade. These undesirable effects are not encountered when fullscouring according to this invention and level shades when dyeing are readily obtained.

Other advantages obtained by employing the fullscouring media of this invention include a more rapid fulling of the woolen material with superior results. Textile materials fullscoured according to this invention not only, in most instances, have a more desirable hand and appearance but also generally have a greater tensile strength for equivalent area shrinkage than goods fullscoured in an alkaline soapy medium.

The non-ionic detergents constitute a well-defined class of synthetic surface active agents and are as a class suitable for use in this invention. The members of this class of compounds are in each instance compounds prepared by substituting a hydrophobic radical with sufficient non-ionic solubilizing groups to result in a compound which is water soluble or at least self dispersing in water. While numerous water solubilizing groups have been described in the literature, substantially all of the non-ionic detergents commercially available at the present time have a polyethylene glycol chain as the solubilizing group and while the number of oxyethylene groups in polyethylene glycol chain will vary, most have from about 8 to 20. This is simply because it has been found that with most hydrophobic groups, this number of oxyethylene groups is necessary for good detergency, and although compounds having both a greater number and a lesser number may be and generally are excellent dispersing agents, they are not generally considered as being suitable detergents.

Within the general class of polyethylene glycol nonionic detergents, I further prefer to employ one which may be represented by the general formula:

$$RY[(C_2H_4O)_nH]_m$$

wherein R is a lipophilic radical having from 10 to 20 carbon atoms, Y is a linking radical as illustrated by ether (—O— and —S—), ester (—COO—), and amide (—CONH— and —CON=) linkages, n is an integer from about 8 to 20, m is an integer from one to two inclusive and the product of m times n is equal to from about 8 to 20 inclusive.

In addition to the non-ionic detergents, I can also employ a class of detergents represented by the formula:

$$RY[(C_2H_4O)_nH]_m$$

where R, n and m are as defined in the preceding para-

graph and Y is an amine (—NH— and —N=) linking radical.

The lipophilic group represented by R in the above formula is highly compatible with the fats and greases present in the wool, including any lubricant that may be added thereto. This radical may suitably be a fatty residue derived from any of the fatty acids of natural oils, as illustrated by capric acid, lauric acid, stearic acid and oleic acid, or R may represent an alkylaryl radical derived from the corresponding phenol, as illustrated by dodecyl phenol, and nonyl phenol, or derived from an alkyl naphthol having not more than about 20 carbon atoms. The lipophilic portion of the molecule may also be a mixed ester as illustrated by radicals derived from sorbitan mono-oleate or the like, or the radical may be substantially any other lipophilic, non-ionic group known to result in satisfactory detergents.

As previously stated the fulling media of this invention also contains a wool plasticizing agent, and as with the non-ionic detergents, the wool plasticizers constitute a well defined class of compounds. Members of this group contain in their molecular structure a very effective hydrophobic group and a somewhat less effective solubilizing group or groups, so that the net effect is that the compound is more lipophilic than hydrophilic. The plasticizer may be either anionic, non-ionic or cationic or, if desired, a mixture of non-ionic and anionic or non-ionic and cationic plasticizing agents may be employed. Of course, as is well known to those skilled in the art, the anionic plasticizing agents and cationic plasticizing agents are not completely compatible and should not ordinarily be used in combination.

The cationic plasticizers have been found as a class to give superior results when employed in this invention and therefore constitute the preferred type of plasticizer. These compounds are generally of two distinct types. The first type has a typical hydrophobic group or groups and a salt-forming amino radical as a water solubilizing group. In some instances the amino radical is the only solubilizing group as is the case with the simple fatty amine plasticizers. In other instances, secondary solubilizing groups may be present as is the case in the acylpolyamine plasticizers which are generally monoacylated aliphatic polyamines wherein the acyl group contains a hydrophobic aliphatic hydrocarbon radical, or acid addition salts thereof. In this case the amide group acts as a secondary solubilizing radical. The second distinct type of catonic plasticizers are the quaternary ammonium derivatives of amines having a hydrophobic group or groups and are produced by exhaustive alkylation of a suitable amino compound or reaction of the amine with ethylene oxide. As with the fatty amine plasticizers, the tertiary amine plasticizers are generally employed in the form of salts. The quaternary ammonium plasticizers may also have additional solubilizing groups as illustrated by carboxamide groups and ester groups and in fact a preferred plasticizer of this type is a quaternary ammonium salt of a fatty acylpolyamine. Both types of cationic lipophilic plasticizers are commercially available and are sold under a variety of trade names as illustrated by "Armac HT," "Catylon," "Sapamine WL," "Ahcovel G," "Soromine A," "Onyxsan," "Triton K–60," "Texsoft Conc.," and "Lupomin Q." "Armac" is the registered trademark of Armour and Company and is applied to primary amine acetates of the formula $RNH_2.Ac$ wherein R designates a long chain aliphatic radical and Ac designates acetic acid. "Armac HT" is applied to stearyl amine acetate which may be represented by the formula $C_{17}H_{35}NH_2.HOOCCH_3$. "Catylon" is the trademark of Hart Products Corporation and is applied to tertiary amine acetates having at least one long chain aliphatic radical. "Catylon C" is applied to a tertiary amine acetate reportedly having the proximate formula

