

[54] DRY-CLEANING AGENT
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[63] Continuation-in-part of Ser. No. 271,035, July 12, 1972, abandoned.

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[51] Int. Cl.² C11D 7/50
[58] Field of Search 252/171, DIG. 1; 8/142

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ABSTRACT

A dry-cleaning agent consists essentially of an organic solvent and an addition which contains a surfactant. The agent is free of water and the surfactant has a HLB value ranging from about 13 to 18.

4 Claims, No Drawings

DRY-CLEANING AGENT

This application is a continuation-in-part of U.S. Ser. No. 271,035, filed July 12, 1972 and now abandoned.

The present invention relates to a dry-cleaning agent consisting of an organic solvent and an additive which contains a surfactant.

Agents of this type containing, for example, chlorinated hydrocarbons as an organic solvent, cleaning reinforcers and water as an addition, with a surfactant used as a cleaning reinforcer, are well known. In this connection, the organic solvents, such as tetrachlorethylene, are useful for dissolving fats.

It is also already known to use surface-active substances, particularly those having a base of fatty alcohol sulfates or alkyl benzene sulfonates, as cleaning reinforcer, together with chlorinated hydrocarbons in order to improve the cleaning action. Unfortunately, it has not been possible with their use to eliminate sufficiently spots which are not soluble in the solvent. The greatest effort by dry-cleaners has been in the elimination of water-soluble dirt during the course of the basic cleaning treatment since manual working after machine dry-cleaning generally demands a considerable expenditure of time on the part of skilled workers which is very expensive. In order to overcome these disadvantages, cleaning agents utilizing a solvent/cleaning reinforcer/water system have been increasingly used in order to remove water-soluble dirt to a large extent even during the basic cleaning step on the machine. In this way, it was possible to reduce the amount of dry-cleaned clothes which previously had to be subjected to subsequent additional cleaning by hand. The disadvantages of the use of this triple system with the employment of water is, however, that the water present leads to the shrinking and felting of articles to be cleaned, and particularly articles of wool. In order to obtain a compromise between good cleaning action (large percentage of water) and little impairment of the material treated (low percentage of water) which depends on various factors, for instance, the fineness of the individual fibers, the nature of the fibers, their softness and the degree of twist, it was therefore necessary to carry out a very careful preliminary sorting which had to be left to skilled personnel.

The purpose of the present invention is to avoid such disadvantages by simple means. Its object is to improve the dry-cleaning agent so that the pieces of clothing to be cleaned can be cleaned practically just as good, if not even better, than in cleaning agents of the aforementioned type, but that the disadvantages effects due to the water action of such agents do not occur on the article to be cleaned. It is obvious that any expense for the elimination of creases and loss in shape which occur upon the basic dry-cleaning should be avoided as far as possible in order to keep the cost of the overall cleaning process low.

The invention is characterized by the following combination of features:

- a. the agent is free of water, and
- b. the surfactant has an HLB value of about 13 to 18.

The invention is therefore based on the use of a substantially water-free solvent/surfactant system with the proviso that special surfactants, i.e., surface-active substances which act, for instance, as emulsifiers and specifically those with an HLB value of about 13 to 18 are used. The cleaning results obtained thereby are

substantially better than with the previous water-free cleaning agents and at least equivalent to the previous water-containing cleaning agents, with the important advantage, however, that the aforementioned disadvantages of water-containing cleaning baths are not obtained. The object of the invention can, therefore, be obtained in exemplary fashion.

The HLB value is a characteristic factor of the HLB scale which extends from the value of zero to 20 and classifies the non-ionic surfactants into those with lipophilic characteristics and those with a hydrophilic character. The HLB value is calculated, for instance, in accordance with the following empirical formula:

$$HLB = 20 \cdot \left(1 - \frac{M_o}{M} \right)$$

in which M_o is the weight of the hydrophobic part of the molecule and M the weight of the entire molecule. A value of 10 represents —somewhat in the same way as a pH of 7 — a limit value between acid and alkaline agents, although the region between 9 and 11 can be referred to as more or less neutral region and the lipophilic surfactants have values between 0 and 9 and the hydrophilic surfactants values between 11 and 20. The technical expression HLB is derived from hydrophil-lipophil-balance. If the values of the HLB scale used here were multiplied by the factor of 5 so as thus to reach from the value of 0 to 100, this would correspond to the complete analog to the true solubility behavior with respect to water. In accordance with this other scale of 0 to 100, the scale value would indicate the percentage of the total hydrophilic share in the total weight of the surfactant molecule. A non-ionic surfactant with 100% hydrophilic share would accordingly have an HLB value of 20 in accordance with the scale used in the present specification and claims. Water is ascribed to said value since no such emulsifier naturally exists. An HLB value of the scale used here of 16.7 would correspond to a hydrophilic portion of said molecule of 84%.

