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The application is published incomplete as filed (Article 93 (2) EPC). The point in the description or the claim(s) at which the omission obviously occurs has been left blank.

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⑤④ **Solid detergent block.**

⑤⑦ A solid detergent composition is provided in the form of a solid block of a compressed, granular material, said block having a weight of 0.2-10 kg. The block has improved stability of heat-labile components and bleach compared with similar blocks obtained by hydration.

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SOLID DETERGENT BLOCK**TECHNICAL FIELD**

The present invention relates to a solid detergent block for obtaining an aqueous chemical solution having a substantially constant concentration. Such blocks of chemical are used in industrial cleaning processes such as mechanical warewashing or fabric washing, and generally comprise alkaline ingredients, detergents, builders, etc.

BACKGROUND OF THE INVENTION

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Industrial warewashing machines generally comprise a wash tank which contains the cleaning solution for the wash process. In this process, the soiled wash load is doused with the cleaning solution and subsequently with rinse water which falls into the wash tank. Each cycle, the cleaning power of the cleaning liquid is reduced, first because some is exhausted by the soil-removing process and, second, because it is diluted with rinse water. The cleaning solution is therefore recharged from time to time by adding fresh cleaning liquid from a dispenser system, which usually provides a concentrated aqueous solution of the alkaline- and/or surfactant-based chemical composition.

A number of techniques are known for converting solid chemicals into a concentrated solution, dependent on the nature of the solid. For example, according to US patent 2,371,720 a solid powdered chemical can be dissolved by placing it on a sieve and spraying water on to said sieve from below.

Alternatively, the powdered material can be dissolved in a dispenser of the "water-in-reservoir" type. In this type of dispenser, the powdered material is submerged under water, which therefore becomes loaded or even saturated with the powder. When more water is added, the excess solution flows into an overflow pipe leading to the washing machine.

It is also possible to use solid detergent materials in the form of briquettes such as, for instance, described in US patents 2,382,163, 2,382,164 and 2,382,165. Briquettes can be used with a "water-in-reservoir" type of dispenser.

A more recent type of solid detergent is the cast or block form, whereby a solid detergent block having a weight of several kilograms is formed by pouring a concentrated aqueous slurry into a container, in which it solidifies upon cooling as a result of the hydration of the salts in the composition, especially the sodium tripolyphosphate. Such cast solid blocks are, for example, described in European patent 3,769.

These solid blocks cast in containers require dispensing systems whereby solvent is sprayed on to the block while it is inside the container, thereby gradually dissolving the exposed surface to form a concentrated solution. Such a dispenser system is, for instance, described in European patent application 244,153.

Solid detergent blocks have won a certain degree of popularity in the area of industrial warewashing because they constitute a non-dusty and therefore relatively safe product form for the often aggressive chemicals used. Furthermore, hydrated solid blocks are economical in use because they can be manufactured and transported as very concentrated products.

A disadvantage of the above-mentioned solid detergent blocks is the difficulty of incorporating bleach in them, owing to the incompatibility of bleach systems with the caustic components of the block and the elevated temperatures used in the manufacturing process of the block. This is true for the hypochlorite-type of bleach, usually sodium hypochlorite, as well as for organic chlorine-type of bleach.

Furthermore, the elevated processing temperatures required to prepare the concentrated slurries adversely affect the stability of heat-labile components. For example, sodium tripolyphosphate degrades to form ortho- and pyrophosphates, which have poor builder properties.

We have now found that solid detergent blocks may be provided which constitute an even more concentrated product than the solid blocks obtained by hydration, and which enable the incorporation of stable bleach in the block. Equally surprising was the constant delivery of the chemicals of the block when the water is sprayed on to the block.

DEFINITION OF THE INVENTION

According to the invention there is provided a solid detergent composition in the form of a block of a

compressed granular material, said block having a weight of 0.2-10 kg, preferably 1-5 kg.