$$C_{16}H_{33}N(CH_3)_2.CH_3COOH$$

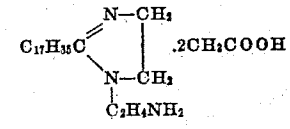
"Sapamine WL" is the registered trademark of Ciba Company, Inc. and is applied to a fatty-acylpolyamine which is reportedly the diacetate salt of a condensation product of stearic acid, or an amide forming derivative thereof, and diethylene triamine which product is reported to have the proximate formula

$$C_{17}H_{35}CONHC_2H_4NHC_2H_4NH_2.2HOOCCH_3$$

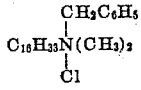
"Ahcovel" is the registered trademark of Arnold Hoffman Company, Inc. for a series of textile plasticizers or softening agents with the mark "Ahcovel G" being applied to a complex fatty-carbamide salt reportedly prepared according to the procedure disclosed in U.S. Patent #2,304,369 by condensing together urea and the condensation product of stearic acid and diethylene triamine. "Soromine" is the registered trademark of General Dyestuffs Corporation applied in general to textile finishing agents with "Soromine A" being applied to an amino ester salt reportedly having the proximate formula:

$$C_{17}H_{35}COOC_2H_4N(C_2H_4OH_2.CH_3COOH$$

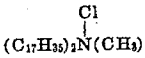
after neutralization with acetic acid. "Onyxsan" is a registered trademark of Onyx Oil and Chemical Corporation and is applied to cation-active alkyl imidazoline hydroacetates prepared according to U.S. Patent #2,200,815. "Onyxsan HSB" is applied to an alkyl imidazoline hydroacetate reportedly having the proximate formula:



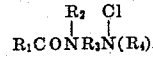
"Triton" is the registered trademark of Rohm & Haas Company with "Triton K–60" being applied to a quaternary ammonium salt reportedly having the proximate formula:



"Texsoft Concentrate" is a trade name applied by Armour and Company to a quaternary ammonium salt reportedly having the proximate formula:



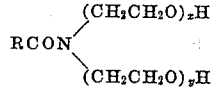
"Lupomin" is a registered trademark of the Jacques Wolf and Company with "Lupomin Q" being applied to a quaternary amino fatty acid amide reportedly of the general formula:



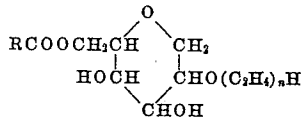
wherein R_1CO represents an acyl group derived from a fatty acid such as stearic acid; R_2 represents hydrogen or lower alkyl; R_3 represents a divalent aliphatic connecting radical; and R_4 represents a lower alkyl group.

The non-ionic plasticizing agents are in general closely related to the non-ionic detergents illustrated above except that they contain in their molecular structure a smaller number of oxyethylene groups or, in other words, fewer than about 8 oxyethylene groups. Although, in some instances the use of a non-ionic plasticizer alone gives superior results, as a general rule their use as the only plasticizing agent in the new fulling media of this invention is not advantageous and they are usually employed in combination with a cationic or anionic plasticizer. The non-ionic plasticizing agents are also com-

mercially available and are sold under various tradenames as illustrated by "Ethofat 60/15," "Ethomid HT/15," and "Avcosol 100." "Ethofat" is a registered trademark of Armour and Company applied to polyoxyethylene fatty acid esters of the general formula $RCOO(C_2H_4O)_nH$, wherein n represents an integer, with "Ethofat 60/15" being applied to a product of this formula wherein R represents the radical $C_{17}H_{35}$ derived from stearic acid and n is equal to 5. "Ethomid" is also a registered trademark of Armour and Company applied to polyoxyethylene fatty acid amides of the general formula:



wherein RCO represents an acyl group derived from a fatty acid and x and y represent integers. "Ethomid HT/15" is applied to a product derived from hydrogenated tallow amide and 5 mols of ethylene oxide. "Avcosol 100" is the registered trademark of American Viscose Company and is applied to a product manufactured for them by the Atlas Powder Company which product is reported to be a polyoxyethylene sorbitan fatty acid ester of the proximate formula:



wherein RCO represents an acyl group derived from a long chain fatty acid such as lauric acid or palmitic acid and n represents an integer.

