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METHOD FOR CLEANING FABRICS

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This invention relates to a soap adapted to be used in conjunction with dry cleaning operations, that is in connection with the cleaning of garments and similar fabrics with light petroleum solvents such as those commonly designated by the terms "cleaning solvent" and "cleaners' naphtha", or carbon tetrachloride or other chlorinated solvents or mixtures of any of these.

The object of the invention is to provide an oil-soluble soap which may be used with such solvents and which will be miscible in all proportions with the solvent for dry cleaning purposes and which will also be readily emulsifiable in water so that it may be removed by laundering. Further objects of the invention are to provide a soap adapted for use by the housewife for home cleaning purposes, to aid and improve the solvent properties of the cleaning solvent, to provide an agent which may be used for removing practically all stains including most of the common food stains and other stains such as those from asphalt, road oil, crank case oil, and the like, spots of which are frequently found upon clothing and similar fabrics. It is a further object that such a cleaning soap shall not weaken or damage fabrics. Nor shall this soap be responsible for leaving a disagreeable odor in the fabrics after cleaning such as is caused by residual free oleic or other unsaturated fatty acids contained in corresponding soaps commonly used by dry cleaners.

I have discovered that the above objects may be accomplished by combining an ethanolamine soap of a higher saturated fatty acid (or an equivalent soap) with a hydroxylated solvent in the class of the liquid higher alcohols and alcohol-ethers, such as propyl alcohol, "butyl cellosolve" (butyl ether of ethylene glycol), cyclohexanol, and the like.

The prepared soap may be in the form of a true liquid solution or a paste or an emulsion, and may or may not contain water, and may or may not contain quantities of a light petroleum solvent of the type mentioned. Preferably however the soap mixture will contain both water and such cleaning solvent.

The ethanolamine soaps of the higher saturated fatty acids are preferred both because they are oil-soluble, i. e. soluble in light petroleum solvents and the like, and because they leave no objectionable odors. The hydroxylated solvents mentioned are selected because of their high solvent properties for the specified soaps and for most food stains, fat stains and oil stains. These solvents also act as blending agents and promote compatibility. When water is included, it is provided for the purpose of attacking and softening those spots and stains which have been deposited from water solutions or similar liquids. Hereinafter these spots and stains will be referred to as "water-soluble" although in fact they are not necessarily strictly soluble in water. Where the petroleum light solvent is added it acts both to attack and dissolve oils and the like, and possibly more important, to reduce the activity of the water and the alcohols upon delicate fabrics, weak dyes, and sizing or other finishing materials in the fabrics. Thus, said light solvent serves to prevent water-marking by water either separately applied to the spot or contained in the soap composition.

Preferably triethanolamine stearate is employed as the soap because it meets all of the above requirements in a most satisfactory degree, and "butyl cellosolve" is employed as the hydroxylated solvent because it possesses a high degree of solvent capacity for the stearate and for various kinds of stains including most of the food, fat and oil stains.

In the simplest form the prepared soap will contain merely the ethanolamine soap and "butyl cellosolve", this alcoholic solvent being used either in an amount sufficient only to make a paste or in an amount sufficient to liquefy the soap. However in order to adapt the prepared soap for attacking water-soluble stains, water will be added in various proportions. Where the cleaning soap is otherwise a liquid, the water may be added either in a quantity small enough to maintain a true liquid or solution form or it may be added in quantity great enough to form an emulsion, the soap being readily emulsifiable. However, unless modified in some manner, the activity of both the water and the alcoholic solvent upon some weak dyes is too pronounced and the effect of the alcohol upon some delicate fabrics is undesirable. The light petroleum solvents mentioned will act as such modifiers both for water and the alcohols. Therefore the prepared soap preferably is diluted with a quantity of such a petroleum solvent in proportions which may vary anywhere between about one to three parts of the solvent to one part of the alcoholic soap. Here also the water may be in small amount (for example about 10%) to maintain a liquid or solution form, or in greater amount (for example 50%) to form an emulsion. It is to be noted that the liquid or solution forms are readily miscible in all proportions with the light petroleum solvent as well as readily emulsifiable with water.