The HLB values of the scale used here can, for instance, be calculated as follows for most polyol fatty acid esters:

$$HLB = 20 \cdot (1 - S/A)$$

S = saponification number of the ester

A = acid number of the acid recovered

With a saponification number of about 45.5 and an acid number of about 276, we then have:

$$HLB = 20 \cdot (1 - 45.5/276) = 16.7$$

If the hydrophilic portion consists solely of ethylene oxide as, for instance, in the case of polyoxyethylene stearates, the following computation formula is used:

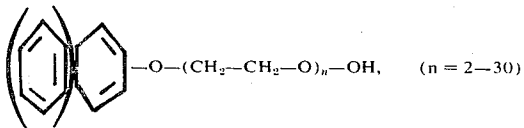
$$HLB = E/5$$

E = weight percent ethylene oxide

As surfactants, there can be used both those of long-chain structure, such as in particular, long-chain alkyl-aryl sulfonates, for instance of the structural formula:



with the long-chain alkyl radical R, such as the dodecyl radical; said surfactant being used in combination with an ethoxylate, such as arylpolyethoxylate as follows:



and other surfactants. Surfactants having an HLB value of more than 9 are particularly well suited when the hydrophilic radical is of linear development. The hydrophilic portion in anhydrous solvent should be as large as possible. The lipophilic portion should only be so large that it is still just sufficient to dissolve the entire molecule of the surfactant in the solvent. Very good cleaning effects are obtained in accordance with the invention namely, when the surfactant is just still soluble in the solvent. In this way, it is possible for its hydrophilic properties to be optimally available for the cleaning action. Although emulsifiers having an HLB value of about 10 to about 18 can be used to particularly good advantage with respect to their washing action, those with an HLB value of less than 11 are particularly good with respect to their brightening action.

It is known to use as an additive for dry-cleaning a cleaning reinforcer comprising sorbitan mono-oleate mixed with polyoxyethylene tail oil ester. This cleaning reinforcer has, however, an HLB value of about 7.9 and is, furthermore, not used by itself with the organic solvent, but as a general rule in the presence of water, since its purpose in accordance with the prior art consists specifically in making the organic solvent capable of taking up water. Wash-active substances having HLB values within the range of between 13 and 15 and even between 11 and 13 are also known. Wash-active substances, however, act only in the presence of water, but no water is added in the case of the present invention.

With regard to the surfactant, it is preferred to use a mixture of:

alkylaryl sulfonate (long-chain) with: polyoxyethylene compounds, such as polyoxyethylene derivatives of sorbitol anhydrides which are partially esterified with fatty acids, such as polyoxyethylene sorbitan tristearate, and polyoxyethylene sorbitanoleate, polyoxyethylene sorbitol ester, polyoxyethylene fatty alcohol ether, polyoxyethylene mannitan monolaurate; and polyoxyethylene derivatives of glycerol monoand diesters with caproic acid, myristic acid, palmitic acid, stearic acid, oleic acid, polyoxyethylene ethers, neopentyl alcohol, of 1-, 2- and 3-pentanol of 2-methyl-1- or 2-butanol, and of hexanol, heptanol, octanol and dodecanol, polyoxyethylene esters of pentanoic acid, carpylic acid, lauric acid, myristic acid and palmitic acid.

By using a mixture of surfactants, the emulsion is as a rule more stable. It is, therefore, advisable frequently to prepare a mixture of a surfactant having a high HLB value with a surfactant having a lower HLB value in order to obtain a particular medium HLB value.

A mixture of three parts of arylpolyethoxylate having an HLB value of 17.5 and one part of alkylaryl sulfonate having an HLB value of 11.7 is particularly advantageous.

