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Europäisches Patentamt
European Patent Office
Office européen des brevets

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Publication number:

**0 232 530
A2**

12

EUROPEAN PATENT APPLICATION

21 Application number: **86117734.3**

51 Int. Cl.4: **C11D 3/43** , C11D 17/06 ,
C11D 3/395

22 Date of filing: **19.12.86**

30 Priority: **21.01.86 US 819955**
31.10.86 US 926268

43 Date of publication of application:
19.08.87 Bulletin 87/34

84 Designated Contracting States:
BE DE ES FR GB IT NL

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54 **Improved textile detergent.**

57 A stable, built detergent-solvent-bleach powdered product for use in laundry operations having components that include an alkaline detergent builder, organic solvent, and an active oxidizing and bleaching agent.

EP 0 232 530 A2

"Improved Textile Detergent"Relationship to Other Applications

This application is a continuation-in-part application of my copending allowed application serial number 819,955 (filed January 21, 1986) and my copending application serial number 897,235 (filed August 18, 1986), both of which are to be abandoned.

Background of the Invention

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This invention relates to a laundry detergent and more particularly to a stable powdered built detergent product containing an alkaline detergent builder, an organic solvent and an active bleaching agent.

It is common practice in many commercial laundry operations to use a built detergent for purposes of soil removal in combination with an organic solvent for enhancing said soil removal. It is also common practice to use an oxygen bleaching agent that is not physically incorporated into the built detergent product in the laundry operation or in subsequent operations for removing stains from the textiles.

Heretofore, it was deemed impractical to combine the built detergent, the oxygen bleaching agent, and the organic solvent due to the frequent formation of unstable materials. Such instability results in the darkening of the final powdered product which indicates a loss of detergent effectiveness.

The powdered product of the present invention may be used with pure soft water (zero grain) with normal tap or hard water for laundering linens, towels, uniforms of all types, dungarees, sheets, mechanic type soils, and the like.

The final product is stable, exhibits good shelf life and is safe to store, use and transport.

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Summary of the Invention

The product of this invention is defined as a built detergent-solvent-bleach powder for use in laundry operations having components comprising an alkaline detergent builder, organic solvent, and an active oxidizing and bleaching agent, said components comprising a major proportion of said powder.

More specifically, the invention is defined as a built detergent-solvent-bleach powder as defined above comprising:

(a) an alkaline detergent builder selected from the group consisting essentially of inorganic and organic builders;

(b) from 0.04 to 0.9 times the builder weight in (a) of an organic solvent having a boiling point of from 120° to 280°C, selected from the group consisting essentially of alkylene and polyalkylene glycols having from 2 to 9 carbon atoms in the molecule, and the alkyl of 1 to 4 carbon atoms ethers or diethers thereof having a total of from 3 to 17 carbon atoms in the molecule; and

(c) from 0.04 to 4.0 times the builder weight in (a) of an active oxidizing agent.

The most preferred product is as above wherein said alkaline builder is sodium metasilicate, said organic solvent is diethylene glycol mono-n-butyl ether, and said active oxidizing and bleaching agent is sodium carbonate peroxyhydrate.

The alkaline detergent builder is preferably selected from the group consisting essentially of alkali metal phosphates, alkali metal acetates, alkali metal carbonates, alkali metal silicates, alkali metal borates, and mixtures thereof, and are most preferably selected from the group consisting essentially of sodium tripolyphosphate, sodium pyrophosphate; sodium nitrilotriacetate; citric acid; sodium carbonate; sodium silicate solids, 2.0 ratio $\text{SiO}_2/\text{Na}_2\text{O}$; sodium silicate solids, 3.2 ratio $\text{SiO}_2/\text{Na}_2\text{O}$; sodium aluminosilicate $\text{Na}_{12}(\text{AlO}_2 \bullet \text{SiO}_2)_{12} \bullet 27\text{H}_2\text{O}$; potassium tetraborate; sodium bicarbonate; potassium hexametaphosphate; sodium orthophosphate; ethane-1-hydroxy-1,1-diphosphonate, sodium salt; potassium pyrophosphate; sodium metasilicate; and mixtures thereof.

