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(54) **WATER SOLUBLE CAPSULES**

WASSERLÖSLICHE KAPSELN

CAPSULES SOLUBLES DANS L'EAU

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Description

[0001] This invention relates to water soluble capsules containing a detergent composition.

[0002] Detergent compositions for machine washing of laundry are provided in many forms such as free-flowing powders, liquids. Detergents in the form of compressed powder tablets are also commonly available. These are advantageous in that they do not require measuring they are thus easier to handle and dispense into the wash load and allow for accurate dosing of detergent.

[0003] More recently water-soluble capsules of detergent composition in liquid and other forms have been introduced. Water-soluble capsules generally comprise a detergent composition encapsulated with water-soluble film, such as polyvinyl alcohol. Encapsulation allows for handling of the product without direct contact with the detergent composition. This is especially advantageous when the detergent composition includes aggressive cleaning components which would irritate the skin on direct contact.

[0004] However, a problem encountered with some known water-soluble capsules, such as square or rectangular shaped capsules in the shape of pillow (e.g. as shown in figures 3a and 3b of the drawings herein), is that when in the wash liquor, the capsule film will often dissolve partially releasing its contents and then collapse under pressure of the surrounding wash liquor, so that adjacent walls may be forced to lie substantially flat against each other and become partly or wholly co-joined in that position. In extreme cases two walls may become completely contiguous so that they act as one wall of double thickness. The resulting portion or wall is, as a consequence of its increased thickness, less soluble.

[0005] There is also the problem that, due to this tendency, in some cases capsule film may remain undissolved, presenting an unsightly mess to the user when they remove the washing from the machine.

[0006] US 4156047 discloses water soluble films suitable for use as packaging film. Heat sealed pillow packs of the films are disclosed.

[0007] It is an object of the present invention to provide a water-soluble capsule containing a detergent composition, which overcomes at least some of the above mentioned problems. In particular, it is an object of the invention to provide a water-soluble capsule with improved dissolution properties.

[0008] Accordingly, in one aspect, the invention provides a water soluble capsule according to claim 1.

[0009] The advantage of the topological constraints imposed by the invention, is that if the capsule does start to collapse, (after partial dissolution of the capsule and release of detergent) it is more difficult for walls to become co-joined with complete evacuation of fluid. Even if walls do become attached in places the orientation of the walls relative to each other is such that this facilitates crumpling of the walls and entrapment of wash liquor which aids dissolution.

[0010] Preferably the inclination of each wall is between 30-90 degrees. Particular preferably the inclination of each wall is between approximately 30 - 60 degrees.

[0011] In a preferred embodiment the capsule is in the form of a tetrahedron (four-walled polyhedron). The tetrahedron may be regular or irregular i.e. the walls may take the shape of regular or irregular polygons. The tetrahedron shape is advantageous in that it can be a fairly simple structure to manufacture (as compared with other polyhedrons with more walls) and at the same time the inclination of each wall relative to each other walls is optimised.

[0012] With the invention, the capsule may be formed into a polyhedron by adapting existing vertical form fill and seal machinery, thereby reducing the costs of producing capsules according to the invention.

[0013] Preferably, the relative inclination of first and second end seals is between approximately 30 and 90 degrees. In a preferred embodiment, the first and second end seals are orientated orthogonal relative to each other. This provides a tetrahedron shaped capsule.

[0014] The transition between adjacent walls may be slightly curved (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) whilst at the same time, distinct walls can still be seen and are still distinguishable from one another.

[0015] The walls may be substantially flat however, it this is not essential, indeed the or each wall may have a slight curvature (e.g. due to the force exerted by the contents of the capsule, and the flexibility of the capsule material) so long as the overall shape is still apparent and the general plane of each wall is inclined to the general plane of each of the other walls.

[0016] The edges of the polyhedron may be formed with increased sharpness by, for example, arrangement of one or more seals during formation, so that one or more seals are orientated along respective one or more edge portions of the polyhedron to give more distinct edges.

[0017] The capsule may contain any form of detergent: liquid, powder, gel, paste or the like or combinations thereof. The detergent composition may be a laundry (fabric cleaning/treatment) detergent composition or a dishwashing machines detergent composition and thus is suitable for use in (fabric) washing and dishwashing machines (automatic or manual).

[0018] The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a capsule according to a form of the invention;

Figure 2 is a side view of the capsule of Figure 1;

5 Figures 3a and 3b are front and side views of a known pillow shaped capsule containing a liquid detergent (outside the scope of the invention);

Figure 4 is a view of a capsule according to another form of the invention;

10 Figure 5 is a view of a capsule according to another form of the invention; and

Figure 6 is a view of a capsule according to another form of the invention.