Another aspect of the present invention is a process for the manufacture of these blocks, whereby a powder is compressed in a mould under a pressure of 3 to 30 kilo Newton per square cm (KN/cm²) bar to form a solid block.

5 Yet another aspect of the present invention is the use of a solid detergent block according to the invention in an industrial warewashing or fabric washing process.

DETAILED DESCRIPTION OF THE INVENTION

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According to the present invention there is provided a solid detergent composition in the form of a block of compressed granular material having a weight of 0.2-10 kg, preferably of 1-5 kg. The blocks are usable for various applications in the area of industrial cleaning, such as in mechanical warewashing and fabric washing, but other industrial detergent processes are also envisaged (e.g. bottle washing or conveyor belt lubricating). Depending on the specific application, the block contains 5-80% by weight, preferably 5-15 65% by weight of an alkaline agent, such as sodium- or potassium-hydroxide, -metasilicate or -carbonate. Fabric washing compositions usually contain mostly metasilicate and/or carbonate, whereas compositions for mechanical warewashing are the most alkaline and comprise sodium hydroxide and/or potassium hydroxide.

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Furthermore, the block contains 5-70% by weight, preferably 10-50% of a builder. This may be a zeolite or a phosphate builder or any other suitable hardness-precipitating or hardness-sequestering agent.

The compressed block may contain up to 15% by weight of a bleach component, for example an active chlorine bleach such as sodium dichloro-isocyanurate. It is a specific advantage of the compressed blocks according to the invention that high levels of such bleaches may be incorporated and that the bleach 25 remains stable for several months. In comparable blocks obtained by hydration, the active chlorine content is known to decrease rapidly in time.

The blocks may furthermore comprise 0-10% by weight of a polymer. Suitable polymers are, for instance, acrylic acid polymers, such as Acrysol LMW 45 ND (ex Rohm & Haas) or Goodrite K 7058 D (ex BF Goodrich).

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For warewashing purposes, it is common to use an anti-foam agent such as a low-foaming nonionic surfactant in the wash liquor and such agents may indeed be incorporated in the solid blocks according to the invention. Amounts of 0-5% by weight proved to be suitable.

The blocks according to the invention may further comprise suitable minor ingredients, such as bleach stabilizers, enzymes, etc. Additional components may be compaction aids, for instance calcium stearate, 35 hydrophobic silica or talc powder, solubility aids, such as polyethylene glycol or carbowax.

The weight, shape and the dimensions of the compressed blocks may vary with the application envisaged. For mechanical warewashing purposes we found blocks of approximately 1.5 kg to be very suitable.

According to another aspect of the invention, there is provided a process for manufacturing a solid 40 detergent block as described above. According to this process, a suitable granular detergent powder corresponding to the desired chemical composition is compressed in a mould under a pressure of 3-30 KN/cm².

This process can be carried out in a suitable press, preferably a hydraulic press, for instance a LAEIS Hydraulische Doppeldr ckpresse, TYP HPF 630 as manufactured by LAEIS, West-Germany. It proved to be 45 especially advantageous to form the block by two or more consecutive pressings of increasing pressure. In the first step, a pre-compaction is achieved at a relatively low pressure, which is then followed by one or more steps at the maximal pressure. Following this procedure, a higher degree of compaction can be achieved than by using one single pressing.

Since the pressing can be carried out at ambient temperature, high levels of heat-labile components, 50 such as STP or enzymes, may be incorporated in the blocks. This is regarded as an exceptional advantage of the present invention. After manufacture, the blocks should be packaged as soon as possible, owing to their hygroscopic nature.

Another aspect of the invention is the use of the solid blocks according to the invention in an industrial warewashing or fabric washing process.

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In use, the compressed block is placed inside a suitable dispenser, in which it is sprayed upon with water in order to obtain an aqueous solution of the solid detergent material. Depending on the nature of the solid block, the water may also form a slurry or suspension of the chemical. For the purpose of this invention, all these possibilities shall be referred to hereafter as aqueous chemical solution.