The anionic plasticizing agents are generally alkali metal salts of fatty sulphonic acids or fatty carbamic acids and this class of plasticizers is likewise commercially available. Suitable anionic plasticizing agents for use in this invention are sold under various trade-names as illustrated by "Avitone A," "Ahcovel E," "Atcosoft N," and "Velvapex HD8121." "Avitone" is a mark applied by E. I. du Pont de Nemours and Company to sodium alkyl sulfonates supplied for use as textile finishing agents. "Ahcovel E" is a mark applied by Arnold Hoffman Company to an alkali metal salt of a fatty carbamide compound prepared according to the disclosure of U.S. Patent #2,344,259. "Atcosoft N" is a mark applied by Metro-Atlantic, Inc. to their anionic substantive textile plasticizing agent stated to be an amine condensate. "Velvatex HD8121" is a mark applied by Apex Chemical Company, Inc., to their anionic substantive textile plasticizing agent stated to be a modified fatty amide. As with the non-ionic plasticizing agents, the anionic plasticizers in some instances give superior results but are as a general rule not as desirable as the cationic plasticizers.

The concentration of surface active agents may vary within wide limits although as a general rule the use of quantities in excess of about 10% active ingredients on the weight of fabric is not advantageous and for reasons of economy the surface active agents are seldom employed in quantities exceeding 6% of the fabric weight. The action of the detergent and of the plasticizer is, at least to some extent, complementary so that by employing an excess of one agent, smaller quantities of the other may be satisfactorily employed. The optimum ratio of detergent to plasticizer depends upon a number of factors and particularly upon the amount of wool oil in the fabric. As the amount of wool oil decreases, the amount of plasticizer should be increased and the amount of detergent can readily be decreased. When one is fullscouring clean fabrics, as little as 0.5% of the detergent may be satisfactorily employed but the amount of plasticizer should be correspondingly increased, and under these conditions one may advantageously use as much as 3 to 5% plasticizer at least part of which, for instance 10–50%, is preferably of the non-ionic type and the remainder of the cationic type. On the other hand, when one is fullscouring woolen fabrics heavily laden with wool oil, the amount of detergent can advantageously be as much as 3 to 5% of the weight of the fabric and the quantity of plasticizer may satisfactorily be as low as 0.5% of the fabric weight. As a general rule, however, it can be said that the concentration of the plasticizer and of the detergent should in each instance be preferably from about 1 to 3% of the weight of the fabric being fullscoured.

The fullscouring operation can be conducted at any pH which does not result in the precipitation or destruction of the plasticizer and which is not known to be unduly injurious to wool. In other words, if one is employing a cationic fatty amine salt as a plasticizer, the pH of the fullscouring medium should be maintained on the acid side but on the other hand, if one is employing an anionic, non-ionic, or quaternary ammonium cationic plasticizer, fullscouring can readily be conducted in basic as well as acidic media. However, it is a primary advantage of this invention that fullscouring can be conducted on carbonized unneutralized cloth and, as previously explained, it is usually advantageous for numerous other reasons to employ neutral or acidic conditions.

The manipulative procedure for fullscouring according to this invention is, in most respects, conventional and comprises milling the fabric wet out with the fullscouring medium until the desired degree of fulling has been achieved, transfering the fabric containing fullscouring medium to a washer, adding clear water and then washing and rinsing to complete the scouring operation. If desired, additional fullscouring medium can be added to the wash although this is generally not necessary and a clear water wash employing the fullscouring medium retained in the cloth from the fulling operation is generally satisfactory. The process of this invention, however, possesses an advantage in this respect since it has been found that the clear water wash and rinse can satisfactorily be conducted with water at room temperature while in conventional practice a temperature of from about 100° F. to 120° F. is employed. It has further been found that this invention makes possible a drastic reduction in the length of time required for rinsing and that the time in the washer can be shortened from approximately 180 minutes, as normally required, to 45 minutes without decreasing the efficiency of the procedure.

