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(11)

EP 0 314 890 B2

(12)

NEW EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the opposition decision:
27.02.2002 Bulletin 2002/09

(51) Int Cl.7: **C11D 17/04**

(45) Mention of the grant of the patent:
19.04.1995 Bulletin 1995/16

(21) Application number: **88113746.7**

(22) Date of filing: **24.08.1988**

(54) **Method of dispensing a pelletized functional material from a water-soluble container.**

Verfahren zur Abgabe eines granulierten funktionellen Stoffes aus einem wasserlöslichen Behälter

Méthode de distribution d'un produit fonctionnel sous form de granulés à partir d'un récipient soluble dans l'eau.

(84) Designated Contracting States:
BE DE FR GB IT NL SE

(30) Priority: **02.10.1987 US 104458**

(43) Date of publication of application:
10.05.1989 Bulletin 1989/19

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Description**Field of the invention**

[0001] The invention relates to a method of dispensing functional material from a dispenser by directing water onto an article contained in said dispenser in order to form a concentrate and directing said concentrate to a use location. The invention further relates to a method for delivering an aqueous alkaline wash chemical and to a method of dispensing multiple volumes of an aqueous solution of a wash chemical from a dispenser.

Background of the Invention

[0002] In the past, many institutional and industrial cleaning apparatuses, warewashing and laundry machines have typically utilized a powdered detergent or a solid cast detergent in a disposable insoluble container in a spray-type dispenser to form a detergent solution upon contact between the water spray and the cleaner. The powdered detergent or solid cast detergent in a disposable container is typically placed in a dispenser wherein the powdered detergent or solid cast detergent is contacted with a water spray in order to form a detergent use solution.

[0003] Powder detergent can be easily spilled by the user causing waste and possible injury. Powders are also disadvantageous in that they can exhibit dusting when being poured into a powdered detergent dispenser posing the risk of inhalation to nearby persons. Powdered detergent compositions are also easy to misuse and waste. In addition powders can be easily pilfered. Moreover, there is a high likelihood of direct user contact with the detergent whenever a powdered detergent is utilized. Furthermore, powders are not very concentrated since they generally contain a number of fillers. Thus, a user of powdered detergent must purchase and store a rather large quantity of detergent.

[0004] Powders also have a tendency to clump and cake after they have been contacted with water and allowed to dry in a dispenser over a period of time. This caking of the powdered detergent diminishes the amount of exposed surface area which can be contacted by water in the dispenser during subsequent detergent formation cycles. The caking of the powdered detergent thus interferes with dispensing efficiency.

[0005] Solid cast detergents have solved the basic problems in the use of powdered detergents. However, many customers continue to use powdered detergents out of habit or from a reluctance to install new dispensers or for cost or other reasons.

[0006] Single use domestic detergent packets comprising powdered or pelletized detergent within a water soluble single use packet are known in the art. See Dunlop, U.S. Pat. No. 3,198,740. Such packets are intended for direct insertion into the wash water contained in a washing machine and are not intended for use in a dispenser. Each packet equals one use or application. In addition, such packets are intended for domestic rather than institutional use. Re. 32,818 (US-A 4,569,781) describes solid cast detergent containing articles produced for use in automatic washing machines, which are of unit dose nature as well. The cast detergent composition includes an alkaline hydratable chemical and optionally further includes one or more preformed cores or plugs comprising an available chlorine source, a defoamer, or the like. The solid block detergent dispenser described is configured to dispense the solid detergents in cast or block form, while this detergent is held in a container, such as a mold or a capsule. Once the detergent within the container is completely utilized, the exhausted container must be removed and a fresh container placed in the dispenser.

[0007] A need exists for a functional material that can be used in a powdered dispersion without exposing the user to powder related hazards.

[0008] A need therefore exists for an institutional multiple use functional composition which can be used in a dispenser to form a solution which does not pose powder-like safety hazards to the user such as through dusting, inhalation and spillage.

[0009] A need also exists for a multiple use functional composition powder replacement which minimizes waste, pilferage and misuse of the functional composition.

