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ABSTRACT OF THE DISCLOSURE

The heavy duty spot and stain remover of the present invention is an aqueous cleansing composition comprising:

(a) an anionic or nonionic surfactant suitable for use on dyed textile fibres, in an amount of from 0.05% to 2.5% by weight of the composition;

(b) a polar solvent or mixture of solvents comprising a glycol containing 5 to 13 carbon atoms and/or an alcohol containing 6 or more carbon atoms;

(c) an effective quantity of active peroxyhydrate oxidising agent, suitable for use on dyed textile fibres;

(d) a transition metal present in the form of an aqueous ammonium complex in an amount of from 2.5 to 200 parts per million of metal;

(e) a water soluble resin selected from the group consisting of styrene maleic anhydrides, styrene acrylic anhydrides, polyacrylic resins, and derivatives thereof in an amount of from 0.10% to 5.0% by weight of dry resin in the composition; and

(f) sufficient ammonium hydroxide to raise the pH of the solution to between 7.0 and 12.5.

The cleansing composition provides a simple and effective improvement on current methods of removing spots and stains from textile fabrics.

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C O M P L E T E S P E C I F I C A T I O N

FOR A STANDARD PATENT

O R I G I N A L

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Invention Title: "TEXTILE SPOT AND STAIN REMOVER"

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The following statement is a full description of this invention, including the best method of performing it known to us:-

TECHNICAL FIELD

The invention concerns improvements in the chemical methods of removing obdurate and unsightly spots and stains from textile fabrics, in particular carpets and upholstery fabrics manufactured from either natural or synthetic fibres or combination thereof presented for use with or without protective treatments.

BACKGROUND ART

Many types of coloured soiling and staining material come into contact with household fabrics in normal use. In private dwellings visible soiling materials with few exceptions are removed by modern fabric cleaning detergents. However, there are a few soiling materials that become chemically bound to the surface of both natural and synthetic fibres which remain after normal cleaning procedures. These are referred to in the art as "stains". In addition some soiling material contain coloured finely divided insoluble particles which cling tenaciously to the surface of fibres, especially to rough fibre surfaces. These latter soiling materials are clearly visible when examined by electron microscopy.

The removal of obdurate coloured staining and soiling materials still represents a major challenge to those employed in professional carpet and upholstery cleaning and, indeed, to the average householder who may occasionally encounter a spillage or soiling of one of these more difficult to remove substances.

Several types of chemical products are widely used for the removal of textile spots and stains by those engaged in both the domestic and professional carpet and upholstery cleaning.

Detergent type formulations

Many modern fabric detergents when applied to fabrics are capable of removing most recent soiling and staining materials from both natural and synthetic fibres. Removal is achieved by conventional and well documented chemical detergent mechanisms. Properly formulated textile detergents are able to solubilise and therefore both remove and decolourise coloured soiling substances from the surfaces of fibres by the process of micellar solubilisation and related detergent mechanisms.

In recent years enzymes of different types have been incorporated into fabric detergents to assist in solubilizing or otherwise removing organic materials binding soils to fibres. More concentrated enzymes-detergent combinations are also employed as spot and stain removers and are particularly useful where aged food based soils are encountered.

Solvent action

Many common soiling materials are physically bound to the surface of fibres by a thin layer of either an oily or greasy substance, eg. butter, vegetable or mineral oils, cosmetics etc.

Application of an efficient cleaning solvent, preferably one containing an appropriate emulsifying

agent to facilitate water rinsibility after use, is applied to the fabric. By penetration into and therefore changing the nature of the physical bond to the surface of fibres, the solvent releases the soiling material which can then be either wiped or rinsed away with water.

Chemical decolourising

A wide range of chemical reactions are employed in more specialised spot and stain removers to remove coloured stains. These include chlorine bleaches, strongly acidic preparations, mild oxidising and reducing agents, concentrated dispersing agents often in combination with either acidic or alkaline salts and reactive chemicals.

