

UNITED STATES PATENT OFFICE

2,544,732

METHOD FOR RENDERING A FABRIC
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Berkeley, Calif.No Drawing. Application September 27, 1945,
Serial No. 619,005

3 Claims. (Cl. 117—139.5)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

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This invention relates to the treatment of fabrics, and it is particularly concerned with the impregnation of fabrics with an oil to reduce the incidence of airborne infections.

It has been established that the incidence of infections caused by bacteria carried in the atmosphere may be sharply reduced in hospitals and other institutions by the use of blankets and other fabrics which have been impregnated with one or more of various oils. Fabrics so treated entrap the dust particles which carry many bacteria, and to a large extent prevent their re-entry into the atmosphere even when the fabric is shaken. However, the known methods for providing such oil impregnated fabrics suffer certain disadvantages.

For example, it would be desirable if the physical action of the oil in retaining the air-, or dust-, borne bacteria were to be re-enforced by a certain amount of bactericidal action as well.

Further, the known treatments of the type discussed above have been deficient in that oil impregnated fabrics have not been able to retain a substantial proportion of the impregnating agent when they are washed. In other words, the bond hitherto obtained between the fabric and the oil has not been a firm one.

Still another disadvantage of the known methods for impregnating fabrics with oils relates to the fact that no one solution may be used for treating both wool and cotton materials.

It is therefore an object of this invention to provide a method which is useful for impregnating fabrics, including both wool and cotton fabrics, with an oleaginous material.

A more particular object of this invention is to accomplish the foregoing object while at the same time establishing a firm bond between the fabric and the oleaginous impregnating agent.

Still another object of the invention is to provide an oleaginous solution, having bactericidal, or germicidal properties, which is useful in carrying out the foregoing objects.

I have discovered that the foregoing objects may be accomplished through use of an emulsion comprising water, oil, and a non-ionic emulsifying agent, or, more properly, a non-ionic surface-active agent as emulsifier to which is added a substance known as a cationic detergent or agent or, more properly, cationic surface-active agent. This latter material, on being introduced into the emulsion, serves to produce a positive charge on each of the oil droplets present therein and these positively charged droplets are firmly taken up by

the negatively charged fabric which is under treatment.

The oil used comprises any high grade mineral oil, those normally used in carrying out my invention conforming to USP specifications.

The emulsifying agents useful in carrying out this invention are well known compounds, and a wide variety thereof are available. However, those which are satisfactory for the purpose described herein are non-ionic surface-active agents. Two representative compounds of this class are polyethylene-glycol-monoiso-octyl-phenyl ether, and the polyoxyalkylene ether of partial oleic acid ester.

The cationic surface-active agent is so called from that fact that it is responsible for imparting a positive charge to the various oil droplets comprising the oil phase of the emulsion. While a variety of compounds exist which are capable of such action, those which I prefer to use are those which possess germicidal qualities and which are non-toxic on application to the skin. The quaternary ammonium salts such as benzalkonium chloride (high molecular alkyl-dimethyl-benzyl-ammonium chloride); parater-tiary-octylphenyl-diethoxy-dimethyl-benzyl-ammonium chloride; lauryl-dimethyl-benzyl-ammonium chloride; cetyl-dimethyl-benzyl-ammonium chloride; and the lauryl-ethyl-methyl-amide of trimethyl-ammonium chloride, have proven to be of particular value. Likewise, good results have also been obtained with the compounds lauryl-pyridinium-iodide and the lauryl ester of glycine hydrochloride.

It is believed that the nature of the invention will be best understood by a consideration of the following paragraphs which set forth the general method for compounding and using the fabric impregnating, oleaginous solution described herein.

The normal procedure is to place an amount of water in a suitable apparatus, as a washing machine, sufficient to thoroughly wet the fabric. Normally about three to four gallons of water are used for a woolen blanket of average size and weight. To the water is then added the fabric to be treated. The machine is then put in motion for a period of time sufficient to evenly distribute the water in the fabric.