The organic solvent is most preferably selected from the group consisting essentially of ethylene glycol; propylene glycol; trimethylene glycol; 1,2-butane diol; 1,3-butane diol; tetramethylene glycol; 1,2-pentane diol; 1,4-pentane diol; pentamethylene glycol; 2,3-hexane diol; hexamethylene glycol; ethylene glycol monoethyl ether; ethylene glycol mono-n-butyl ether; ethylene glycol di-n-butyl ether; ethylene glycol monomethyl ether; ethylene glycol mono-n-butyl ether; diethylene glycol monoethyl ether; diethylene glycol

mono-n-butyl ether; propylene glycol monomethyl ether; propylene glycol monoethyl ether; propylene glycol mono-n-butyl ether; dipropylene glycol monomethyl ether; dipropylene glycol monoethyl ether; dipropylene glycol mono-n-butyl ether; tripropylene glycol monomethyl ether; tripropylene glycol monoethyl ether; and mixtures thereof.

5 The most preferred oxidizing agent is selected from the group consisting essentially of hydrogen peroxide, alkali metal peroxides, alkali metal perborates, alkali metal percarbonates, alkali metal persulfates, alkali metal persulfates, alkali metal perphosphates, ammonium persulfate, alkali metal nitrates, sodium persulfate, and sodium carbonate peroxyhydrate.

10 Most preferably, the organic solvent is present in an amount within the range of 0.1 to 0.3 times the weight of the alkaline detergent builder and the inorganic oxidizing agent is present in an amount of 0.75 to 3.0 times the weight of the alkaline detergent builder.

15 The above product preferably includes up to 0.40 times the alkaline detergent builder weight of carboxymethyl cellulose or carboxyethyl cellulose as a soil suspension agent; up to 3.0 times the alkaline detergent builder weight of a secondary linear alcohol alkoxylate as a surfactant; up to 0.1 times the alkaline detergent builder weight of an optical brightener; and up to 1.0 times the alkaline detergent builder weight of amorphous silica as a processing agent.

Detailed Description of the Invention

20 A typical built detergent-solvent-bleach powdered product of the present invention is designated "Product A" in the table below; a similar product without active oxygen is designated "Product B."

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TABLE I

<u>Component</u>	<u>Function</u>	<u>Parts By Weight, Preferred</u>		<u>Range (Products A & B)</u>
		<u>Product A</u>	<u>Product B</u>	
Anhydrous sodium metasilicate	Alkaline builder	250	250	100-500
Diethylene glycol mono-n-butyl ether	Organic solvent	40	40	5- 80
Sodium carbonate peroxyhydrate	Oxidizing and bleaching agent	432	---	25-600
Sodium carbonate	Builder	---	432	25-600
Carboxymethyl cellulose	Soil suspension - anti-redeposition	16	16	0- 40
Sodium tripolyphosphate	Mild alkaline builder - sequestant	160	160	0-600
Secondary linear C ₁₂₋₁₄ alcohol 7 mol alkoxyolate	Surfactant	20	20	15-300
Secondary linear C ₁₂₋₁₄ alcohol 9 mol alkoxyolate	Surfactant	70	70	15-300
Optical brightener	Brightener	1	1	0- 10
Amorphous silica	Processing agent	30	30	0-100
	Available Oxygen	4.9%	0.0%	

In evaluating the soil removal effectiveness of Products A and B, wash tests were carried out at 160°F in a commercial washing machine on 65/35 polyester/cotton fabric with permanent crease finish, printed with a standard soil (soiled fabrics supplied by Testfabrics, Inc., Middlesex, NJ). Since stability of the built detergent-solvent-bleach powder is an important property of the present invention, a portion of Product A was allowed to age at an elevated temperature of 105°F for a period of 14 days.

The test fabrics were cut into swatches about 4" x 9" to provide a 4" x 4" area of the printed soil, the remaining 4" x 5" of the swatch being unsoiled.

These swatches were then sewn to form bags and 50 grams of $\frac{1}{4}$ " stainless steel balls were enclosed in each bag prior to sealing thereof. Two of the weighted bags were placed into each of several launderometer cans along with 200ml of a solution from one each of the detergent products, i.e., Product A, Product A - (aged), and Product B. The concentration of each solution was 2.5 grams of the Product per liter of deionized water or 300ppm hard water (prepared with 0.3544 g/l $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ and 0.1194 g/l $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) and determinations run with a duplicate set of cans for each of the Products tabulated below.

