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PROCESS OF SCOURING WOOL AND OTHER FIBERS AND FABRICS.

No Drawing.

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The present invention relates to the cleansing or scouring of wool and other animal fibers, vegetable fibers, mixed fibers, and fabrics manufactured therefrom, and is also applicable to the cleaning of feathers, furs, pelts and the like.

Heretofore many processes have been devised for scouring raw wool and other materials above referred to. These methods may be generally classified into three groups, i. e. (1) methods involving the use of aqueous solutions of soap and alkalies (either alone or mixed with volatile or non-volatile solvents of oils, fats, waxes and greases); (2) methods involving direct use of volatile oil, fat, wax and grease solvents not soluble in water, usually followed by an application of warm water which may contain alkali or soap or both for removing water-soluble impurities from the fibers; and (3) dry scouring processes involving the use of a white fine mineral powder such as gypsum, infusorial earth or fuller's earth.

The most common method heretofore used has been the scouring of the wool by the use of a warm aqueous solution of soap or alkali or both. This method is open to the objection particularly that it is extravagant in its requirements for water as well as soap and soda which are wasted after being used once. These reagents also offer an objection in that they contaminate the "wool grease" and the water soluble salts of the yolk and suint, thereby making it difficult and in many cases commercially impossible to recover either the grease or the potassium compounds in pure form. In addition, the large volume of effluent liquid coming from such wet scouring operations is difficult to dispose of economically. The purification of the waste liquors so that they can be utilized commercially for the recovery of the by-products, or even so that the entire output may be discharged into streams without violation of laws regarding sanitation and sewage disposal, is an expensive undertaking.

The so-called "volatile solvent" process as a commercial method has some points of superiority over the wet method above described, but it also is open to certain objections, namely that the cost of materials used is high and that there is a considerable fire hazard especially when using a

light naphtha or other inflammable solvent. Also there is a considerable loss of these solvents by evaporation during the process which adds to the expense. By this process as ordinarily conducted, the wool is first treated with a volatile solvent alone and then with an aqueous soap solution either with or without soda ash. The soap and soda so introduced greatly interfere with the subsequent recovery of the potassium compounds in a pure state.

The third method mentioned has not been extensively used commercially so far as I am aware.

The present invention comprises the use of an intimate mixture or emulsion of water and a volatile liquid solvent of oils, fats, waxes and greases, which solvent is largely insoluble in water. This emulsion may be used either with or without the addition of alkalies or extraneous emulsifiers. When carrying on the process in cleansing raw wool and pelts advantage is taken of emulsifying properties possessed by certain organic substances contained in the so-called "wool grease" on the wool, and when raw fibers and fabrics other than wool are being treated advantage is taken of emulsifying properties possessed by certain organic substances carried thereby. Thus emulsifying agents naturally carried by the various raw fibers assist materially in emulsification of the water and said volatile solvent during the operation of the cleansing process. Under these conditions extraneous emulsifiers preferably will not be used, at least ordinarily. However where advantageous or desirable, as is sometimes the case when treating certain fibers, more particularly fibers other than raw fibers and including mixed fibers and fabrics, resort may be had to such extraneous emulsifiers as will assist emulsification but will not materially retard the recovery of the by-products, or chemically contaminate them, or vitiate the same for use as fertilizers. Many such emulsifiers are available, such as vegetable extracts like soap-root, gums, glue, casein, and potassium soaps.

In cases where alkali is added to said intimate mixture of water and insoluble volatile solvent before treatment of the raw wool, it is advisable to employ potassium carbonate as the alkali or to use dilute am-

monia. It is not advisable to use sodium compounds or soda soaps as the principal source of the alkali, since both soda soaps and caustic soda or soda ash introduce into the liquid sodium compounds which make the subsequent recovery of the potassium compounds much more difficult, or would damage the water-soluble residue rendering it unfit if to be used for fertilizers. However, it is altogether feasible and usually advantageous from the standpoint of economy, to add the mixed carbonates of potassium and sodium which may be obtained as a by-product from the wool scourings.