Suitable dispensers for solid blocks are known in the art. A good constant delivery was for example obtained when the compressed block according to the invention was placed in a dispenser as described in our co-pending British application 8830006.6.

The invention will now be further explained by the following non-limiting Examples.

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Examples 1-5

Batches of 4.3 kg each of the detergent compositions shown in Table I (weight %) were compressed in a LAEIS hydraulic press, TYP HPF 630, to form solid blocks of 17.5 x 21 cm, having a height of 7.5 cm. The compression was carried out in two steps. First, a pressure of 5.3 KN/cm² was applied, then a second compression was carried out at 6.4 KN/cm².

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Table I

	1	2	3	4	5
Sodium tripolyphosphate.6 aq.	30.5	30.0	29.0	31.0	0
Sodium tripolyphosphate.0 aq.	0	0	0	0	30.5
NaOH	59.0	51.0	49.0	62.0	59.0
Polyacrylate	5.0	5.0	5.0	5.0	5.0
Na dichloroisocyanurate	3.5	0	0	0	3.5
Triton DF 12	2.0	2.0	2.0	2.0	2.0
Dequest 2041	0	2.0	2.0	0	0
Sodium-metasilicate.5 aq.	0	10.0	0	0	0
Sodium perborate monohydrate	0	0	10.0	0	0
TAED	0	0	3.0	0	0

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The blocks obtained were then stored in a closed container for a period of three months at 20° or 30° C. Subsequently, they were analyzed for their sodium tripolyphosphate (STP) and active chlorine content. The results are shown in Table II. The STP content and the active chlorine content are expressed as a percentage of the values found for the starting material.

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Example 6

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In order to investigate the delivery of the chemicals from a solid detergent block according to the invention, a block was prepared according to Example 1. Subsequently, it was sawn into smaller blocks of 7.5 x 7.5 x 16 cm. One of these blocks was placed in a dispenser as described in our co-pending British application 8830006.6. Subsequently, it was sprayed upon in portions of 200 ml water, for 10 seconds, with intervals of 60 seconds. The water had a temperature of 20° C and was of 7° German Hardness. The conductivity of the effluent was measured as a function of the number of sprays. The results are shown in the accompanying Figure. As can be seen from the Figure, the concentration in the effluent was found to be essentially constant over a prolonged period of time of more than 4 hours.

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Claims

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1. Solid detergent composition in the form of a block of a compressed granular material, said block having a weight of 0.2-10 kg.
2. Solid detergent composition according to Claim 1, having a weight of 1-5 kg.
3. Solid detergent composition according to Claims 1-2, comprising:
5 - 80% by weight of an alkaline agent;

5 - 70% by weight of a builder; and

0 - 15% by weight of an active chlorine bleach;

4. Solid detergent composition according to Claims 1-3, comprising:

10 - 65% by weight of an alkaline agent;

5 10 - 50% by weight of a builder.

5. Solid detergent composition according to Claims 1-4, wherein the builder is sodium tripolyphosphate.

6. Solid detergent composition according to Claims 1-5, wherein the active chlorine bleach is sodium or potassium dichloro isocyanurate.

7. Process for the manufacturing of a solid detergent composition according to any of Claims 1-6, whereby a powder having a corresponding composition is compressed in a mould under a pressure of 3-30 KN/cm² to form a solid block.

8. Process according to Claim 7, whereby the block is formed by two or more consecutive pressings of increasing pressure.

9. Process according to Claim 8, whereby the first compression is carried out at a pressure of 3-10 KN/cm² and the second compression at a pressure of 10-30 KN/cm².