Any of these soaps may be used for removing

spots from fabrics by the application of small quantities to the spots. In general there are two procedures, one to be employed for the removal of oil stains and the like, and the other to be employed for the removal of spots laid down from water solutions and the like, i. e. the "water-soluble" spots and stains above mentioned which classification includes many food spots and stains. In the first instance, soap in non-emulsion form is applied to the spots and worked into the fabric. In this case the soap should be a form containing light petroleum solution in order that this solvent may serve to dissolve the oily materials and to some extent to loosen gritty substances and the like and disintegrate the spot sufficiently that the alcoholic solvent may attack and dissolve the stains and the soap may have ready access to the fabric in order to exercise its detergent function. After the soap composition has been sufficiently worked into the spots, the fabric may be subsequently washed. Washing may be carried out with a petroleum light solvent or the like, or the fabric may be laundered with water. In either case the soap on the spot is completely removed during the washing operation. Laundering with water completely removes the soap because the latter is readily emulsifiable with the water, and the petroleum solvent likewise readily removes the soap because of its free solubility therein. When spots laid down from water solutions are to be treated, a small amount of water may first be applied to dampen the spots for the purpose of softening and loosening the materials in the spots. The soap composition is then applied and worked into the fabric to form an emulsion in situ with the applied water. Or a previously prepared emulsion of the soap may be applied directly to the spots. In either case the resultant emulsion is well worked into the fabric until adequate disintegration and solution of the spots and their stains is accomplished. No further soap treatment is required if the fabric is to be laundered with water, due to the ready dissipation of the emulsion in the water. However if the fabric is to be washed or rinsed with petroleum light solvent, additional amounts of concentrated soap must be applied to the emulsion on the spots to reduce the water content of the emulsion to such a point as to render the resultant soap mixture compatible with the petroleum solvent so that all of the soap together with the spot and stains may be removed thereby. By compatible I mean emulsifiable or soluble in the solvent. This operation is necessary because the form of emulsion required to remove water-soluble spots contains so much water as not to be compatible with such light petroleum solvents, and therefore will not be removed from the fabric when washed therein. The measure of the amount of concentrated soap required to be added for the purpose of adequately reducing the emulsion may be determined by reason of the fact that the opacity of the emulsion disappears when the water content has been sufficiently reduced by additional concentrated soap. Having obtained this condition the fabric may be washed in the usual way with petroleum solvent and the soap will be completely removed along with the spots and their stains.

The invention therefore may be stated as comprising a soap composition adapted for use in cleaning fabrics either by laundering with water or by washing with petroleum light solvents, wherein the composition comprises an ethanolamine soap of the higher saturated fatty acids (such as triethanolamine stearate) or other suitable oil-soluble soap free from the characteristic of leaving residual odors in the fabrics, combined with a liquid higher alcohol or alcohol-ether such as propyl alcohol or "butyl cellosolve" (butyl ether of ethylene glycol), the alcohol or alcohol-ether having a high solvent capacity for the soap and for most of the stains to which fabrics are commonly subjected. This soap may be in either liquid or paste form. The invention also includes such a soap combined with a quantity of water either small enough to maintain a liquid form or sufficient to produce an emulsion. Similarly the emulsion may be put in either paste or liquid form by variation in the quantity of water added. The invention further includes such a soap in liquid or emulsion form combined with two or three times its own weight of petroleum light solvent or the like in which the soap is readily miscible and whereby the activity of contained water and alcoholic solvent is reduced to a degree sufficiently low to avoid injury to weak dyes and delicate fabrics. The invention resides further in the methods of cleaning fabrics with the resultant soap compounds wherein the spots or strains on the fabrics are first rubbed with a quantity of the cleaning soap both with and without previous dampening with water as may be required, and with subsequent additional cleaning of the fabrics and removal of the cleaner by washing in a light petroleum cleaning solvent or in water according to usual laundering procedures.

Considering the soap hereof in detail, a desirable form is a liquid containing both water and petroleum cleaning solvent. One method of preparation of this liquid soap is as follows: A suitable kettle or other receptacle is charged with about 250 pounds of stearic acid and heated to approximately 165° F. until the stearic acid is melted, whereupon the heat is removed. Approximately 2100 pounds (or about 315 gallons) of cleaning solvent in the form of the usual light petroleum fraction is then added with constant agitation, and thereafter there are added about 300 pounds of "butyl cellosolve" (butyl ether of ethylene glycol) and about 125 pounds of triethanolamine (i. e. in suitable combining proportions), following which about 225 pounds of water (27 gallons) is slowly introduced. Agitation is continued until a clear solution is obtained which requires about 15 minutes. The product is then ready for packaging. In the above example the proportions are approximately as follows:

	Per cent by weight	Pounds
Triethanolamine stearate	12½	375
"Butyl cellosolve" ($CH_2OH.CH_2OC_4H_9$)	10	300
Water	7½	225
Petroleum cleaning solvent	70	2100