[0019] Throughout the Figures common numbers are used to designate similar features.

15 **[0020]** Referring to the drawings and in particular figures 1 and 2, a capsule 1 according to one form of the invention is shown, which contains a measured unit dose of flowable detergent composition 2, which may be liquid, powder, gel, paste or a combination thereof. In the example shown in figures 1 and 2 the detergent is a liquid detergent (as described below).

20 **[0021]** The capsule is in the form of a four-walled polyhedron, i.e. a tetrahedron, each wall (only two shown: 10,12) of the polyhedron being inclined at an angle of relative to each other wall (10,12).

[0022] The capsule is formed from a flexible film disposed in folded configuration and sealed with one longitudinal seal 4a and first and second end seals 6,8 located at opposed ends of the capsule 1. The first seal 6 is substantially orthogonal to the longitudinal seal 4a and further it is substantially orthogonal to the second end seal 8.

25 **[0023]** The capsule shown in the drawings is formed by a so-called 'vertical form fill and seal' machine (not shown). Using such a machine, a flat web of thermoplastic film is unwound from a roll and formed into a continuous tube in a tube-forming section, by heat-sealing together the longitudinal edges of the web to form a lap seal or a fin seal which eventually forms the longitudinal seal 4a of the capsule 1. The tube thus formed is then pulled down to a filling station. A section of the tube is flattened at a sealing device positioned below the filling station, and the first transverse seal is made, providing the first end seal of the capsule 1 which is a fluid-impervious barrier.

30 **[0024]** After the first transverse seal 6 has been made, the tube is then moved down through a predetermined distance, and the jaws of the sealing device are closed. The flowable detergent is then caused to enter the tube, and fill the tube upwardly from the first end seal 6. A second transverse seal is then made at an angle orthogonal to the first transverse seal 6, forming the second end seal 8 of the capsule and trapping the flowable detergent composition inside the capsule. This second end seal 8 is located just above the fill-level in the tube to avoid trapping liquid in the seal which would compromise the seal integrity.

35 **[0025]** The sealing and severing of successive end seals can be performed by mutually transverse pairs of sealing bars which are motor driven to make successive seals in mutually transverse directions.

[0026] The filled package, now in the form of a tetrahedron pouch, is either cut away or left in place. The second transverse seal also forms the bottom seal of the next package, and the process can be repeated to form the next package.

40 **[0027]** The sealing device for forming the transverse seals is commonly an impulse sealer, wherein an electrical current flows through the sealing element for only a fraction of the sealing cycle. After the current has heated the sealing element and melted the thermoplastic film, there is then a cooling period, during which the seal resolidifies.

[0028] There are many variants on the ways such machines operate. A typical vertical form, fill and seal machine is sold under the trade name GV2K1 by Gainsborough Engineering Company.

45 **[0029]** As can be seen from the drawings 1 and 2, some of the edges 24,22 of the tetrahedron are sharply defined by seals - However some of the edges 20,26,28 have no seal so that the transition between adjacent walls e.g. walls 10 and 12 is slightly curved (due to the pressure of the contents contained in the capsule) whilst at the same time, two distinct walls 10, 12 can still be seen extending from such an edge 20 and the overall shape of a tetrahedron is apparent. Furthermore, in order for the invention to work, it is not essential that each wall of the capsule is entirely flat, indeed the walls may have a slight curvature as shown in the drawings(e.g. due to the force exerted by the contents of the capsule) so long as general plane of each wall is inclined to the general plane of each of the other walls so that the overall tetrahedron shape is still apparent.

50 **[0030]** The tetrahedron shapes shown are not perfectly regular tetrahedrons as the walls are not perfectly regular polygons. Regular tetrahedrons can be formed by adjusting the width of the tube (i.e. length of end seal) to equal the length of the tube (length of the longitudinal seal).

55 **[0031]** Referring to figure 4, the capsule 1 shown here has end seal 6 oriented orthogonal relative to the longitudinal seal and inclined at an angle of approximately 80 degrees to the second end seal 8. This produces what may be describes as a slightly skewed tetrahedon, whose walls are asymmetrical. However, the shape still functions to increase the

solubility of the capsule film.

[0032] Referring to figure 5, the capsule shown here is formed with two longitudinal seals 4b and 4c along side edges (26,28) of the capsule during formation. The polyhedron formed has a greater number of distinct edges (22,24,26,28) where the seals (4b,4c,6,8) are located (as compared say with the capsule shown in figs 1 and 2).