The invention will now be further illustrated by the following specific examples:

EXAMPLE I

Six pieces of 16 oz. woolen goods manufactured using a non-ionic type wool oil sold as Druspin WL by E. F. Drew, which have been carbonized in the grease, tacked, and dry-milled and which still contain the acid of carbonization are passed into a soaper and through a solution containing 3 ounces per gallon of red oil polyoxyethylene ester having 15 mols of ethylene oxide per mol of red oil and 1½ ounces per gallon of a plasticizer, in this case, a quaternary ammonium derivative of a fatty-acylpolyamine, sold under the trade name of Lupomin Q by Jacques Wolf & Co. of Passaic, New Jersey. Wet pick-up is adjusted to about 70–100%. The pieces are then introduced into a fulling machine of the type manufactured by James Hunter and others and it is placed in operation and the goods fulled for 55 minutes. From the fulling machine, the goods are delivered to a dolly washer, washed for 25 minutes, employing only the mixture of surface active agents retained in the fabric upon its removal from the fulling machine with added water, and

thereafter rinsed for 20 minutes. Part of the goods are then dyed in the usual manner, the remainder being finished in their natural condition.

Upon examination, the pieces have a firm, full hand, a tensile strength as high or slightly higher than that of alkaline treated goods and felting is highly satisfactory. The dyed goods are uniform in appearance and of good color; the natural goods being whiter than when alkaline scoured.

EXAMPLE II

Example I was repeated except in place of the red oil polyoxyethylene ester detergent there was employed an equal quantity of an alkyl phenyl polyethylene glycol ether detergent manufactured by Carbide & Carbon Chemical Corporation and marketed under the trade name of "Tergitol NPX." Felting was highly satisfactory and the material had a tensile strength slightly higher than that of alkaline treated goods.

EXAMPLE III

A fullscour bath is prepared containing 3% of an ethylene oxide derivative of rosin fatty acids having about fifteen ethylene oxide groups per molecule, and 1½% of a quaternary ammonium salt sold under the trade name "Triton K–60" and having the probable formula $C_{16}H_{33}N(CH_3)_2(CH_2C_6H_5)Cl$. Pieces of woolen cloth to which a wool oil, sold as "Proxol" had been added during manufacture are fulled in this medium under acid conditions. Tensile strength remains high, running qualities are excellent and fulling efficiency is very good.

EXAMPLE IV

Example III is repeated employing as the plasticizer a quaternary ammonium salt sold as "Texsoft Conc." and having the probable formula: $(C_{17}H_{35})_2N(CH_3)_2Cl$. Running qualities and tensile strength are good and fulling efficiency is high.

EXAMPLE V

Example III is repeated in two separate experiments using as the plasticizer, in the first instance, an acetate salt of a fatty acylpolyamine purchased under the tradename "Sapamine WL," and having the formula

$$C_{17}H_{35}CONHC_2H_2NHC_2H_2NH\cdot 2HOOCCH_3$$

and in the second instance a similar fatty carbamine compound, sold under the trade name "Ahcovel G." Running qualities in each instance are excellent and fulling efficiency is satisfactory.

In addition to fatty acid ester detergents, I have obtained good results in acid fulling with compounds such as polyoxyethylene derivatives of a mixed ester, e.g., sorbitan tall oil contining about 15 ethylene oxide groups per molecule, a polyoxyethylene derivative of red oil amide with 10 groups per molecule, a polyoxyethylene tallow amine with 15 groups per molecule, a polyoxyethylene fatty ether, sold as "Lissapol N," the ethylene oxide content of which was unknown but believed to be within the range heretofore stated and a polyoxyethylene derivative of nonyl phenol having 15 groups per molecule.

EXAMPLE VI

Samples of woolen cloth manufactured using a wool oil sold as "Proxol" by Proctor & Gamble Company were fulled for 15 minutes in a laboratory fulling mill. Running qualities were observed, area shrinkage was determined and the samples were hand washed in clear water without further addition of surface active agents. After drying, tensile strength measurements were made.

It should be emphasized that these are laboratory tests and fulling would never in actual practice be carried as far as was done in these determinations. The laboratory fulling mill is considerably more efficient than the full scale mills ordinarily employed in textile finishing and 15 minutes in the laboratory mill equals approximately three or four hours in a full scale fulling mill. It has been found, however, that the laboratory tests are a true indication of the results that can be expected in plant operations if the proper allowances are made.

Tests were made with two commercially available non-ionic detergents, the first being a fatty acid polyoxyethylene ester marketed by Armour & Co. and the other being an alkyl phenyl polyethylene glycol ether sold by Carbide & Carbon Chemical Company. Each detergent was employed in combination with several commercially available plasticizers sold under various trade names.