The use of powdered and liquid formulations containing mild oxidising agents with and without added detergents are currently popular and indeed are widely promoted in the technical press and cleaning supply industry. These formulations may contain one or more of the following oxidising agents:

Hydrogen peroxide, sodium peroxide, sodium percarbonate, sodium perborate (with or without a specific organic activator), sodium persulphate, sodium peroxidiphosphate and the potassium salts and hydrates thereof, as well as organic oxidising agents such as, benzyl peroxide and urea peroxide.

Australian Patent No. 611808 uses the traditional alkaline (ammonia) activation of hydrogen peroxide

(Encyclopaedia Britannica, Macropaedia Vol. 18, page 184, 1978, Encyclopaedia Britannica Inc., USA) plus an alcohol in aqueous solution to reduce the colour of food and some beverage stains on textiles, in particular carpets. This product, like similar products currently sold, is still not effective with two common classes of soils and stains.

Firstly, stains due to soiling with used lubricating oils. Used, partly oxidised, lubricating oils usually contain dark carbonaceous particles resulting from heat decomposition of oil. These dark particles often remain on fibres after the oil is removed and are quite difficult to remove.

Secondly, stains found on natural fibres, particularly wool, when fouled by hot brewed, unfiltered coffee, eg. percolated coffee, which contains fine particles of dispersed coffee solids. Aged stains from strong coffee on natural fibres very often defy these latter mild oxidising agents. Total removal often requires repeated and time consuming retreatment to reduce coloured stains to an acceptable level for commercial purposes.

There is a need for improved simple methods for removing these obdurate spot and stains beyond those currently marketed.

The present invention provides a simple and effective improvement on current methods of removing spots and stains from textile fabrics which has been

demonstrated to be very effective and quick to use on these latter types of common obdurate spots and stains.

SUMMARY OF THE INVENTION

The present invention is an improved cleaning solution and a heavy duty spot and stain remover for use on textile fabrics.

According to the one aspect, the invention consists in an aqueous textile fabric cleansing composition comprising:

(a) an anionic or nonionic surfactant suitable for use on dyed textile fibres, in an amount of from 0.05% to 2.5% by weight of the composition;

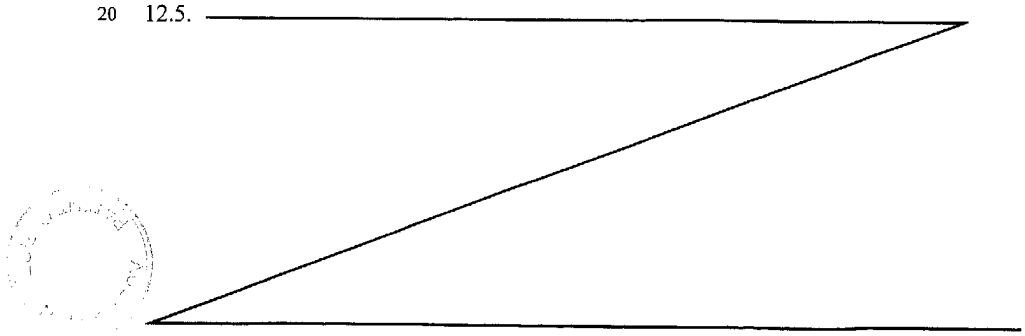
(b) a polar solvent or mixture of solvents comprising a glycol containing 5 to 13 carbon atoms and/or an alcohol containing 6 or more carbon atoms;

(c) quantity effective to reduce the colour of a spot or stain of active peroxyhydrate oxidising agent salt or thereof, suitable for use on dyed textile fibres;

(d) a transition metal present in the form of an aqueous ammonium complex in an amount of from 2.5 to 200 parts per million of metal; and

(e) a water soluble resin selected from the group consisting of styrene maleic anhydrides, styrene acrylic anhydrides, polyacrylic resins, and derivatives thereof in an amount of from 0.10% to 5.0% by weight of dry resin in the composition;

(f) sufficient ammonium hydroxide to raise the pH of the solution to between 7.0 and 12.5.