[0010] A need also exists for a nonreusable multiple use functional composition powder replacement in which there is no customer contact with the functional composition.

[0011] A need also exists for a multiple use functional composition in which a replacement multiple use functional composition can be placed in the dispenser directly on top of the multiple used functional composition contained in the dispenser without first having to remove a disposable container or waiting until the functional composition is consumed.

[0012] A need also exists for a multiple use functional composition which does not significantly clump and cake after having been contacted with water and allowed to dry adversely affecting dissolution of the functional composition.

Brief Description of the Invention

[0013] I have found that the drawbacks of powder use generally can be solved by former claim 10.

[0014] The amount of pelletized composition contained in the article can vary according to a number of factors including but not limited to the following: the dispenser size, the intended use of the solution formed, the pellet composition, etc.

Brief Description of the Drawings

[0015]

Fig. 1 is a front perspective view with portions thereof broken away for ease of installation of a dispenser in which is situated an article comprising a water soluble bag containing pelletized functional material.

Fig. 2 is a front elevational view with portions thereof broken away of the article comprising a water soluble bag containing a functional pelletized material shown in Fig. 1 which further comprises a moisture impervious outerwrap.

Fig. 3 is a front elevational view taken in section generally through the center of the dispenser in which is situated an article which is resting upon pelletized functional material which was previously enclosed in a water soluble container which has dissolved.

Detailed Description of the Invention

[0016] Referring to the drawings, wherein, like numerals represent like parts throughout the several views; there is generally designated an article 16 comprising a sealed water soluble bag 3 containing a pelletized functional composition 4 situated in a dispenser 5. (See Fig. 1.)

[0017] There is also generally designated an article 16 comprising a sealed water soluble bag 3 containing a pelletized functional composition 4 further contained within a removable water impervious outerwrap 2. (See Fig. 2.)

Water Soluble Film

[0018] The water soluble bag 3 of the article 16 can be manufactured from a number of water soluble films which are available commercially.

[0019] Suitable water soluble film forming materials include but are not limited to the following:

[0020] Polyvinyl alcohol, polyvinyl acetate, methyl cellulose, hydroxyethyl cellulose, carboxymethyl cellulose, sodium carboxymethylhydroxyethyl cellulose, polyvinyl pyrrolidone, poly(alkyl)oxazoline, and film-forming derivatives of polyethylene glycol.

[0021] Polyvinyl alcohol which is preferred is an excellent film forming material, and has good strength and pliability under most conditions. Commercially available polyvinyl alcohol compositions for casting as films vary in molecular weight and degree of hydrolysis. For most film applications, molecular weights in the range of 10,000 to 100,000 are preferred. Hydrolysis is the percent by which acetate groups of the polyvinyl alcohol have been substituted with hydroxyl groups. For film applications, the range of hydrolysis typically is 70% up to 100%. Thus, the term "polyvinyl alcohol" usually includes polyvinyl acetate compounds.

[0022] Such water soluble films and water soluble bags 3 manufactured therefrom are available from a number of commercial sources including the MONO-SOL® Division of Chris Craft Industries, Inc. A particularly useful type of a water soluble polyvinyl alcohol film is the 7-000 series of polyvinyl alcohol films which is available from the MONO-SOL® Division of Chris Craft Industries, Inc. The 7-000 series of polyvinyl alcohol films dissolve at a water temperature of 1.1°C-93.3°C (34° F.-200° F). Such films are nontoxic and display a high degree of chemical resistance. A 5.08 x 10⁻³cm +/- 5.08 x 10⁻⁴ (0.002 inch +/- 0.0002) inch thick 7-000 series polyvinyl alcohol film has the following properties and performance characteristics:

Table A

Properties	Value
Clarity	Translucent 165068 cm ² Kg (11,600 sq. in/lb)
Yield ((cm ² /Kg)) (sq.in/lb)	154.4-176.6°C (310-350°F.),
Hot bar heat seal range	2.068 x 10 ⁵ Pa (30 psi), 3/4 second dwell
	0.8-1.0 second, 5.516 x 10 ⁵ Pa
Impulse heat seal range	(80 psi), 1 second cooling 1.1°C-93.3°C (34°F.-200°F.)
Water temperature range for solubility	