10. Use of a solid detergent composition according to Claims 1-6 in an industrial warewashing or fabric washing process.

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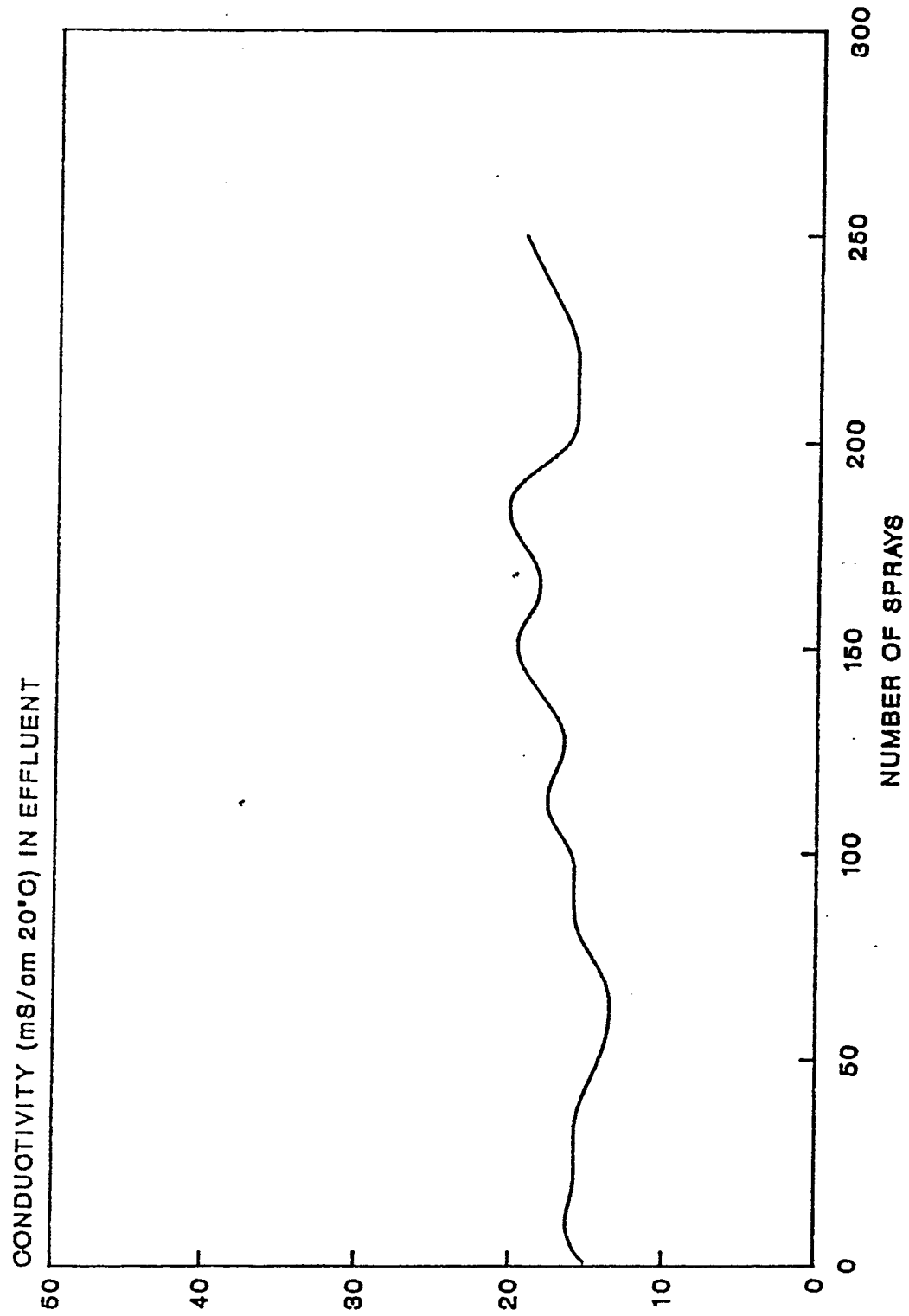
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Fig. 1