The cleaning solution may be optionally presented as a two part system, which is mixed in equal proportions immediately before use. One part comprises an aqueous solution or a powdered mix of an oxidising agent preferably hydrogen peroxide or sodium percarbonate. The other part comprises an aqueous solution containing an efficient wetting agent, a glycol alcohol containing 5 to 13 carbon atoms or an alcohol containing 6 or more carbon atoms and/or other polar cleaning solvents, together with a metal containing ammoniacal resin solution having a pH in the range 10.0 to 12.5. The two parts when mixed may be applied directly onto fabrics either by spray or wet cloth, then allowed to air dry and the dry residue remaining vacuumed away.

Optionally a stain repellent resin can be included which helps protect the soil and stain repellent coatings applied to, for example, most currently produced new carpets.

According to another aspect of this invention there is provided a method of removing spots and stains from textile fabrics, whether made from natural or synthetic fibres, by application of a cleansing composition described above.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The wetting system can be provided by a range of surfactants, both anionic and non-ionic in current use for fabric cleaning. However, to facilitate the

purposes of this invention, the preferred choice is highly biodegradable classes of surfactants such as alcohol poly ethoxylates, alkyl sulphates, alkyl aryl sulphonates, alkyl glucocides, olefin sulphonates, diphenyl oxide disulphonates and alkyl amine oxides. In the preferred embodiment an alkyl sulphate where the alkyl chain contains 8 to 16 carbon atoms, such as sodium lauryl sulphate, is employed in the amount of 0.1 to 2.5 percent by weight. The 30% solution form of this surfactant is employed for easy manufacture. The amount of surfactant required will clearly be dependent upon the total chemical system involved but in general the preferred quantity is that which equals to or exceeds the critical micelle concentration of the particular surfactant in the use solution.

Other surfactants acceptable for the purposes intended are alkyl amine oxides wherein the alkyl chain contains from 8 to 16 carbon atoms; alkyl substituted benzene sulphonates and alkyl naphthalene sulphonates wherein the alkyl chain contains from 4 to 18 carbon atoms, olefin sulphonates containing 10 to 18 carbon atoms, commercially available disulphonated alkyl diphenyl and diphenyloxides, alkyl polyglucocides, and alkyl (C8 to C16) alcohol ethoxylates containing 4 to 16 moles of ethylene oxide. Other classes of surfactants can obviously be adapted to suit the purposes of this invention by those skilled in the art.

The polar water soluble solvent will assist in cleaning action and will be chosen from those products currently available commercially which include alcohols containing more than 6 carbon atoms. Mono, di and tri ethylene glycols and propylene glycols wherein the alkyl or aryl chain attached to these polar glycols contains from 1 to 10 carbon atoms can also be used advantageously to facilitate wetting of the fibres as well as aid destained action by assisting removal of organic staining materials. The glycols and other polar solvents that can be successfully employed are generally the same as those used to promote detergency in aqueous alkaline domestic and industrial hard surface cleansers. The preferred glycols are triethylene glycol and mono methyl dipropylene glycol. Mixtures of approximately equal amount of an alcohol and glycol are preferred provided that at least one solvent is a glycol having 5 to 13 carbon atoms or an alcohol having more than 6 carbon atoms e.g. ethanol and the methyl ether of dipropylene glycol.