In the preferred operation of the process and for most purposes, the insoluble volatile solvent will be a heavier distilled petroleum hydrocarbon which will completely volatilize at ordinary temperatures. Those volatile liquids from crude petroleum or from petroleum distillates, which distil over between 175° C. and 225° C. are preferred because they are unusually effective as cleansers, because less losses occur by vaporization during use, and because they produce better emulsions than the lighter distillates. Moreover, these heavier liquids decrease the fire risk, are cheaper, and may be readily obtained in all parts of the country. However, lighter fractions of these petroleum hydrocarbons which boil above 75° C. may be used with good results, such as those coming over between 150° C. and 175° C., or between 125° C. and 150° C., or even as low as 75° C. to 125° C. Other volatile solvents which may be used as desired, are coal tar distillates, chlorinated hydrocarbons particularly chlorinated aliphatic hydrocarbons, esters and ethers, whose boiling points are within suitable ranges and which also will completely volatilize at ordinary temperatures so that the solvent may be removed readily from the materials. While the chlorinated hydrocarbons have certain points of superiority in that they are less inflammable, they are generally not so satisfactory because of the high first cost and also because of the relatively greater losses during the scouring and recovering operations. To some extent the same is true of the ethers and esters. For most purposes the above mentioned petroleum distillates alone give the best results, although if desired these may be mixed with other solvents referred to in any suitable proportions.

In carrying on the process, an intimate mixture or coarse emulsion of water and the insoluble volatile solvent is first formed as by means of agitation, the alkali and extraneous emulsifier being added or not as above indicated. The material to be cleaned is now treated with this mixture or emulsion preferably in a counter-current system until substantially all of the impurities of said material have been removed. It is understood

that the material will be subjected to the usual operations of agitation, intermittent squeezing and the like, in order to cause the liquid to penetrate all of the interstices of the material readily and frequently and to come into intimate contact with the fibers of the material, and also to maintain the desired state of emulsion in the liquid. The liquid takes up from the materials certain ingredients which assist in forming and maintaining the emulsion as hereinbefore indicated. Certain fibers naturally carry smaller percentages of organic acids which while relatively insoluble in water are readily soluble in dilute alkalies. In such cases it is desirable to add a small quantity of said alkali.

Thus there are simultaneously presented to the fibers under treatment, water which removes the water-soluble substances from the fibers, a solvent capable of removing all oily, fatty, waxy and greasy substances, and, where required for the purpose set forth, an alkali and an extraneous emulsifier, whereby the fibers are cleaned quickly and thoroughly in one operation. In the same operation the insoluble sand and earthy matters originally on the fibers are released by the solvents and are carried off for the most part by the solutions; the remainder of the insoluble matter may be removed readily by subsequent dusting or carding.

As to proportions, it is desirable to use for the emulsion such amounts of volatile solvent and water as will result in saturating the two liquids with dissolved substances simultaneously. Ordinarily about equal volumes of the volatile solvent and water will be used, warm water being preferred since it has a much greater detergent effect, and since it aids in keeping the greases and fats in a fluid state whereby the solutions of the same can be increased greatly in concentration. When alkali is to be used, the dilute ammonia or potassium carbonate or mixed potassium and sodium carbonates may vary considerably, for example from 0.1% to 0.5%, the function thereof being to maintain neutrality or slight alkalinity. When an extraneous emulsifier is used only a small proportion is necessary, being just sufficient to maintain the emulsion. As to relative amounts of emulsion and materials to be treated, this will depend, of course, upon a great number of factors particularly the quantity and nature of the impurities on said materials. For ordinary purposes a sufficient amount of the emulsion liquid is used to immerse the materials and to thoroughly clean the same. By feasible counter-current methods this quantity of liquid can be used until a strong and substantially saturated viscous liquid is produced from which the by-products may be recovered with more or less readiness.

