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(54) Particulate detergent composition contained within a closed bag of sheet material.

(57) A detergent product comprises a bag formed partly or wholly of polypropylene fibres, and containing a particulate detergent composition. Polypropylene does not degenerate on storage as do cellulose fibres. The detergent composition may be fully formulated composition, particularly containing a bleach, and or other fabric treatment materials. The bag may be formed by heat-sealing. One or more seals may be water-soluble or mechanically weak to enable the bag to burst open in the washing machine.

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TITLE MODIFIED

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DETERGENT PRODUCTS

TECHNICAL FIELD

The invention relates to detergent products which are suitable for treating fabric in a washing machine and which contain detergent compositions in particulate form.

BACKGROUND ART

Although the marketing of powdered detergent compositions packaged in cartons is common practice, this imposes constraints both on their formulation and methods of production. For example the powders must be free flowing and have an attractive appearance to the consumer, and the ingredients should not segregate during transport and storage. The products must also be safe, both for contact with the skin and in the event of accidental ingestion; in particular, the compositions should not

contain too high a level of alkaline materials although alkalinity is beneficial for detergent properties. When using washing machines which have a rotating drum in which the fabrics are placed, there can also be substantial losses of conventionally dosed detergent powder by retention in the dispenser and by its accumulation in the dead spaces beneath the drum, such as the drain hose.

It has been proposed previously to market powdered detergent compositions in packages each of which contains suitable amounts of the detergent powders for individual washes under normal washing conditions. In particular, from United States Patent Specification No 3 198 740 the detergent powders can be contained within bags of water-soluble materials such as soluble polyvinyl alcohol, but such packages have not yet met with much commercial success. One of the reasons for this is believed to be the higher cost of packaging the detergent powders in this way which has outweighed the increased convenience in using the products. British Patent Specification No 961 821 discloses a package for chemicals such as bleaching powder, soaps or detergents, the package material being formed of a vented film such as polypropylene. Canadian Patent Specification No 901 244 described a water-soluble bag for insecticides, the bag being reinforced with a polypropylene net. We have now found that improved bags can be made by using polypropylene fibres.

DISCLOSURE OF THE INVENTION

Accordingly, the present invention provides a detergent product which comprises a particulate detergent composition contained within a water-insoluble, but water-permeable bag which is constructed of sheet material containing at least a minor proportion of polypropylene fibres.

A major advantage of the use of a proportion of polypropylene fibres is that they facilitate making the bags by heat-sealing methods, which are convenient for large scale manufacture, and yet the polypropylene is relatively cheap to use, compared with other heat-sealing methods and the

fibres are strong and can be made in fine denier sizes to make suitable porous sheet materials. In addition, the polypropylene fibres have a major advantage in being chemically stable and, by using a relatively high proportion of such fibres in the material from which the bags are formed, it is possible to include in the detergent compositions ingredients which could not be packed in conventional bags of cellulosic fibres, for example bleaching agents such as sodium perborate or trichlorocyanuric acid.

10 BEST MODE OF CARRYING OUT INVENTION

Preferably the bags are constructed substantially only from polypropylene fibres or at least from a major proportion of polypropylene fibres together with other conventional fibres. The minimum amount of polypropylene fibres which can be used to achieve any significant benefit is about 10% by weight of the total fibre mix.

The polypropylene fibres may contain a minor content of copolymerisable monomers, or additives for dispersibility such as styrene-vinylpyridine copolymer and may optionally be surface modified with mineral additives. Such fibres are commercially available in staple fibre or continuous filament form, either of which may be used. The bag material may alternatively include bicomponent fibres such as polypropylene/polyethylene fibres available from Chisso E.S., Japan.

The polypropylene-containing sheet material used to form the bags in the products of the invention may be paper or woven, knitted or non-woven fabric, which can be made by conventional techniques. Such sheet material should be water-insoluble and water-permeable. The material used to form the bags advantageously has a high wet strength, so as not to disintegrate during the washing process. Although the polypropylene content can improve wet strength, treatment with polymeric wet strength agents may also be used.