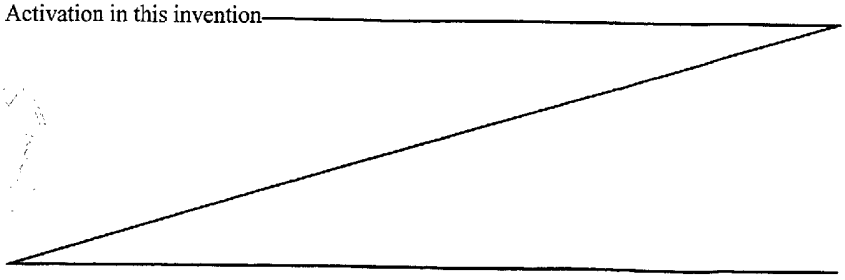
Examples of polar solvents are ethanol, isopropanol, butanol, mono, di and triethyleneglycols, the methyl, ethyl and butyl ethers of ethyleneglycol, the methyl, ethyl and butyl ethers of diethyleneglycol, mono, di and tri propyleneglycol, the methyl, ethyl and butyl ethers of mono, di and tri propyleneglycol, the aryl ethers of mono, di and tri propyleneglycol, 3-methylmethoxybutanol, hexyleneglycol and like polar

cleaning solvents. However, any aqueous soluble polar solvent normally employed in the preparation of heavy duty water based industrial and domestic cleaning products can be employed provided it is suitable for use on textile fibres, that is to say, it does not affect any fibre, dye or surface treatment applied to textile fibres when incorporated into the products of this invention. Mixtures of these various solvents are clearly envisaged, such as 3 methylmethoxy butanol and either triethylene glycol or mono methyl dipropyleneglycol ether.

An oxidising agent could be chosen from the general class of peroxyhydrate compounds most of which are listed above, including hydrogen peroxide, sodium peroxide, sodium percarbonate, sodium persulphate, sodium perborate, sodium peroxy diphosphate, sodium carbonate peroxydihydrate or the potassium salts or commercially available hydrates thereof, but will preferably be hydrogen peroxide in liquid products and sodium percarbonate in powdered products manufactured according to the art herein disclosed. The amount used will be from 5 to 35 percent of the total weight of the formulation applied to the fibre.

To intensify the reactiveness of the oxidising agent an appropriate catalyst is added to the solution containing the oxidising agent immediately prior to application to the fabric. The purpose of the catalyst is to reduce the activation energy required to optimise the colour reducing power of the oxidising agent. This both increases the effectiveness of the colour reducing system and speeds the rate at which colour reduction occurs.

Activation in this invention



is achieved through the incorporation of a divalent or trivalent metal in the form of its ammonium complex. The transition elements are preferred for this purpose, in particular zinc, copper, iron, silver and zirconium. However, other members of this group of elements can be employed provided the metal can be demonstrated not to form a coloured complex either during use of the product or during or after drying on the surface of fibres; likewise it must have no deleterious effect on fibres nor on stain and soil repellent coatings found on normal household and commercial furnishing fabrics when used in accordance with this invention. The ammonium complex of the metal is prepared in-situ by adding an appropriate soluble salt of the metal into an aqueous ammonia solution. The amount of catalyst required is quite small varying with the metal employed from 5 to 250 parts per million of the ready to use cleaning solution.

The resin to be used is one designed for use as an additive to carpet detergents with the purpose of both assisting in soil and stain removal and promoting a dry friable residue when the cleaning solution dries. Such resinous dry residues also serve as vacuuming aids permitting dry solid soils (coated with resin during the drying process) to be removed during regular vacuuming of carpets and other textile fabrics. Suitable resins generally fall into the group of styrene maleic anhydride, styrenated acrylic and polyacrylic acid resins; which are completely soluble in dilute ammonia

solution. These types of resin may also be suitable for use as brightening resins in aqueous acrylic floor polishes. They can usually be procured as 30 percent ammoniacal resin solutions. If not so available, these resins can be quite simply solubilised in dilute aqueous ammonia solutions at temperatures above 50°C. SMA #17325 resin manufactured by Arco Corporation, USA, is such a resin, although polyacrylic acid resins employed for water softening and soil dispersion in modern fabric detergents may also provide similar effect, as will some resins employed as "brighteners" in aqueous acrylic floor polishes. Some commonly encountered coloured soils found on textile fibres are generally decolourised when coated by some of these latter resins. Lightly coloured "brightening resins" used in floor polishes may also be employed for this purpose as they may also be decolourised by the oxidising agent whilst in solution in preparations made according to this invention.