[0033] Figures 6 shows another capsule according to the invention. The capsule has five-walls and is configured as a pyramid with 4 walls and a base.

[0034] In one embodiment a capsule according to the invention contains a liquid detergent composition. When a liquid detergent composition is used, it is preferred that the composition is essentially non-aqueous. However, compositions may be used which contain substantial amounts of water, provided that this water is in a form where its chemical activity is reduced (e.g. as water of crystallisation or in combination with a solvent such that its vapour pressure is reduced) such that the soluble film does not dissolve prematurely.

[0035] In another embodiment One example of a detergent composition used is as follows:

Raw material	Level (weight percent of total)
Nonionic Surfactant (alcohol ethoxylate)	20.00
Linear Dodecylbenzene Sulphonic Acid	20.00
Fatty acid	17.00
Monopropylene glycol	22.35
Monoethanolamine	9.65
Water, perfume, minor ingredients	11.00

[0036] In another embodiment, capsules contain a granular laundry detergent powder as follows:

Base powder

[0037]

Linear Dodecylbenzene Sulphonic Acid (Sodium salt)	8.8%
Alcohol ethoxylate (C12 - C13 7 EO)	7.0%
C16 -C18 Carboxylic acid	1.0%
Zeolite	29.6%
Anhydrous Sodium Carbonate	10.5%
Moisture, Salts, Minors	4.1%

(All above in a granulated Base Powder)

Post-dosed ingredients

[0038]

Sodium Percarbonate	18.0%
Tetracetyl ethylenediamine	3.5%
Sodium Disilicate	5.5%
Sodium Citrate	2.0%
Fluorescer, antifoam, speckles, enzyme, fragrance, minors	10.0%

[0039] In use capsules according to the invention can conveniently be placed directly into the wash liquor where the film dissolves, releasing the liquid detergent composition.

Dissolution of all the capsule film is aided by the topological constraints imposed by the above arrangement.

If the capsule does start to collapse, (after partial dissolution of the capsule and release of detergent) it is more difficult for walls to become co-joined with complete evacuation of fluid. Even if walls do become attached in places the orientation of the walls relative to each other is such that this facilitates crumpling of the walls and entrapment of wash liquor which

aids dissolution and reduces the possibility of undissolved capsule film persisting throughout the wash.

[0040] It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

Claims

1. A water soluble capsule (1) containing a detergent composition (2), the capsule being formed from a flexible film disposed in folded configuration and sealed with c) one or more longitudinal seals (4a, 4b, 4c); and d) first and second end seals (6, 8) located at opposed ends of the capsule (1),
characterised in that the first end seal (6) is substantially orthogonal to the or each longitudinal seal (4a, 4b, 4c) and inclined at an angle to the second end seal (8).
2. A water soluble capsule (2) according to claim 1
characterised in that the relative inclination of first and second end seals (6, 8) is between 30 and 90 degrees.
3. A water soluble capsule according to claim 2
characterised in that the first and second end seals (6, 8) are orientated substantially orthogonal relative to each other.
4. A water soluble capsule (1) according to any preceding claim **characterised in that** one or more of the seals (4b, 4c, 6, 8,) are orientated along respective one or more edge portions (22, 24, 26, 28) of the polyhedron (1).
5. A water soluble capsule (1) according to any preceding claim **characterised in that** the detergent composition (2) is a laundry composition.
6. A water soluble capsule (1) according to any preceding claim **characterised in that** the detergent composition (2) is in liquid form.
7. A water soluble capsule (1) according to any preceding claim **characterised in that** the detergent composition (2) is in powder or granular form.

Patentansprüche

1. In Wasser lösliche Kapsel (1), enthaltend eine Waschmittelzusammensetzung (2), wobei die Kapsel aus einer biegsamen Folie, angeordnet in gefalteter Konfiguration, und verschlossen mit
c) einem oder mehreren Längsverschlüssen (4a, 4b, 4c); und
d) ersten und zweiten Endverschlüssen (6, 8), die bei entgegen gesetzten Enden der Kapsel (1) angeordnet sind, hergestellt ist,
dadurch gekennzeichnet, dass der erste Endverschluss (6) im Wesentlichen senkrecht zu dem oder jedem Längsverschluss (4a, 4b, 4c) ist und mit einem Winkel zu dem zweiten Endverschluss (8) geneigt ist.
2. In Wasser lösliche Kapsel (2) nach Anspruch 1, **dadurch gekennzeichnet, dass** die relative Neigung der ersten und zweiten Endverschlüsse (6, 8) zwischen 30 und 90 Grad liegt.
3. In Wasser lösliche Kapsel nach Anspruch 2, **dadurch gekennzeichnet, dass** die ersten und zweiten Endverschlüsse (6, 8) im Wesentlichen senkrecht bezüglich zueinander orientiert sind.
4. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** einer oder mehrere der Verschlüsse (4b, 4c, 6, 8) entsprechend einem oder mehreren Kantenteilen (22, 24, 26, 28) von dem Polyeder (1) orientiert sind.
5. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** die Waschmittelzusammensetzung (2) eine Wäschewaschmittelzusammensetzung ist.

6. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** die Waschmittelzusammensetzung (2) in flüssiger Form vorliegt.
7. In Wasser lösliche Kapsel (1) nach einem vorangehenden Anspruch, **dadurch gekennzeichnet, dass** die Waschmittelzusammensetzung (2) in Pulverform oder granulärer Form vorliegt.

Revendications

1. Capsule hydrosoluble (1) contenant une composition de détergent (2), la capsule étant formée à partir d'un film souple disposé en configuration pliée et fermé hermétiquement avec
 - c) un ou plusieurs joints longitudinaux (4a, 4b, 4c) ; et
 - d) les premier et deuxième joints d'extrémité (6, 8) situés aux extrémités opposées de la capsule 1,**caractérisée en ce que** le premier joint d'extrémité (6) est essentiellement orthogonal par rapport au ou à chaque joint longitudinal (4a, 4b, 4c) et incliné à un angle par rapport au deuxième joint d'extrémité (8).
2. Capsule hydrosoluble (2) selon la revendication 1, **caractérisée en ce que** l'inclinaison relative des premier et deuxième joints d'extrémité (6, 8) est entre 30 et 90 degrés.
3. Capsule hydrosoluble selon la revendication 2, **caractérisée en ce que** les premier et deuxième joints d'extrémité (6, 8) sont orientés essentiellement de façon orthogonale l'un par rapport à l'autre.
4. Capsule hydrosoluble (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'un** ou plusieurs des joints (4b, 4c, 6, 8) sont orientés le long d'une ou plusieurs parties de bord respectives (22, 24, 26, 28) du polyèdre (1).
5. Capsule hydrosoluble (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la composition de détergent (2) est une composition pour laver le linge.
6. Capsule hydrosoluble (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la composition de détergent (2) est sous forme liquide.
7. Capsule hydrosoluble (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la composition de détergent (2) est sous forme pulvérulente ou granulaire.

Fig.1.

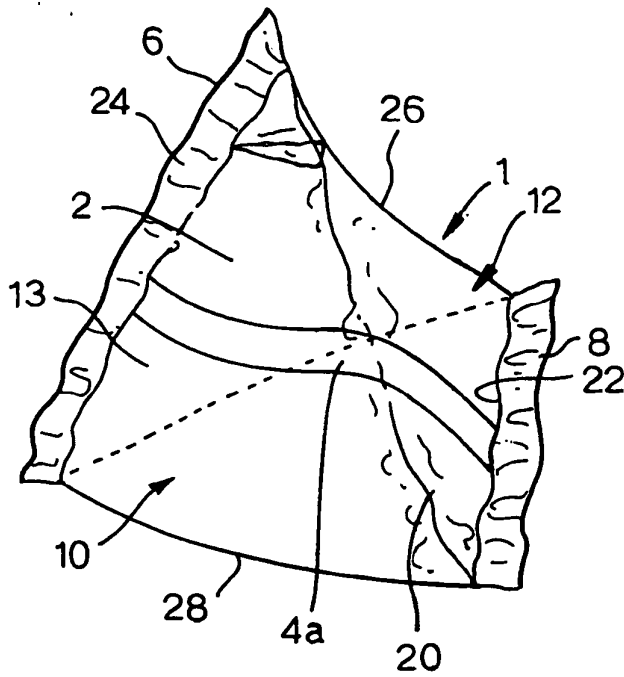


Fig.2.

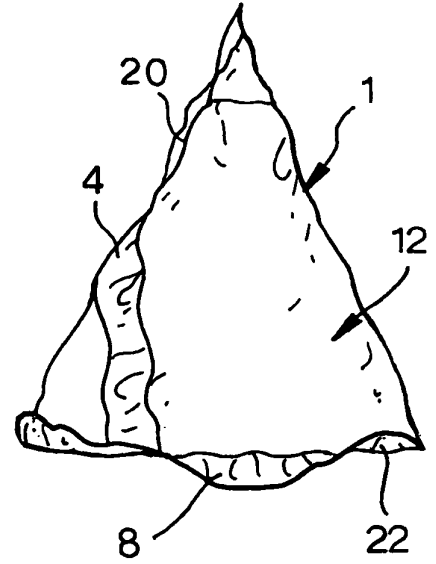


Fig.3a.