Performance	Value	Test Method
Tensile strength (at break)	4.13 x 10 ⁷ Pa (6000 lb./sq. in.) minimum	ASTM D822
Tear strength	3.937 x 10 ⁵ g/cm (1000 gm/mil) minimum	ASTM D 1922
Burst strength (Mullen)	Exceeds limit of equipment	TAPPI
Elongation	450% min.	ASTM D 822

[0023] When selecting a water soluble film for use in the water soluble bag 3, one must take into account the water temperature at which one desires the water soluble bag 3 to dissolve. It is often desirable to choose a water soluble film that can dissolve at a low water temperature so that the invention functions properly over a wide range of water temperatures. It is not uncommon for the water used during a first wash cycle, for example, to have a lower temperature than water used in subsequent cycles.

[0024] Useful water soluble films for use in the water soluble bag 3 include those that dissolve at a water temperature of about 1.1°C (34° F). It is preferable, however, that the water soluble film for use in the water soluble bag 3 dissolve at a water temperature range of 37.77 - 93.33°C (100°F.-200°F.), for reasons of faster dissolution rate of the water soluble bag 3 and therefore faster dispensing of the product.

[0025] It is also important to select a water soluble film that does not react with the pellets 4 contained in the water soluble bag 3 formed therefrom. Other factors which should be considered when choosing a water soluble film to form the water soluble bag 3 include the following: the effect of the water soluble film on equipment including pumps, pipes and nozzles; the effect of the water soluble film on waste water; the toxicity of the water soluble film; the printability of the water soluble film; and properties which allow the water soluble film to be used on automated bag-making equipment (i.e. sealability, tensile strength and tear strength).

[0026] Printability is a factor since one may desire to print appropriate warnings and instructions on the water soluble bag 3.

[0027] Materials useful as the water soluble bag 3 should have the following minimum properties in order to be successfully utilized.

[0028] The material should have a maximum hot bar heat seal range of about 176.66°C (350°F.), 2.068 x 10⁵ Pa (30 psi), 3/4 second dwell.

[0029] The material should have a maximum impulse seal range of about 1 second, 5.515 x 10⁵ Pa (80 psi), 1 second cooling.

[0030] The material should have a minimum water temperature range for solubility of about 1.1°C (34° F.) minimum.

[0031] The material should have a minimum tensile strength (at break) of about 4.136 x 10⁷ Pa (6000 lb./sq. in.) according to the ASTM D822 test method.

[0032] The material should have a minimum tear strength of about 3.937 x 10⁵ g/cm (1000 gm/mil) according to the ASTM D 1922 test method.

[0033] The material should have a minimum elongation of about 450% according to the ASTM D822 test method.

Water Soluble Bag

[0034] The water soluble bag 3 can be made according to the general methods employed by the plastic film package producing industry. Such water soluble bags 3 used in the present invention are, however, typically of a larger size than the water soluble bags 3 traditionally manufactured. However, such water soluble bags 3 can be specially ordered from a number of sources as previously indicated. The water soluble bag 3 is preferably made of a water soluble polyvinyl alcohol film for cost reasons.

[0035] The water soluble bag 3 can be prepared from the water soluble film by placing two rectangular sheets of the water soluble film face-to-face so that the edges coincide and heat sealing or water sealing three edges using sealing equipment and methods known in the industry.

[0036] Alternatively, other sealing methods known in the art can be utilized.

[0037] The water soluble bag 3 is filled by pouring the weighed pelletized functional material 4 into the previously prepared water soluble bag 3 and finally heat sealing the fourth edge.

[0038] Polyvinyl alcohol film can be hygroscopic and its physical properties can change with changes in temperature and humidity.