The polypropylene-containing sheet material used for forming the bags normally weighs about 5 to 100,

preferably about 10 to 60 g/m², especially about 15 to 40 g/m². If other fibres are used with the polypropylene fibres to form the sheet material, they may be of natural or synthetic origin, for example polyamide, polyester, 5 polyacrylic, PVC, PVdC (polyvinylidene chloride), cellulose acetate, polyethylene or cellulosic fibres. If a significant porportion of natural, e.g. cellulosic, fibres are used, it may be desirable to include a proportion of long fibres as Manila hemp, in order to improve the strength 10 of the sheet material and pliability, and reducing stiffness, thereby giving the material a fabric-like appearance, and a binder may also be necessary for increasing wet strength.

The bag material should have a pore size such that there is no excessive dusting of the detergent composition 15 through the material of the bags in the dry state but yet that water can pass readily through the material forming the bags to disperse and dissolve the contents when the product is used.

For optimum properties, the pore size distribution of 20 the polypropylene-containing sheet material should be selected in relation to the particle size distribution of the detergent composition so that no more than about 5% by weight, preferably not more than about 1%, of the particles can pass through the sheet material, and hence cause dusting. 25 With very fine powders, for example made by dry mixing, the maximum pore size of the sheet material must be very small, preferably so as to retain only detergent particles greater than about 20 microns. With coarser grained detergent compositions the maximum pore size of the sheet material 30 may be larger so as to retain detergent particles greater than about 100 microns, e.g. about 500 up to about 1000 microns, as appropriate. It may be noted that larger pore sizes are generally better for dissolving powder quickly, but this puts more constraints on the powder processing 35 techniques which can be used in order to avoid excessive dusting.

If desired, the polypropylene-containing sheet material may be treated to protect the detergent compositions from atmospheric moisture or the non-polypropylene fibres from chemical attack by the detergent composition, for example by coating the sheet material with a water-soluble substance, e.g. gelatine, salts or esters of alginic acid, salts and esters of methyl cellulose or carboxymethyl cellulose, soap or a water-soluble cationic detergent active material, or by providing an extra protective layer of a water-soluble sheet material such as soluble polyvinyl alcohol. Alternatively, the sheet material of the bag may be treated with a removable water-insoluble protective agent such as a water-insoluble cationic fabric softener, a silicone, a fatty acid, wax or clay. Some of these treatments, e.g. clay, also alleviate dusting, so sheet materials with somewhat larger maximum pore sizes can be used, which facilitates the rapid dissolution or dispersion of the detergent composition in water. If the bags are to be used for detergent powder which consists of, or contains, a bleaching agent such as sodium perborate or sodium percarbonate, it is desirable to treat the sheet material before or after forming the bags with a coating to improve oxidation resistance or to form the bags from polypropylene fibres alone or from a mixture of polypropylene and other oxidation resistant fibres.

The bags can be formed from a single folded sheet formed into a tubular section, or from two sheets of the material bonded together at the edges. For example, the bags can be sachets formed from single folded sheets and sealed on three sides or from two sheets sealed on four sides for the preferred rectangular shape. Alternatively, the sheets can be folded like envelopes with overlapping flaps to be sealed. The seals may be formed in a variety of ways including heat sealing, cold pressure sealing or with an adhesive.

In one embodiment of the invention, the bag is formed of two sheet materials heat-sealed together, one of said

sheet materials containing at least a minor proportion of polypropylene fibres and heat-sealing at a relatively low temperature, the other sheet material heat-sealing at a relatively high temperature or being a non-heat-sealable sheet material, such as paper.

The use of bicomponent fibres such as polypropylene/polyethylene fibres in the bag material enables the bag to be heat-sealed at a lower temperature than if polypropylene fibres were used alone.

The bags used to form the products of the invention can either be of the type which open in the washing machine, for example by using a water-sensitive seal or which are closed and constructed so that the detergent composition escapes through the walls of the bag by dissolution and dispersion in the wash liquor.