Table I lists for convenience the surface active agents employed in the reported tests, as well as their manufacturer, chemical nature, and type (non-ionic, anionic or cationic).

Table I.—Surface active agents

DETERGENTS

Trade Name	Manufacturer	Chemical Nature	Type
Energetic	Armour & Co.	Polyoxyethylene ester of fatty acids.	NI
Tergitol NPX	Carbide and Carbon.	Alkylarylpolyglycol.	NI

PLASTICIZERS

Avitone A	E. I. du Pont	Sodium alkyl-sulfonate.	A
Ahcovel E	Arnold, Hoffman & Co.	Fatty carbamide	A
Atcosoft N	Metro-Atlantic, Inc.	Amine condensate	A
Ethofat 60/15	Armour & Co.	Polyoxyethylene fatty acid ester.	NI
Ethomid HT/15	Armour & Co.	Polyoxyethylene derivative of fatty amide.	NI
Avcosol 100	American Viscose	Sorbitol ester derivative.	NI
Armac HT	Armour & Co.	Fatty amine acetate.	C
Ahcovel G	Arnold, Hoffman & Co.	Fatty carbamide	C
Ethomeen 18/15	Armour & Co.	Fatty amine	C
Lupomin Q	Jacques Wolf & Co.	Quaternary fatty acid amide.	C
Onyxsan HSB	Onyx Oil & Chemical.	Imidazoline salt	C
Texsoft Conc	Armour & Co.	Quaternary ammonium salt.	C
Triton K-60	Rohm & Haas	Tetra-alkyl ammonium halide.	C

Table II lists the results of tests in which the detergent employed was one sold under the name of "Energetic" by Armour & Co. employed in an amount of 3% in each instance based on the weight of woolen cloth being fulled. The indicated plasticizer was in each instance employed in an amount equal to 1.5% of the dry weight of the material being fulled. No pH adjustment of the full-scouring bath was made and the measured pH in each instance is listed in the table.

Table II

[3% Energetic detergent and 1.5% plasticizer.]

Plasticizer	pH	Running Qualities	Area Shrinkage	Tensile Strength
Ahcovel E	9.45	Fair	50	116
Ethofat 60/15	7.5	do	45	102
Ethomid HT/15	7.25	do	51	109
Avcosol 100	6.2	Good	48	111
Ethomeen 18/15	7.0	Fair	45	99
Ahcovel G	5.2	Good	47	98
Triton K-60	4.55	Excel	47	97
Texsoft Conc	6.5	do	50	106
Lupomin Q	4.8	Fair	47	97

Table III lists the results of tests identical in nature to those reported in the preceding table except that in each instance a quantity of concentrated sulphuric acid equal to 5% by weight of the woolen cloth was added to the fulling bath.

Table III

[3½ Energetic detergent and 1.5% plasticizer.]

Plasticizer	Running Qualities	Area Shrinkage	Tensile Strength
Avitone A	Excel	53	126
Ahcovel E	do	56	136
Ethofat 60/15	do	53	142
Ethomid HT/15	do	56	135
Avcosol 100	do	59	139
Armac HT	do	45	109
Sapomine	do	57	137
Ahcovel G	do	58	138
Onyxsan HSB	do	58	138
Triton K-60	do	59	130
Texsoft Conc	do	48	114
Lupomin Q	do	60	144

Table IV lists the results of a series of tests wherein the detergent employed was one sold by Carbide & Carbon Chemical Company under the name of "Tergitol NPX." In each instance 4 oz. of detergent for each gallon of fulling medium were employed. The indicated plasticizer or combination of plasticizers was employed in amounts listed in the table. No pH adjustment was made in these tests and fullscouring was conducted at the pH resulting from the addition of the detergent and plasticizer to the fulling medium.

Table IV

[Tergitol NPX detergent, 4 ozs./gal.]

Plasticizer	Ozs./gal.	Running Qualities	Area Shrinkage	Tensile Strength
Lupomin Q	2	Good	42	88
Atcosoft N	2	do	43	100
Atcosoft N	2	do	44	95
Monopole Oil	1			
Atcosoft N	2	do	49	105
Sulfonated Red Oil	1			

The above tests show that a wide variety of plasticizers and non-ionic detergents can be employed in this invention irrespective of their exact chemical nature as long as they possess, in each instance, the desired physical properties.