TABLE II

	<u>Wash Solution, 160°F</u>	<u>Water Hardness</u>	<u>Soil Removal</u>	<u>Whiteness Retention</u>
	Product A	0 ppm	88.9%	104%
	Product A (aged)	"	88.5	104
	Product B	"	62.7	102
	Product A	300ppm	59.3%	104%
	Product A (aged)	"	64.4	104
	Product B	"	46.6	102

Each Wash Solution was prepared with 2.5 g/l of the respective Product. Product A (aged) comprised ageing at 105°F for 14 days.

Percentage Soil Removal may be calculated:

$$\frac{\left(\frac{\text{reading for stained, washed sample}}{\text{reading for unstained, unwashed sample}} - \frac{\text{reading for stained, unwashed sample}}{\text{reading for stained, unwashed sample}} \right)}{\left(\frac{\text{reading for stained, washed sample}}{\text{reading for unstained, unwashed sample}} - \frac{\text{reading for stained, unwashed sample}}{\text{reading for stained, unwashed sample}} \right)} \times 100$$

Whiteness Retention percentage is calculated by:

$$\frac{\text{reading for unstained, washed sample}}{\text{reading for unstained, unwashed sample}} \times 100$$

All readings for Whiteness Retention values were obtained using a fluorescence filter to eliminate any improvement which may have resulted from the presence of the optical brightener.

Similar results are obtainable when the other ingredients listed below are substituted in various combinations:

Alkaline Detergent Builders

Sodium tripolyphosphate, sodium pyrophosphate; sodium nitrilotriacetate; citric acid; sodium carbonate; sodium silicate solids, 2.0 ratio $\text{SiO}_2/\text{Na}_2\text{O}$; sodium silicate solids, 3.2 ratio $\text{SiO}_2/\text{Na}_2\text{O}$; sodium aluminosilicate $\text{Na}_{12}(\text{AlO}_2 \bullet \text{SiO}_2)_{12} \bullet 27\text{H}_2\text{O}$; potassium tetraborate; sodium bicarbonate; potassium hexametaphosphate; sodium orthophosphate; ethane-1-hydroxy-1,1-diphosphonate, sodium salt; potassium pyrophosphate; sodium metasilicate; and mixtures thereof.

10 Organic Solvents

Ethylene glycol; propylene glycol; trimethylene glycol; 1,2-butane diol; 1,3-butane diol; tetramethylene glycol; 1,2-pentane diol; 1,4-pentane diol; pentamethylene glycol; 2,3-hexane diol; hexamethylene glycol; ethylene glycol monoethyl ether; ethylene glycol mono-n-butyl ether; ethylene glycol monomethyl ether; 15 ethylene glycol mono-n-butyl ether; diethylene glycol monoethyl ether; diethylene glycol mono-n-butyl ether; propylene glycol monomethyl ether; propylene glycol monoethyl ether; propylene glycol mono-n-butyl ether; dipropylene glycol monomethyl ether; dipropylene glycol monoethyl ether; dipropylene glycol mono-n-butyl ether; tripropylene glycol monomethyl ether; tripropylene glycol monoethyl ether; and mixtures thereof.

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Inorganic Oxidizing Agents

Hydrogen peroxide, alkali metal peroxides, alkali metal perborates, alkali metal percarbonates, alkali 25 metal persulfates, alkali metal persulfates, alkali metal perphosphates, ammonium persulfate, alkali metal nitrates, sodium persulfate, and sodium carbonate peroxyhydrate.

Although the ratio of the above components can vary widely, it is most preferred that the organic solvent is present in an amount within the range of 0.1 to 0.3 times the weight of the alkaline detergent builder and the active oxidizing agent is present in an amount of 0.75 to 3.0 times the weight of the alkaline 30 detergent builder.

Claims

35 1. A built detergent-solvent-bleach powder for use in laundry operations having components comprising an alkaline detergent builder, organic solvent, and an active oxidizing and bleaching agent, said components comprising a major proportion of said powder.