An opening bag may be formed by sealing the bag with a water sensitive adhesive as described in our Belgian patent No. 867 039 (United States application S/N 905 680) or by forming the bag of a material that will disintegrate in the wash. This may be achieved by using a fibrous bag material, particularly a cellulosic fibrous bag material, which includes little or no binder or includes a water-sensitive (e.g. water-soluble) binder such as starch, dextrin or soluble PVA latex. However, it is preferred to form an opening bag by closing the bag with at least one weak seal. In the case of a bag material which contains only a minor proportion of polypropylene fibres, the remaining fibres being non-thermoplastic, the weak seal may be formed by heat sealing at a lower temperature, lower pressure or for less time than the remaining seals. The construction of bags solely from polypropylene fibres facilitates the manufacture of heat-sealed bags which will not open in the wash.

In the case of a bag material which consists of, or contains a large proportion of, polypropylene, it may be difficult to produce a seal weak enough to open in the wash, if direct heat sealing is used. This may be overcome by

locally coating the bag material with a non-heat-sealable material or by inserting between the surfaces of the bag material which are to form the weak seal, a layer of non-heat-sealable material, such as paper or non-woven synthetic fabric, thereby to weaken the seal. A particular embodiment of the invention therefore comprises a heat-sealed bag formed of polypropylene, one or more seals being formed with a paper insert strip. The paper strip may be provided on one face of the polypropylene sheet before the bags are made and filled, or may be inserted during heat-sealing.

The bag may also be formed of a material comprising or consisting of polypropylene and a second component which heat-seals at a different temperature, such as polyacetate. In this case the weak seal or seals are formed by selecting a sealing temperature at which only one of these components will heat-seal, the remaining seals being formed by selecting a sealing temperature at which both these components will heat-seal.

A still further method of enabling the bag to open and discharge its contents in use, is to form the side walls of the bag with weakened areas, e.g. in the form of linear slit perforations with a removable protective strip positioned thereover. Opening of the bag then occurs by bursting at the weakened areas.

In the preferred embodiments of the invention, the bag is generally rectangular being sealed on either three or four edges. In the case where the bag is sealed along three edges, the fourth edge is formed by a fold in the bag material. In the case where the bag is sealed along all four edges, it is not desirable for all four seals to open in use. It is therefore preferred in such cases that no more than three such seals should be capable of opening in use.

Any detergent composition in particulate form can be packaged to advantage in the products of the invention. As an alternative to a fully formulated detergent composition (that is a composition containing at least a

surfactant and a builder) the bags may contain any one or more of the following fabric treatment materials: bleaches such as sodium perborate; bleach precursors such as tetraacetylene diamine (TAED), fabric softeners such as quaternary ammonium compounds; starch, perfumes, anti-bacterial agents; anti-static agents; whitening or blueing agents; stain removing agents and the like. It can be of particular advantage to add fabric treatment materials to the wash in a bag while dosing a fully formulated detergent composition in a conventional manner, where the incorporation of the fabric treatment material in the fully formulated detergent composition may otherwise be difficult. This is of particular importance in the case of perfumes, bleaches, bleach precursors and cationic fabric softening agents.

The fully formulated compositions which can be packaged to advantage in the products of the invention are amply described in the literature, for example in "Surface Active Agents and Detergents", Volumes I and II, by Schwartz, Perry and Berch.

However, the products of the invention are advantageously used for detergent powders containing insoluble ingredients, especially when the bags are constructed so as to open and liberate the detergent composition during the wash. Specific examples of such ingredients include finely divided calcium carbonate, the use of which is described in UK patent No. 1 437 950, and aluminosilicate ion exchange materials as described in UK patent specifications Nos. 1 429 143, 1 473 201 and 1 473 202.

It is also advantageous to use the products of this invention with detergent compositions containing bleach systems, particularly containing TAED and sodium perborate.