For purposes of a satisfactory solution these proportions may be modified to a very considerable extent except that the water percentage should not be greatly increased if it is desired to maintain liquidity. Nor is there any necessity for increasing the proportion of "butyl cellosolve" with respect to the stearate above that indicated in the example, it being desired merely to insure solubility of the stearate which function is in part performed by the light petroleum solvent. However the proportions of the stearate and "butyl cellosolve" with respect to cleaning solvent may be considerably increased, as by doubling. One very satisfactory liquid soap mixture contains only

about 45% of cleaning solvent and is approximately as follows:

	Percent by weight
Triethanolamine stearate	25
"Butyl cellosolve"	20
Water	10
Cleaning solvent	45

Either of the above cleaning compositions may be used for the removal of all of the common food stains, fats and fat stains and stains from asphalt, crank case oil, road oils and the like such as nowadays frequently are found to have soiled the clothing. The soap is used ordinarily by first applying a small quantity of it to spots to be removed. Normally the water content as given is sufficient to remove "water-soluble" stains, i. e. those put down from water solutions and the like. The other stains are removed principally by the stearate and the "butyl cellosolve", although the cleaning solvent itself performs a portion of the solvent function, in addition to reducing the activity of the water and the alcohol upon weak dyes and delicate fabrics. Under these circumstances, after the spot has been well rubbed, the entire garment or other fabric may be immersed and agitated in cleaners' solvent or other light petroleum solvent, or carbon tetrachloride or mixtures of these, whereby the entire garment is cleaned and the soap is removed. Or after treating the spots with the liquid soap, the garment may be laundered with water in the usual manner, the soap being completely removed in the laundering. Where the spot is largely "water-soluble" such as is the case with many food stains, it is preferable to apply a small amount of water to the stain sufficient only to dampen it, and then to apply a small quantity of the liquid soap and work the same into an emulsion with the applied water. The garment may be then laundered, but if it is desired to clean it with petroleum solvent the emulsion formed on the spot must be somewhat reduced as to water content so that the cleaning solvent will take it up as above developed. This reduction as accomplished by applying an additional quantity of the liquid soap. Thereupon the garment may be successfully cleansed by immersion and agitation in the light solvent.

With some fabrics, and especially with certain dyes, the application of water to a spot before soap application frequently results in water-marking the fabrics, this apparently being due to the activity of the water before an emulsion is formed. In order to avoid this disadvantage, a soap emulsion having an appreciable quantity of water is prepared from either of the liquid soaps given above, the water content of the emulsion being such that the water-soluble stains may be satisfactorily treated; here the cleaning solvent serves to protect the dye and the size or other finish in the fabric against the activity of the water. For these purposes about two parts of the liquid soap example containing 12½% of the triethanolamine stearate will be combined with one part of water, and in the example containing 25% of triethanolamine stearate one part of the liquid soap will be combined with one part of water to produce the desired emulsion. After using either of these emulsions, the fabric may be laundered with water. But if to be treated with light petroleum solvent, the water content will be first reduced by application of appropriate quantities of the concentrated liquid soap from which the emulsion was prepared, the fabric being thereafter cleaned with said light solvent.

When neither the action of the water nor of the alcoholic solvent ("butyl cellosolve") is a detriment, the petroleum light solvent may be omitted from the liquid soap. For example a liquid cleaner which may be readily used with strong dyes and ordinary fabrics would contain

	Per cent
Triethanolamine stearate	25
"Butyl cellosolve" (butyl ether of ethylene glycol)	67½
Water	7½

Most dyes are not affected by either the "butyl cellosolve" or the water, although some red dyes and many green dyes may show some effect and watermarking in these instances is quite apt to occur. Substantially the only fabric that can be affected is that commonly known as "celanese" which is an artificial product from cellulose acetate. For all other purposes this liquid soap is very satisfactory, since it has marked solvent effects upon all spots and stains. For the purpose of more readily attacking some water-soluble spots, the liquid may be converted into an emulsion by combining the liquid in equal proportions with water. Again, where water is not required it may be entirely omitted, in which case the liquid soap would contain for example 25% of triethanolamine stearate and 75% "butyl cellosolve." Even in this case an emulsion could be readily formed either separately by addition of equal parts of water or by first dampening the spot to be cleaned and then working in some of the liquid soap. Also, it is feasible to combine a sufficiently large proportion of the stearate with the "butyl cellosolve" that a paste rather than a liquid is formed; this paste is applicable to non-water-soluble stains, or to water-soluble stains which have first been dampened with water. In some instances it would be permissible to omit the alcohols as well as the water, the soap then being worked up with petroleum light solvent alone. After spotting fabrics with any of these soaps the fabrics may then be laundered with water or cleaned with light petroleum solvents or the like as above described in connection with the other examples, which includes suitable reduction of any emulsion with a portion of concentrated soap composition where the spotting operations are to be followed by cleansing in light solvent.