These latter groups of resins are readily solubilised by the addition of ammonia in warm solution (50 - 60°C) at pH in the range 10.0 to 12.5. The ammoniacal solution of resin thus made will also serve as a carrier for the metal catalyst. As the preparation dries on a carpet the metal, having served its purpose as an activating catalyst, subsequently becoming firmly bound to carboxylic groups on the resin backbone. As the ammonia evaporates to air during the drying process, the metal-resin complex becomes part of the dry,

vacuumable residue and therefore unavailable and unreactive to the surface of either natural or synthetic fibres over time. Thus the metal - ammoniacal - resin solution serves both as the catalyst for the oxidising agent as well as part of the dry residue resin and fibre protective systems in the final products of this invention.

If required an additional component, a stain blocking resin, usually a poly aromatic sulphonate, a sulphonated polyaromatic sulphone or a poly acrylic aromatic sulphonate, can be incorporated into this latter solution to limit (usually avoid) loss of stain blocker resin from treated fabrics during spot and stain removal procedures. These resins are widely available commercially.

To facilitate the operation of the invention the cleaning preparation may be presented as a two part system. Part A contains the oxidising agent, in solution or in powdered form, - to ensure its shelf stability and to avoid the remote possibility of premature decomposition of the oxidiser in storage.

In liquid form, this is an aqueous solution made with demineralised or distilled water containing from 10 to 30 percent by weight of, for example, stabilised 30 percent hydrogen peroxide. This is equivalent to 3.0 to 9.0 percent hydrogen peroxide, H_2O_2, at use strength.

Alternatively, in powdered form, sodium percarbonate can be packaged in a suitable container

which is then added into and dissolved in an equal weight of PART B to make the ready-to-use cleaning solution.

Part B contains the solution of the surfactant, the solvent, the metal - ammoniacal - resin complex in water pH adjusted to 10.0 to 12.5. The chosen surfactant is first dissolved in demineralised or distilled water at room temperature. The polar solvent is then added. To form the metal complex, a transition metal salt, eg zinc carbonate, is solubilised in an equimolar quantity of dilute aqueous ammonia at room temperature by simple stirring. The required amount of the metal complex solution is slowly added into the surfactant - solvent - resin solution with good stirring. If required additional ammonia is added until a clear stable solution is achieved. The pH of the solution is adjusted to between 10.0 and 12.5, preferably 11.5 and 12.5, by slow addition of further ammonia to stabilise the solution on storage. Addition of a stain blocking resin, if needed, may require some adjustment to the formulation of PART B with respect to pH and solvent choice to ensure stability and functionality of the stain blocker resin in this type of system; however, this will be readily appreciated by those familiar with the art.

The formulations comprising PART A and PART B are then appropriately packaged and labelled with instructions for use. The two parts are mixed in equal

proportion immediately before use. Usable life after mixing is approximately 4 hours before decolourising power is lost by catalysed decomposition of the oxidising agent.

The invention will now be illustrated by way of examples which are not intended to nor should they be construed so as to, limit the scope thereof.

Example 1 - Formulations of cleansing compositions

Examples of actual formulation evaluated for effectiveness both in the laboratory and by extended field testing under actual use conditions are as follows.

FORMULA NO. 1

PART A

This is made by diluting 100 grams of 30 percent stabilised hydrogen peroxide with 900 grams of demineralised or distilled water.

PART B Mix together in the following order:

1	Demineralised water	500 g
2	Sodium lauryl sulphate	4.0 g
3	3 Methylmethoxy Butanol	50 g
4	Dipropyleneglycol methylether	50 g
5	SMA 17325* 30% solution	30 g
6	Zinc ammonium carbonate 15% sol'n	1.0 g
7	Concentrated ammonia solution	to pH Control
8	Demineralised water	to 1000 g
9	pH control	12.0 to 12.5

*Arco Corp.