In addition, the detergent products of the invention are particularly suited for containing detergent compositions of relatively high bulk density, i.e. over about 0.5 g/cc, preferably about 0.6 to 0.8 g/cc. Bulk densities over about 1 g/cc are not recommended as this normally gives a reduced rate of water-solubility or dispersibility. The

use of high bulk density makes it possible to decrease the size of the detergent bags whilst still containing enough particulate detergent composition to be fully effective during use. This also enables the use of simple processing techniques for the production of the detergent compositions themselves, for example granulation or dry mixing, instead of traditional spray techniques.

If desired, the bags can be formed with more than one separate compartment for different detergent ingredients, or the bags may be formed in a conjoined manner, for example in a strip to facilitate dosing of different numbers of the bags as appropriate for the wash conditions. The use of multi-compartment bags facilitates the use of detergent ingredients which interact with other ingredients in detergent compositions, whilst avoiding encapsulation or other treatment to prevent contact between such ingredients in a single composition.

For example one opening compartment may contain a fully formulated detergent free of bleach while a non-opening second compartment may contain the bleach. A non-opening third compartment may contain a fabric softener.

Other bag shapes or constructions, for example circular cushion shaped sachets or of tetrahedron form, may be used if desired. The bags may also be reinforced to decrease the risk of leakage during handling, for example by adding an extra thickness of the sheet material where the bags are expected to be held or passing completely round the bags to help support the weight of detergent powder.

If desired, the sheet material used to form the bag can be marked or tagged so that it can be easily recognised amongst the washed fabrics, for example the material may be printed with a simulated fabric pattern such as check or gingham. It can then either be discarded, or, if desired, it may be constructed of a suitable material to provide it with a secondary use, for example as a cleaning cloth.

The invention is illustrated by reference to the following Examples in which parts and percentages are by weight except where otherwise indicated.

EXAMPLE 1

5 Detergent bags in sachet form were made from spun-bonded non-woven sheet material constructed wholly from thermoplastic polypropylene filaments, and weighing 20 g/m². Pieces of the sheet material measuring approximately 9" x 4½" (22.5 cm x 11.25 cm) were folded in half and then
10 heat-sealed along two opposing edges. The open bags so formed were each filled with 84 g of detergent powder of high bulk density (0.69 g/cc) prepared by a granulation process as described in Belgian patent No. 867 038 (United States application S/N 905 681) to the formulation below
15 and then heat sealed along the open edge to form sachets (4½" x 4½").

	<u>Ingredient</u>	<u>%</u>
	Nonionic detergent surfactant	14.0
	Sodium carbonate	34.0
20	Calcium carbonate (80 m ² /g)	18.0
	Sodium perborate	25.0
	Sodium carboxymethylcellulose	3.3
	Fluorescent agent, perfume	1.0
	Water	4.7

25 It was found that the filled bags gave very little dusting during normal handling. On using the sachets in a front loading automatic washing machine (Hoover Electronic 800), by placing the sachets with the clothes inside the drum, then washing the clothes under the high
30 temperature wash cycle, the bags were found to discharge their contents rapidly through the pores of the material on coming into contact with the water, and to give a satisfactory wash.

EXAMPLE 2

35 Detergent bags were made from water-permeable paper formed from mixed cellulosic fibres (Manila hemp) 70% and polypropylene thermoplastic fibres 30%, treated with

acrylic latex wet strength agent. The bags were formed by folding in half sheets of 9" x 4½" and heat sealing the two opposing sides, then filling the bags with 84 g each of the detergent powder used in Example 1, and finally heat-sealing the bags to give rectangular filled sachets of about 4½" x 4½".

The bags were then used to wash fabrics in front loading automatic washing machines by placing the bags inside the drums with the fabrics. It was found that all the bags opened early in the wash cycle by bursting along one of the seams, and good detergency results were achieved.

EXAMPLE 3

The following Example demonstrates the benefit of a polypropylene bag over a cellulosic bag.