A quantity of an oil emulsion made up of the oil and the emulsifying agent is then added. This emulsion comprises about 2 to 15 per cent by weight of the emulsifying agent (a preferred range is about 5 to 10 per cent by weight) and the balance oil. The amount of emulsion used is

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sufficient that the oil fraction thereof is from about $\frac{1}{2}$ to about 5 per cent by weight of the dry weight of the fabric, though a preferred range is about 1 to 3 per cent. The use of larger quantities of the emulsion introduces a fire hazard, and is therefore to be avoided.

The machine is then again rotated to an extent sufficient to secure an even dispersion of the solution, or emulsion, throughout the fabric. The cationic surface-active agent is then added. The amount thereof to be used will preferably be varied depending on the nature and weight of the fabric under treatment, the percentages of this ingredient which follow being given in terms of the weight of the dry fabric. In the case of undyed wool, about 0.05 to about 0.5, and preferably about 0.2 to about 0.3, per cent of the cationic surface-active agent are used in the machine. For dyed woolen fabrics, this amount is increased to about 0.35 to about 1.35 per cent, and preferably to about 0.5 to about 1.0 per cent. For either plain or dyed cotton goods, about 0.05 to about 0.5 per cent, and preferably about 0.1 to about 0.3 per cent, of the cationic surface-active agent are employed. The cationic surface-active agent is normally added in the form of a water or other solution, but the ranges given above for this ingredient are calculated on a dry weight basis and, as stated above, in terms of the per cent by weight of the weight of dry fabric in the machine. Obvious calculations will provide the amount of any given solution of the cationic surface-active agent to be employed.

After the various ingredients have all been added, the rotation of the machine is continued until an appreciable clearing of the emulsion is noted. Such a clearing is evidence that substantially all of the oil in the emulsion has been taken up by the fabric in the machine. The machine is then drained of the remaining watery fluid and the fabric is given the conventional finishing treatment.

Fabrics treated in accordance with the invention described herein possess the ability to retain and destroy most of the saprophytic and pathogenic micro-organisms deposited in the fabric through dust, human upper respiratory tract, and other air-borne, channels. Upon shaking the treated fabric, only about one-tenth of the dust particles and bacteria entrapped in the fabric are brought back into the atmosphere as compared with the amount of dust and bacteria released by a similar shaking of non-treated fabrics. The foregoing properties are retained by a treated fabric for a period of at least six months per single treatment.

One washing of fabrics treated in accordance with the method described above removes about 40 per cent of the oil from cottons, and about 25 per cent of the oil from woolens. Therefore, in the re-treatment of the washed fabric, the amounts of the various ingredients used should be correspondingly less than the amounts specified in the foregoing paragraphs which related to the treatment of fabrics having no appreciable oil content.

While this invention is described in terms of particular ingredients, and ranges thereof, to be used, it is obvious that many modifications and variations in the nature and proportions of the

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ingredients may be made without departing from the spirit and scope of the invention, and only such limitations should be imposed as are indicated in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A method of rendering a fabric germicidal comprising the steps of: intimately contacting the fabric with a mineral oil in water emulsion stabilized by a non-ionic surface-active emulsifying agent selected from the group consisting of polyethylene - glycol - monoiso - octyl-phenyl ether and polyoxyalkylene ether of a partial oleic acid ester, said emulsion used to contact said fabric containing an amount of mineral oil equivalent to from about 0.5 to about 5 percent by weight based on the dry fabric and an amount of non-ionic surface-active emulsifying agent equivalent to about 2 to 15 percent by weight based on the blend of oil and emulsifying agent; adding to said emulsion in contact with the fabric a cationic surface-active germicidal detergent selected from the group consisting of benzalkonium chloride, paratertiary-octylphenyl-diethoxy-dimethyl-benzyl-ammonium chloride, lauryl-dimethyl-benzyl-ammonium chloride, cetyl-dimethyl-benzyl-ammonium chloride, lauryl-ethyl-methylamide of trimethyl-ammonium chloride, lauryl-pyridinium-iodide, and lauryl-ester of glycine hydrochloride, said cationic surface-active germicidal detergent being added in an amount equivalent to from about .05 to 1.35 percent by weight based on the dry fabric; and drying to remove the water phase of the emulsion from the treated fabric.

2. The method of claim 1 wherein the fabric is woolen.

3. The method of claim 1 wherein the fabric is cotton.

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