FORMULA NO. 2

PART A

Sodium percarbonate	750 g
Sodium sesquicarbonate	250 g

PART B as in Formula No. 1.

It will be evident to those skilled in the art that these types of formulations can be manufactured more concentrated, each formulation diluted with water prior to mixing Parts A and B. The concentrations chosen above are for market convenience. Likewise the application strength of the fully constituted product prior to application can be further reduced to lessen the concentration of chemicals applied to fibres, where indicated by experience or field testing in particular situations.

Example 2 - Evaluation Methods

Two procedures were followed. Each of the above formulation was compared with a commercial alkaline activated hydrogen peroxide based destainer marketed as a two pack product and considered the most effective currently available for the removal of aged coffee stains on carpets.

In the laboratory, samples of new plain light coloured medium weight loop pile Hessian-backed carpet made from both 100% wool and 100% nylon fibres were cut into pieces $20cm^2$. Test pieces were stained by pouring on them 25mL of hot freshly brewed strong percolated coffee, which was then allowed to air dry

overnight. Each stained area was then sprayed with a solution of the test product made by mixing equal volumes of PARTS A and B immediately before application. After 5 minutes the spray was absorbed by clean white tissue. The area was then lightly resprayed a second time and the solution allowed to air dry overnight, after which it was thoroughly vacuumed.

Identical tests were performed with rasberry cordial concentrate (Cottee Brand) diluted 1 part to 4 parts with tap water. 25mL was poured onto each piece of carpet and allowed to air dry.

Tests were carried out concurrently and in exactly the same manner using both the purchased product and Formulations 1 and 2. Observations were made and recorded each 5 minutes while the tests were in progress. Each test was repeated three times on different samples of new carpet. It was found that both formulations herein disclosed were faster in action. Complete removal of colour from both types of soils from the stained area was achieved by the formulation of the present invention whereas the purchased product was slower in action and did not totally remove the coffee stain under test conditions.

That removal of dried coffee was achieved quicker and more completely with the test formulations compared with the commercial product based upon hydrogen peroxide demonstrates the benefit of the novel detergent and activation systems in this invention. Significantly greater decolouring ability of Formulation 1 and 2 was

noted on wool carpet compared with synthetic carpet. This was another quite significant finding from this testing program.

Further tests were made by smearing 5 mL of used sump oil over the carpet pieces. Oil was allowed to age for 4 hours then removal attempted by application of an emulsifiable d-limonene based solvent oil and grease remover. This removed the oil but coloured soil remained and was still clearly visible. The areas were then sprayed with the test formulations by the above procedure, allowed to air dry then thoroughly vacuumed. No coloured soil was visible where Formulations 1 and 2 had been employed whereas some dark soiling was still apparent where the purchased product was used. Again there was faster and more complete cleaning and decolourising action from the test formulations compared with the purchased product.

Example 3 - Field Testing

Samples of both test Formulations 1 and 2 and the labelled purchased product were issued to three highly experienced professional carpet cleaners engaged daily in both domestic and commercial carpet and upholstery cleaning. The products were compared on obdurate stains found in both domestic and commercial buildings over a four week period. The three professional cleaners each reported definite improvement from Formulations 1 and 2 compared to the purchased product, claiming them by far the best stain removers they had yet tried under field conditions.

Other tests on a less organised basis have been carried out with the test formulation made according to this invention on both acrylic, polyolefin and polypropylene carpets in the field by other professional carpet cleaners. The test formulations were reported more efficient than the commercial product on each fibre type indicating the general acceptability of the products made according to the preceding methods for general domestic and commercial use on a regular basis.

Although the present invention has been described in terms of preferred embodiments it will be evident to those versed in the art that variations and modifications are possible whilst not departing from the basic principles and the spirit of this invention.