Storage tests were carried out in which a powder having the composition given in Example 1, was stored in bags made from (a) Manila hemp with a viscose wet strength agent, (b) thermally bonded non-woven polypropylene staple (36 g/m²) (obtained from Monte Edison (UK) Limited of Manchester, England), and (c) a spun-bonded continuous non-woven filament polypropylene sheet material (30 g/m²) (obtained from Bondina Industrial Limited, Halifax, England). The samples were stored at 20°C/90% RH and 28°C/70% RH. Sample (a) bags under both storage conditions had degraded after 2 weeks. Samples (b) and (c) bags under both storage conditions were still intact after 3 months.

C L A I M S

1. A detergent product which comprises a particulate detergent composition contained within a water-insoluble, water-permeable bag, characterised in that the bag is constructed of sheet material consisting of, or containing at least a minor proportion of, polypropylene fibres.
2. A detergent product according to Claim 1, characterised in that the sheet material contains at least about 10% by weight of polypropylene fibres.
3. A detergent product according to Claim 2, characterised in that the sheet material contains at least substantially only polypropylene fibres.
4. A detergent product according to Claim 1, characterised in that the sheet material further contains cellulosic fibres, polyester fibres, polyamide fibres and mixtures thereof.
5. A detergent product according to Claim 1, characterised in that the sheet material is coated with a water-soluble material or a removable water-insoluble material.
6. A detergent product according to Claim 1, characterised in that the bag has heat sealed edges.

7. A detergent product according to Claim 6, characterised in that at least one of said heat sealed edges is adapted to open in the wash to discharge the detergent composition from the bag.
8. A detergent product according to Claim 1, characterised in that the bag has at least one water-sensitive sealed edge.
9. A detergent product according to Claim 1, characterised in that the particle size distribution of the particulate detergent composition in the pore size distribution of the sheet material are such in relation to each other that less than about 5% of the particles can pass through the sheet material.
10. A detergent product according to Claim 1, characterised in that the particle size distribution of the particulate detergent composition and the pore size distribution of the sheet material are such in relation to each other that less than about 1% of the particles can pass through the sheet material.

11. A detergent product according to Claim 1, characterised in that the detergent composition is selected from fully formulated detergent compositions, bleaches, bleach precursors, fabric softeners, starch, perfumes, anti-bacterial agents, antistatic agents, whitening agents, blueing agents, stain removing agents and mixtures thereof.

12. A detergent product according to Claim 1, characterised in that the particulate detergent composition includes a bleaching agent.

13. A detergent product according to Claim 1, characterised in that the bag is formed of two sheet materials sealed together, one of said sheet material containing at least a proportion of polypropylene fibres and having a relatively low heat-sealing temperature, the other sheet material having a relatively high heat-sealing temperature or being formed from a non-heat-sealable material.

C L A I M S

1. A detergent product which comprises a particulate detergent composition in powder form contained within a water-insoluble, water-permeable bag, characterised in that the bag is constructed of sheet material consisting of, or containing at least a minor proportion of, polypropylene fibres.
2. A detergent product according to Claim 1, characterised in that the sheet material contains at least about 10% by weight of polypropylene fibres.
3. A detergent product according to Claim 2, characterised in that the sheet material contains at least substantially only polypropylene fibres.
4. A detergent product according to Claim 1, characterised in that the sheet material further contains cellulosic fibres, polyester fibres, polyamide fibres and mixtures thereof.
5. A detergent product according to Claim 1, characterised in that the sheet material is coated with a water-soluble material or a removable water-insoluble material.
6. A detergent product according to Claim 1, characterised in that the bag has heat sealed edges.



European Patent
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EUROPEAN SEARCH REPORT

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Application number

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	GB - A - 1 013 014 (OLIN MATHIESON CHEMICAL CORP.) * Claims; page 1, lines 60-70 * --	1	C 11 D 17/04 B 65 D 65/38
DA	GE - A - 961 821 (OLIN MATHIESON CHEMICAL CORP.) * Claims * --	1	
DA	BE - A - 867 039 (UNILEVER) * Claims * ----	1	TECHNICAL FIELD SEARCHED (Int. Cl. 3) C 11 D 17/04 B 65 D 65/38
			CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13-02-1980	Examiner MALHERBE