I claim:

1. A method of fulling and scouring wool which method comprises milling the wool wet with an aqueous mixture of surface active agents comprising a detergent characterized by being more hydrophilic than lipophilic and a wool plasticizer characterized by being more lipophilic than hydrophilic, said detergent being selected from the group consisting of non-ionic detergents and detergents capable of being represented by the formula:

$$RY[(C_2H_4O)_nH]_m$$

wherein R is a lipophilic radical having from 10 to 20 carbon atoms, Y is an amine linking radical, n is an integer from about 8 to 20 and m is an integer from 1 to 2 inclusive and the product m times n is equal to about 8 to 20 inclusive.

2. The method of claim 1 wherein the detergent is a polyoxyethylene compound containing from about 8 to 20 oxyethylene groups.

3. The method of claim 2 wherein the fulling and scouring are conducted in a medium having a pH of a numerical value of less than 7.0.

4. The method of claim 3 wherein the wool plasticizer is a cationic surface active agent.

5. The method of claim 4 wherein the non-ionic detergent is a fatty acid polyoxyethylene ester.

6. The method of claim 5 wherein the plasticizer is a quaternary ammonium salt.

7. The method of claim 4 wherein the non-ionic detergent is an alkylaryl polyglycol compound.

8. The method of claim 7 wherein the plasticizer is a quaternary ammonium salt.

9. A method of fulling and scouring wool piece goods which have been carbonized in the grease and which still contain the acid of carbonization, which method comprises milling said wool while wet with an aqueous medium containing from 1 to 5% based on the weight of woolen material of a non-ionic detergent characterized by being more hydrophilic than lipophilic and from 1 to 5% based on the weight of woolen material of a cationic plasticizer characterized by being more lipophilic than hydrophilic.

10. The method of claim 9 wherein said non-ionic detergent is a polyoxyethylene compound.

11. The method of claim 10 wherein said cationic plasticizer comprises a surface active quaternary ammonium salt.

12. A method of fulling and scouring wool piece goods laden with wool oil and carbonizing acid which method comprises milling said piece goods while wet with an aqueous medium containing a polyoxyethylene fatty acid ester surface active agent having from about 8 to 20 oxyethylene groups, and a quaternary fatty acid amide surface active agent.

13. A method of fulling and scouring wool piece goods laden with wool oil and carbonizing acid which method comprises milling said piece goods while wet with an aqueous medium containing alkylarylpolyglycol ether surface active agent having from about 8 to 20 oxyethylene groups, and a quaternary fatty acid amide surface active agent.

14. In a method of fulling and scouring wool wherein the wool is milled subsequent to being wetted with an aqueous fulling agent, the improvement which comprises employing as a fulling agent, a mixture comprising a detergent, characterized by being more hydrophilic than lipophilic, and a wool plasticizer characterized by being more lipophilic than hydrophilic, said detergent being selected from the group consisting of non-ionic detergents and detergents capable of being represented by the formula:

$$RY[(C_2H_4O)_nH]_m$$

wherein R is a lipophilic radical having from 10 to 20 carbon atoms, Y is an amine linking radical, n is an integer from about 8 to 20 and m is an integer from 1 to 2 inclusive and the product m times n is equal to about 8 to 20 inclusive.

15. A method of finishing woolen piece goods which comprises carbonizing the fabric in the grease and thereafter, while the fabric still retains the acid of carbonization, milling the fabric while wet with an aqueous mixture comprising a detergent characterized by being more hydrophilic than lipophilic and a wool plasticizer characterized by being more lipophilic than hydrophilic, said detergent being selected from the group consisting of non-ionic detergents and detergents capable of being represented by the formula:

$$RY[(C_2H_4O)_nH]_m$$

wherein R represents a lipophilic radical having from 10 to 20 carbon atoms, Y is an amine linking radical, n is an integer of from about 8 to 20, m is an integer of from 1 to 2 inclusive and the produce of m times n is equal to from about 8 to 20.

16. A method according to claim 14 wherein the detergent is a polyoxyethylene ester of a fatty acid.

17. A method according to claim 16 wherein the plasticizer is a quaternary ammonium compound having at least one hydrophobic, long-chain alkyl substituent group.

18. A method according to claim 17 wherein the plasticizer is a quaternary ammonium derivative of a fatty-acylpolyamine.

19. A method according to claim 17 wherein the plasticizer is a compound capable of being represented by the formula $(C_{17}H_{35})_2N(CH_3)_2Cl$ and the detergent

is a derivative of rosin fatty acids having about 15 ethyleneoxide groups per molecule.

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