It is intended that the appended claims should cover all such equivalent variations which come within the scope of the invention claimed.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An aqueous textile fabric cleansing composition comprising:

(a) an anionic or nonionic surfactant suitable for use on dyed textile fibres, in an amount of from 0.05% to 2.5% by weight of the composition;

(b) a polar solvent or mixture of solvents comprising a glycol containing 5 to 13 carbon atoms and/or an alcohol containing 6 or more carbon atoms;

(c) quantity effective to reduce the colour of a spot or stain of active peroxyhydrate oxidising agent or salt thereof, suitable for use on dyed textile fibres;

(d) a transition metal present in the form of an aqueous ammonium complex in an amount of from 2.5 to 200 parts per million of metal;

(e) a water soluble resin selected from the group consisting of styrene maleic anhydrides, styrene acrylic anhydrides, polyacrylic resins, and derivatives thereof in an amount of from 0.10% to 5.0% by weight of dry resin the composition; and

(f) sufficient ammonium hydroxide to raise the pH of the solution to between 7.0 and 12.5.

2. A composition according to claim 1, wherein the surfactant is a linear alcohol (C8-C18) ethoxylate containing from 6 to 16 moles of ethylene oxide, a linear (C8-C12) alkylbenzene sulphonate, an alkyl (C4-C10) sulphate, an olefin (C8-C16) sulponate, an

alkyldiphenyl, an diphenyloxide isosulphonate, an alkyl amine oxide, an alkyl polyglucocide.

3. A composition according to claim 1 or claim 2, wherein the polar solvent comprises a mono, di or tri glycol derived from either ethylene or propylene oxide and their methyl, ethyl, butyl or benzyl ethers or 3-methylmethoxybutanol.

4. A composition according to any one of claims 1 to 3, wherein the polar solvent comprises from between 2.5 and 25% by weight of the composition.

5. A composition according to any one of claims 1 to 4, wherein the oxidising agent is selected from the group consisting of hydrogen peroxide, sodium peroxide, sodium percarbonte, sodium persulphate, sodium perborate, sodium peroxydiphosphate, sodium carbonate peroxydihydrate or their potassium salts and commercially available hydrates thereof.

6. A composition according to claim 5, wherein the oxidizing agent is a liquid.

7. A composition according to any one of claims 1 to 6, wherein the metal in the ammonium complex is silver or zinc.

8. A composition according to any one of claims 1 to 7, wherein the water soluble resin is a styrene maleic anhydride.

9. A composition according to any one of claims 1 to 8, wherein the transition metal ammonium complex is soluble in, and reactive on drying with, the water soluble resins.

10. A composition according to any one of claims 1 to 9, wherein the quantity of ammonium hydroxide added is sufficient to adjust the pH of the composition to between 11.5 and 12.5.

11. A composition according to any one of claims 1 to 10, further comprising from between 0.25 and 2.5% by weight of a commercial stain blocking resin to restore stain blocking properties to cleaned fabrics.

12. A composition according to any one of claims 1 to 11, wherein the cleaning composition is manufactured as a two-part system, the two parts being mixed together in equal proportions before use.

13. A composition according to claim 12, wherein at least one of the two parts is in powdered form.

14. A method of removing spots and stains from textile fabrics, comprising the step of application to the fabric of a cleansing composition according to any one of claims 1 to 13.

15. A method according to claim 14, wherein the textile fabric comprises natural fibres.

16. A method according to claim 15, wherein the textile fabric comprises a mixture of natural and synthetic fibre.

17. An aqueous textile fabric cleansing composition, substantially as hereinbefore described with reference to any one of the Examples but, excluding any comparative Examples.

18. A method of removing spots and stains from textile fabrics, substantially as hereinbefore described with reference to any one of the Examples but, excluding any comparative Examples.

DATED this 18th day of MAY, 1995

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