2. The built detergent-solvent-bleach powder as defined in claim 1 comprising:

40 (a) an alkaline detergent builder selected from the group consisting essentially of inorganic and organic builders;

(b) from 0.04 to 0.9 times the builder weight in (a) of an organic solvent having a boiling point of from 120° to 280°C, selected from the group consisting essentially of alkylene and polyalkylene glycols having from 2 to 9 carbon atoms in the molecule, and the alkyl of 1 to 4 carbon atoms ethers or diethers thereof having a total of from 3 to 17 carbon atoms in the molecule; and

45 (c) from 0.04 to 4.0 times the builder weight in (a) of an active oxidizing agent.

3. The powder of claim 1 wherein said alkaline builder is sodium metasilicate, said organic solvent is diethylene glycol mono-n-butyl ether, and said active oxidizing and bleaching agent is sodium carbonate peroxyhydrate.

4. The powder as defined in claim 2 wherein the alkaline detergent builder of (a) is selected from the 50 group consisting essentially of alkali metal phosphates, alkali metal acetates, alkali metal carbonates, alkali metal silicates, alkali metal borates, and mixtures thereof.

5. The powder as defined in claim 4 wherein the alkaline detergent builder of (a) is selected from the group consisting essentially of sodium tripolyphosphate, sodium pyrophosphate; sodium nitrilotriacetate; citric acid; sodium carbonate; sodium silicate solids, 2.0 ratio $\text{SiO}_2/\text{Na}_2\text{O}$; sodium silicate solids, 3.2 ratio $\text{SiO}_2/\text{Na}_2\text{O}$; sodium aluminosilicate $\text{Na}_{12}(\text{AlO}_2 \bullet \text{SiO}_2)_{12} \bullet 27\text{H}_2\text{O}$; potassium tetraborate; sodium bicarbonate; 55 potassium hexametaphosphate; sodium orthophosphate; ethane-1-hydroxy-1,1-diphosphonate, sodium salt; potassium pyrophosphate; sodium metasilicate; and mixtures thereof.

6. The powder as defined in claims 1, 2, 4 or 5 wherein the organic solvent is selected from the group consisting essentially of ethylene glycol; propylene glycol; trimethylene glycol; 1,2-butane diol; 1,3-butane diol; tetramethylene glycol; 1,2-pentane diol; 1,4-pentane diol; pentamethylene glycol; 2,3-hexane diol; hexamethylene glycol; ethylene glycol monoethyl ether; ethylene glycol mono-n-butyl ether; ethylene glycol monomethyl ether; ethylene glycol mono-n-butyl ether; diethylene glycol monoethyl ether; diethylene glycol mono-n-butyl ether; propylene glycol monomethyl ether; propylene glycol monoethyl ether; propylene glycol mono-n-butyl ether; dipropylene glycol monomethyl ether; dipropylene glycol monoethyl ether; dipropylene glycol mono-n-butyl ether; tripropylene glycol monomethyl ether; tripropylene glycol monoethyl ether; and mixtures thereof.
7. The powder as defined in claims 1, 2, 4, or 5 wherein the active oxidizing agent is selected from the group consisting essentially of hydrogen peroxide, alkali metal peroxides, alkali metal perborates, alkali metal percarbonates, alkali metal persulfates, alkali metal persilicates, alkali metal perphosphates, ammonium persulfate, alkali metal nitrates, sodium persulfate, and sodium carbonate peroxyhydrate.
8. The powder as defined in claims 1 or 2 wherein the alkaline detergent builder is sodium metasilicate, the organic solvent is diethylene glycol mono-n-butyl ether, and the inorganic oxidizing agent is sodium carbonate peroxyhydrate.
9. The powder as defined in claims 1, 2, 3, 4, or 5 wherein the organic solvent is present in an amount within the range of 0.1 to 0.3 times the weight of the alkaline detergent builder and the active oxidizing agent is present in an amount of 0.75 to 3.0 times the weight of the alkaline detergent builder.
10. The powder as defined in claim 9 having up to 0.40 times the alkaline detergent builder weight of carboxymethyl cellulose or carboxyethyl cellulose as a soil suspension agent; up to 3.0 times the alkaline detergent builder weight of a secondary linear alcohol alkoxylate as a surfactant; up to 0.1 times the alkaline detergent builder weight of an optical brightener; and up to 1.0 times the alkaline detergent builder weight of amorphous silica as a processing agent.