The invention will be explained in further detail below on the basis of an example and compared with the prior art.

EXAMPLE A

This example refers to a known agent for dry-cleaning which is used, for instance, in a 30 kg machine for the cleaning of pants, which contains 4% water (referred to the weight of goods or pants) in the dry-cleaning bath. The composition of the dry-cleaning bath is the following:

125 Liters of perchlorethylene as organic solvent, in which there is contained 2 g/l of a mixture of long-chain alkyl sulfate, aralkyl sulfonate and solubilizer, 1.2 liters of water in which there is contained the same quantity of the mixture as above, so that the dry-cleaning bath contains a total of about 4 g/l of the mixture.

Although excellent cleaning effects can be obtained with this dry-cleaning bath, certain textiles shrink, felt and crease when the dry-cleaning bath is removed from the drum and the goods dried. The pants must, therefore, be carefully ironed without it being possible to do away with the reduction in size which has resulted from the shrinkage.

EXAMPLE B

The dry-cleaning agent of the invention consists of perchlorethylene as organic solvent together with an additive which is contained in a portion of 2 g/l in the solvent. The additive consists of three parts of arylpolyethoxylate and one part of long-chain alkylaryl sulfonate.

By means of this dry-cleaning bath, not only is the cleaning action of the dry-cleaning bath of Example A surpassed, but it was also impossible to note any shrinkage of the pants or felting of the textile material. After removal of the pants from the dry-cleaning bath and drying, no wrinkling could be noted so that the subsequent ironing is considerably facilitated. The excellent cleaning action avoids or reduces subsequent spotting.

The articles cleaned in accordance with Example B could therefore be cleaned not only better but also cheaper.

EXAMPLE C

The dry-cleaning agent corresponds essentially to that indicated in Example B, with the difference, however, that the addition consists of 80% polyoxyethylene fatty alcohol ether and 20% alkylaryl sulfonate.

By means of this dry-cleaning bath, there is obtained a cleaning effect corresponding to that of Example B, but with the further improvement that the cleaned piece of textile shows a finishing effect.

The amount of surfactant added to the organic solvent may range from about 2 grams to 5 grams per liter of the solvent.

The ethoxylate-sulfonate combination employed in the invention is further defined as follows:

A. Ethoxylate component

I. Amount: at least 75% by weight of the detergent mixture

II. Definition:

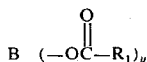
General formula: $\text{A}-\text{O}-(\text{CH}_2-\text{CH}_2-\text{O})_n-\text{OH}$ wherein $n = 2$ to 30 and

A is a member from the group consisting of:

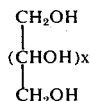
a. Naphthyl or phenyl, optionally substituted with from 1 to 3 C_1-C_{10} -alkyl groups with the proviso

that the number of total substituent carbon atoms does not exceed 18

- b. branched C_3-C_{12} -alkyl groups, such as isobutyl
- c. straight chain C_4-C_{12} -alkyl groups
- d. C_4-C_{17} -acyl groups
- e. the residue of a fatty acid ester of the formula



wherein $y = 1$ to 3 ; $\text{R}_1 = C_5-C_{17}$ -alkyl or -alkenyl (branched or straight chain) and B is derived from



wherein $x = 1$ to 4 or an anhydride of this compound with the proviso that if $x = 1$, y is 1 or 2 and that at least one OH is etherified with ethylene oxide to form the ethoxylate component whereas at least one of the remaining groups OH is esterified with the fatty acid residue;

III. Other features: The hydrophilic residue should be only large enough that the compound is soluble in the organic solvent used for dry cleaning.

B. Sulfonate component

1. amount 25% by weight or less of the detergent mixture
2. Definition



$R = C_8-C_{18}$ branched or straight chain alkyl groups

3. Other features: This component acts as a solubilizer. $(A + B) - \text{HLB-value}$ 13 to 18

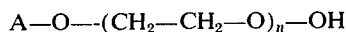
In the examples, component A was $A-O-(C_6H_4-CH_2-O)_n-OH$ in which A is the phenyl group

and component B was sodium dodecylbenzene sulfonate.

Additional comparative tests were conducted as follows.