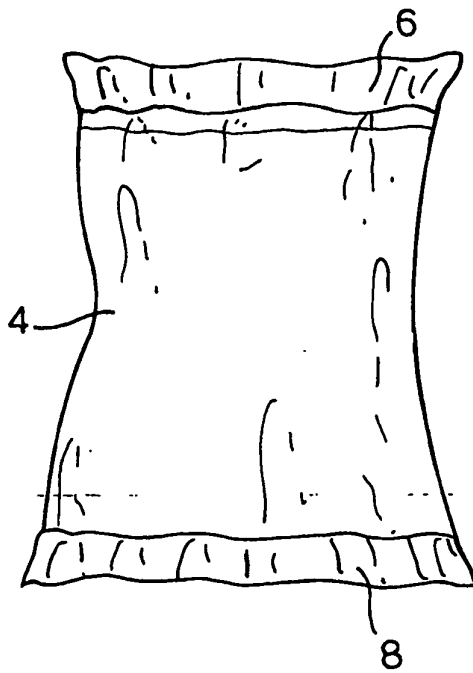


Fig.3b.



Fig.4.

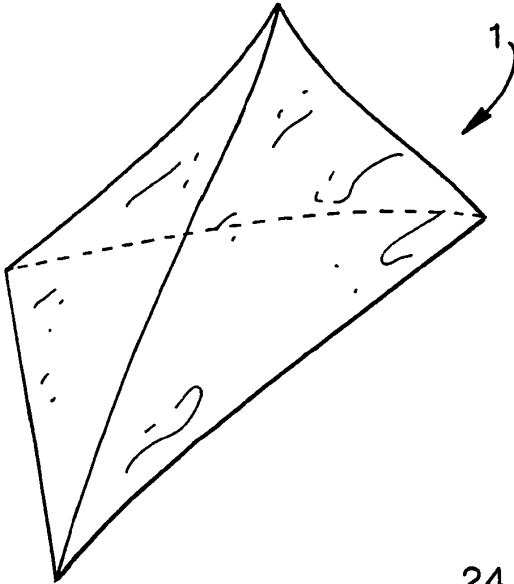


Fig.5.

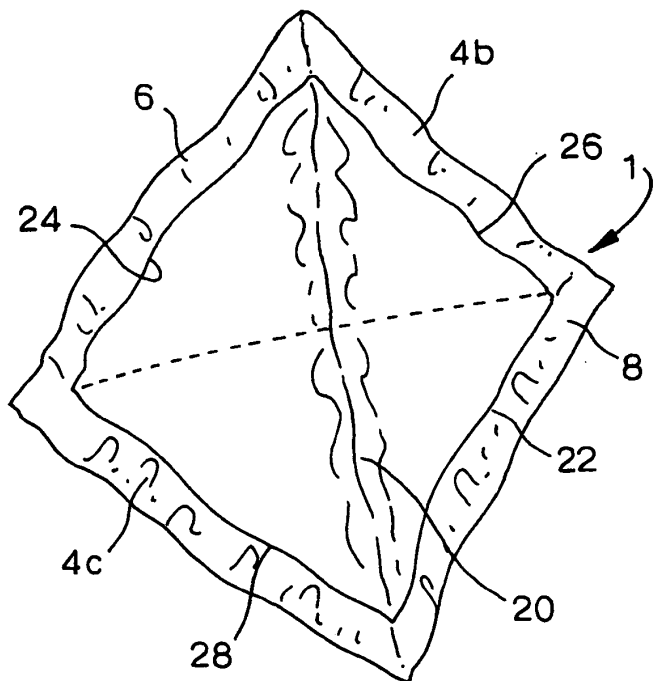
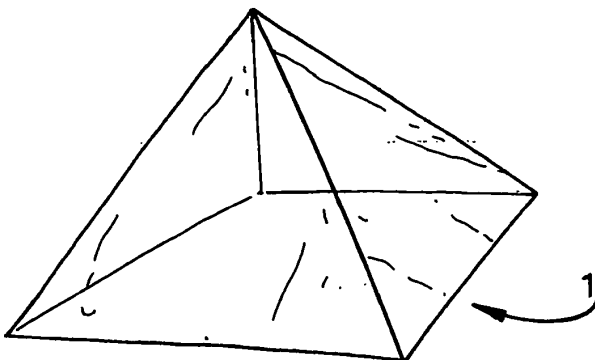


Fig.6.



REFERENCES CITED IN THE DESCRIPTION

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