In all these cases it is to be understood, as previously pointed out, that the term "water-soluble" is used to apply to spots and stains which have been laid down from water solutions although not all the substances in the spots may be in themselves strictly soluble in water.

Various equivalents may be employed for the triethanolamine stearate and for the "butyl cellosolve" (butyl ether of ethylene glycol) above given. Thus any ethanolamine soap may be prepared from any of the higher saturated fatty acids. This includes the range from palmitic acid to behenic acid, the object being to avoid unsaturated fatty acids wherein residual acids from the corresponding soaps tend to impart disagreeable residual odors to fabrics which have been cleaned with the soap. Due to their non-odorous characteristics an excess of these saturated acids will therefore not be detrimental. It will be sufficient if monoethanolamine or diethanolamine be employed in the preparation of the soap, although triethanolamine has been preferred. Even here the commercial product contains 20 or 25% of the two lower amines mentioned. As a sub-

stitute for the "butyl cellosolve", other high solvent agents having similar high solvent characteristics for both the soap and the various stains mentioned may be employed, these being the liquid higher alcohols or alcohol-ethers beginning with propyl alcohol and including the cyclohexanol and "butyl cellosolve" mentioned and other alcohol-ethers or "cellosolves" such as the methyl and ethyl ethers of ethylene glycol and the methyl, ethyl and butyl ethers of diethylene glycol. These solvents are valuable by reason of their cyclic or ether characteristics.

Practically all stains can be removed with these cleaners in one way or another. However, in the case of stains from ink, mercurochrome, iodine and the like, complete removal cannot be effected although the intensity of these stains is greatly reduced. Again substantially all colors and all fabrics may be treated. The only exceptions which have been found are that sometimes red silks are slightly affected and green silks are sometimes inclined to be water-marked where water is used to dampen the spots prior to soap treatment.

In general there are two methods for the use of the cleaner in connection with all fabrics and all colors. In conjunction with most food stains the best results are obtained by first dampening the spot with water, applying a small quantity of a non-emulsified form of the cleaning soap hereof and rubbing the soap into the spot until it is thoroughly emulsified with the water which has been applied, or by applying a previously prepared emulsion. Where the stains are not attacked by water, as in the case of asphalt stains, petroleum oil stains and various fat stains, the concentrated or non-emulsified soap is rubbed directly on the dry spots. Thereafter the fabric may be laundered with water or cleaned in any ordinary cleaning solvent as above described.

For these reasons the dry cleaning soap here disclosed lends itself particularly well to home cleaning uses. This is especially true with garments that are required to be dry cleaned, that is with light solvents, since it enables the housewife to remove substantially all spots and stains and do as satisfactory a job as is ordinarily turned out by the average commercial cleaning establishment.

It is to be understood that the above disclosures are to be taken as illustrative of the invention, not as limiting since obviously many variations may be devised by the skilled operator.

I claim:

1. A method for cleaning fabrics having spots at least partially water-soluble, comprising working into the spots a water emulsion of a soap composition containing an oil-soluble ethanolamine soap of a higher saturated fatty acid free from the characteristic of leaving residual odors and a liquid higher alcoholic solvent for the soap, and for many stains, applying to the emulsion a quantity of said soap composition in non-emulsified form for the purpose of reducing the water content of the emulsion on the spots, and subsequently removing the resultant soap mixture from the fabric by washing in a light petroleum cleaning solvent.

2. A method for removing spots from fabrics comprising working into the spots a water emulsion of a soap composition containing an oil-soluble ethanolamine soap of a higher saturated fatty acid, an ether of ethylene glycol, and a quantity of light petroleum solvent capable of dissolving the soap and reducing the activity of the water and the glycol ether, applying to the emulsion a quantity of such soap composition in non-emulsified form for the purpose of reducing the water content of the emulsion to such a degree that it is compatible with light petroleum solvents and the like, and subsequently washing the soap mixture from the fabric with such a light solvent.

3. A method for removing from fabric spots capable of being softened with water, comprising dampening the spots with a small amount of water, working into the dampened spots a quantity of soap composition and forming an emulsion therewith, said composition containing an oil soluble ethanolamine stearate and an ether of ethylene glycol, applying to the emulsion a quantity of the soap composition in non-emulsified form to lower the water content so that the soap mixture will be compatible with a light petroleum cleaning solvent, and washing the spots with such light cleaning solvent to remove the soap.

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