The by-products resulting from scouring raw wool and pelts consist chiefly of "wool grease" and compounds of potassium and nitrogen. By the process above described, the "wool grease" is held in a more or less saturated solution by the volatile solvent, and the potassium and nitrogen compounds are concentrated in the water solution. By well understood methods, the grease may be separated from the volatile liquid solvent and the latter recovered, and the potassium compounds may be separated from the nitrogenous substances. Or the mixed potassium and nitrogen compounds, being valuable plant foods, may be disposed of directly as fertilizers along with the insoluble residues, thus avoiding any further separating or refining operations.

Throughout the specification and claims the expression "wool grease" indicates the water-insoluble substance found on wool and commonly so designated, and the word "grease" when used alone designates any fats, oils, waxes and greases naturally occurring on the fibers. By the expression "volatile solvent" or "grease solvent" is meant a solvent of fats, oils, waxes and greases which is to be distinguished from water and is used to remove the "wool grease" or any fats, oils, waxes or greases naturally occurring on the fibers to be treated. The term "suint" as commonly used means the dried perspiration of sheep, which is always present in considerable amounts on wool and is almost completely water-soluble; it contains an emulsifying agent capable of producing the oil-in-water type of emulsion, whereas wool grease produces the water-in-oil type. The term "wool" is used in the claims to include not only wool, either on the hide or removed therefrom, but also fur, hair and like animal fibers.

It will be noted that when cleaning raw wool and other raw fibers, no extraneous emulsifier need be used, either saponaceous or otherwise, and that the emulsion then will be strictly non-saponaceous. Either there are no substances present on the fibers which will saponify during the process, even when an alkali is used, or such substances are not present in appreciable quantities.

I claim:

1. A process for cleaning raw wool, characterized by a one-step operation for the complete scouring, comprising subjecting the same to an intimate mixture of water and a liquid hydrocarbon insoluble in water and which is a good grease solvent; agitating the mixture thoroughly to maintain it and continuing the agitating and subjecting until the wool is substantially freed from grease and water-soluble and insoluble impurities.

2. A process for cleaning raw textile fibers and furs, characterized by a one-step operation for the complete scouring of the material, comprising subjecting the same to an intimate mixture of water and a water insoluble grease-oil-and-fat-solvent; agitating the mixture sufficiently to maintain it and continuing the agitation and subjection until the material is substantially freed from greases or oils or fats and water-soluble and insoluble impurities.

3. A process for cleaning raw wool, characterized by a one-step operation for the complete cleansing of the fibers, comprising subjecting the same to a non-saponaceous emulsion of water and a volatile grease-solvent, maintaining the emulsion throughout the process, and continuing the subjection of the wool to such emulsion by agitation, until the wool is substantially freed from grease and from water-soluble and insoluble impurities.

4. A process for cleansing raw wool, characterized by a one-step operation for the complete cleansing of the fibers, comprising subjecting the wool to a non-saponaceous intimate mixture of water and a water insoluble volatile liquid hydrocarbon which is a good grease-solvent, maintaining the intimate mixture by sufficient agitation and continuing the subjection of the wool by agitation to the intimate mixture until the fibers are substantially freed from grease and from water-soluble and insoluble impurities.

5. A process for cleaning raw textile fibers and furs characterized by one-step operation for the complete scouring, comprising subjecting the same by agitation to a non-saponaceous intimate mixture of water, an alkali and a water insoluble volatile liquid which is a good grease-oil-and-fat-solvent; continuing the treatment of the materials while maintaining the intimate mixture until said materials are substantially freed from their impurities.

6. A process for cleaning raw textile fibers and furs, characterized by a one-step operation for completely cleansing the materials, comprising subjecting the same to an intimate mixture of water, an ammonium alkali, and a water insoluble volatile grease-oil-and-fat-solvent, agitating the mixture to maintain it in the state of an emulsion and continuing the agitation and subjection until the materials are substantially freed from impurities.