I. The Invention

A blend was formulated comprising about 80% by weight of aa compound of the formula:



wherein A is phenyl and $n = 15$, and comprising 20% by weight of sodium dodecylbenzene sulfonate, the blend being essentially anhydrous and having an HLB value of 16.

II. Comparison Product

A commercial product was used known by the trade-name "Lanadol OL" comprising a blend of sodium alkyl-benzene sulfonates (mainly dodecylbenzene sulfonate) and an adduct of nonylphenol with 6 moles of ethylene oxide, the blend containing 5% water and having an HLB value of 9.

The tests were carried out using 3 grams of composition (I) and 3 grams of composition (II), respectively, per liter of perchloroethylene as a solvent. A dry-cleaning machine referred to as BÖWE R9 was used.

- 5 The goods which were subjected to cleaning were trousers of cotton and polyacrylonitrile, the latter having been treated with a water soluble dye (metal complex dye), the former being impregnated with sodium chloride.

- 10 In the test using commercial composition (II), 3% water by weight of the goods being treated was added according to the manufacturer's instructions.

- In determining dry cleaning effectiveness, light reflection of the fabrics treated with the dye was increased before and after dry cleaning with compositions (I) and (II), respectively. In addition, the chloride content was determined by the Mohr titration before and after dry cleaning.

- 20 The "greying" effect of the fabric which relates to the redeposition of dirt was measured optically to determine the whitening value before and after dry cleaning.

- As a final test, the wear and crease resistance of the trousers were evaluated visually. In each test, three runs were carried out. The average results are given in the table below:

Fabric	% Greying		% Dirt Removal		Cleaning Agent
	Polyacrylonitrile	Cotton	Dye	Salt	
Trousers	2.3	4.2	21.3	14.29	(II)
	1.3	1.6	23.4	14.99	(I)

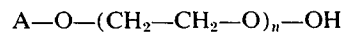
- 35 The results show that the dry cleaning composition of the invention is superior in that there is less redeposition of dirt. In addition, the trousers cleaned according to the invention exhibited better crease resistance.

- Although the present invention has been described in conjunction with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit and scope of the invention as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the invention and the appended claims.

What is claimed is:

1. A dry-cleaning agent consisting essentially of a chlorinated hydrocarbon containing an effective amount of a surfactant,

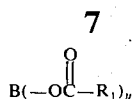
- I. said effective amount of surfactant containing as a mixture at least 75% by weight of an ethoxylate component having the general formula:



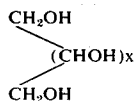
wherein $n = 2$ to 30

- wherein A is a member of the group consisting of:
 - a. naphthyl or phenyl, optionally substituted with from 1 to 3 C_1-C_{10} -alkyl groups with the proviso that the number of total substituents carbon atoms does not exceed 18,

- 65 b. branched C_3-C_{12} -alkyl groups,
- c. straight chain C_4-C_{12} -alkyl groups,
- d. C_4-C_{17} -acyl groups
- e. the residue of a fatty acid ester of the formula

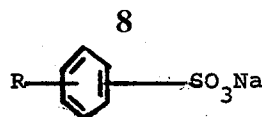


wherein $y = 1$ to 3 ; $\text{R}_1 = \text{C}_5\text{--C}_{17}$ -alkyl or -alkenyl groups (branched or straight chain), and B is derived from



wherein $x = 1$ to 4 or an anhydride of this compound with the proviso that if $x = 1$, y is 1 or 2 and that at least one OH is esterified with ethylene oxide to form the ethoxylate component whereas at least one of the remaining OH groups is etherified with the fatty acid residue

II. said surfactant having a sulfonate component ranging up to about 25% by weight of the mixture having the general formula:



wherein $\text{R} = \text{C}_8\text{--C}_{18}$ of branched or straight chain alkyl groups, said component acting as a solubilizer; said ethoxylate component and said sulfonate component together having an HLB-value of 13 to 18 and being free of water.

2. The dry-cleaning agent of claim 1, wherein the amount of said surfactant ranges from about 2 to 5 grams per liter of solvent, and wherein the solvent is perchlorethylene.

3. The dry-cleaning agent of claims 2, wherein the surfactant is made up of approximately 3 parts of the ethoxylate component and 1 part of said sulfonate component.

4. The dry-cleaning agent of claim 3, wherein said ethoxylate is polyoxyethylene fatty alcohol ether.

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