7. A process for cleaning raw wool, characterized by a one-step operation for the complete scouring, comprising subjecting the wool by agitation to the action of an intimate mixture of water, an alkali other than sodium compounds, and a volatile liquid which is insoluble in water and is a good grease-solvent, continuing said treatment un-

til the wool is substantially free from impurities and maintaining the intimate mixture during said treatment.

8. A process for cleaning raw wool, characterized by a one-step operation for the complete scouring, comprising subjecting the wool by agitation to a non-saponaceous emulsion of water, an alkali other than sodium compounds, and a volatile grease-solvent insoluble in water, continuing said agitating and subjecting until the wool is substantially freed from grease and from water-soluble and insoluble impurities, and maintaining said emulsion during the entire operation.

9. A process for cleaning raw wool, characterized by a one-step operation for the complete scouring, comprising subjecting the wool by agitation to an intimate mixture of water, a volatile grease-solvent, and an emulsifying agent other than that contained on the wool fibers, and continuing said subjecting until the wool is substantially clean.

10. A process for cleaning raw textile fibers and furs, characterized by a one-step operation for the complete cleansing, comprising subjecting the materials by agitation to an intimate mixture of water, a volatile grease-oil-and-fat-solvent, and an emulsifying agent other than compounds of sodium and other than that in or on the materials treated, continuing the maintenance of the intimate mixture and the subjecting by agitation until the materials are substantially clean.

11. A process for cleaning raw textile fibers and furs, characterized by a one-step operation for the complete cleansing, comprising subjecting the materials by agitation to a non-saponaceous intimate mixture of water and a volatile liquid, which is largely insoluble in water and is a good grease-oil-and-fat-solvent until the materials are substantially freed from grease, oils and fats and from water-soluble and insoluble impurities, agitating and maintaining such intimate mixture during the treatment, whereby substances occurring naturally on the materials assist the formation of an emulsion of the liquid mixture and thus facilitate the cleaning.

12. A process for cleaning raw wool, characterized by a one-step operation for the complete cleansing, comprising subjecting the same to a non-saponaceous emulsion of water and a water-insoluble, volatile solvent for the grease on said wool, the emulsification being assisted by substances occurring naturally on the raw wool fiber, and being maintained by constant agitation; continu-

ing such subsection and agitation until the wool is substantially freed from grease and from water-soluble and insoluble impurities.

13. A process for cleaning raw wool, characterized by a one-step operation for the complete scouring, comprising subjecting the same to an intimate mixture of water and a water insoluble volatile grease-solvent, and moving the liquid mixture counter-currently with respect to the wool during such subjecting, while maintaining the intimate mixture until the wool is substantially freed from grease and from water-soluble and insoluble impurities and until said impurities are concentrated in the said mixture, during the procedure, the formation of an emulsion of the said water and grease solvent and the consequent cleaning of the fibers being aided by substances occurring naturally on the raw wool.

14. A process for cleaning raw textile fibers and furs, characterized by a one-step operation for the complete cleansing, comprising subjecting the materials to an emulsion of water and a volatile grease-oil-and-fat solvent, aided by substances occurring naturally on the materials that serve as emulsifying agents, the emulsion being maintained and moved counter-currently with respect to the materials until said materials are substantially freed from impurities and until the impurities are concentrated in the emulsion.

15. A process for cleaning textile fibers and fabrics and furs, characterized by a one-step operation for the complete cleansing, comprising subjecting the materials to an emulsion of water and a volatile grease-oil-and-fat solvent and an emulsifying agent, other than compounds of sodium and other than that contained naturally in or on the materials, the maintaining emulsion, and moving the emulsion counter-currently with respect to the materials, until the materials are substantially free from impurities and until said impurities are concentrated in the emulsion.

16. A process for cleaning textile fibers and furs, characterized by a one-step operation for completely cleansing the materials, comprising subjecting the same to an intimate mixture of water, an alkali other than sodium compounds, and a water insoluble volatile grease-oil-and-fat-solvent, continuing said treatment until the materials are substantially freed from impurities and maintaining the mixture by agitation during said treatment.

In testimony whereof I affix my signature.

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