[0039] Thus the article 16 comprising the sealed water soluble bag 3 containing the pelletized functional composition 4 should be protected from atmospheric humidity. The article 16 can be placed in the moisture impervious outerwrap 2 described further below.

[0040] The thickness of a wall of the water soluble bag 3 can range from 20 to 90 microns, preferably 25 to 50 microns

for reasons of solubility, and most preferably 50 microns for reasons of effective containment, rapid solubility and machineability.

[0041] The term "mil." as used herein is defined as follows: 1 mil = 0.001 inch and 0.001 inch = 2.54×10^{-3} cm.

[0042] The water soluble bag 3 should have a minimum wall thickness greater than 20 microns.

[0043] The water soluble bag 3 can be of whatever dimensions necessary in order to enclose the desired amount of pelletized functional composition.

[0044] The length of the water soluble bag 3 can range from 15.24 to 45.72 cm (6 to 18 inches), preferably 20.32 to 40.64 cm (8 to 16 inches), for reasons of automated filling and most preferably 25.4 to 35.56 cm (10 to 14 inches), for reasons of fit within the dispenser.

[0045] The width of the water soluble bag 3 can range from 12.7 to 25.4 cm (5 to 10 inches), preferably 16.51 to 20.32 cm (6 1/2 to 8 inches) for reasons of automated filling, and most preferably 17.78 to 19.05 cm (7 to 7 1/2 inches) for reasons of fit within the dispenser.

[0046] However, as currently envisioned with 200 to 450 grams as the expected minimum amount of pelletized composition that will be enclosed, the expected internal bag dimensions would typically be 10.16 to 12.7 cm (4 to 5 inches) wide and 12.7 to 17.78 cm (5 to 7 inches) long.

[0047] The water soluble bag 3 should have a minimum capacity of 200 grams to 900 grams for reasons of customer convenience depending upon the nature of the pellet 4.

[0048] The amount of pelletized composition 4 that the water soluble container 3 would contain is dependent to an extent upon the pelletized composition and its intended use.

[0049] A water soluble container 3 intended for containing a pelletized silicate laundry detergent or a pelletized laundry softening agent should have a typical capacity of about 450 grams.

[0050] A water soluble container 3 intended for containing a pelletized silicate warewashing composition or a pelletized caustic warewashing composition should have a typical capacity of about 900 grams.

[0051] A water soluble container 3 intended for containing a pelletized presoak composition, a pelletized general purpose composition or a pelletized hard surface cleaner should have a typical capacity of about 200 grams.

[0052] Whenever a warewashing pelletized functional composition 4 is enclosed by the water soluble container 3, the water soluble container typically encloses at least 900 grams of the pelletized functional composition 4.

[0053] The water soluble bag 3 should have a maximum capacity of 3 kg - 9 kg for reasons of customer convenience. Preferably, the water soluble bag 3 should have a capacity of 1 kg - 5 kg most preferably 2-3 kg, depending upon the pelletized composition and its intended use.

[0054] The water soluble bag 3 should have a dissolution rate ranging from 0.5 to 3 minutes at a water temperature of 4.4°C to 82.2°C (40°F. to 180° F.) and a water pressure of 1.72×10^5 - 2.06×10^5 Pa (25-30 psig).

[0055] The water soluble bag containing pelletized warewashing composition should have a capacity of 900 grams - 9 kg for reasons of customer convenience.

[0056] A typical water soluble bag 3 containing approximately four pounds of pelletized functional material 4 may have overall dimensions of about 20.32 cm (8 inches) by about 30.48 cm (12 inches), with sealed margins of about 0.635 to 1.27 cm (1/4 to 1/2 inches).

[0057] A typical water soluble bag 3 containing approximately six pounds of pelletized functional material 4 may have inside dimensions of about 19.05 cm (7 1/2 inches) by about 35.56 cm (14 inches), with sealed margins of about 0.635-1.27 cm (1/4-1/2 inches).

[0058] These figures are exemplary and may be varied depending upon the size of the dispenser and the particular use desired. The style of bag described above is known as a flat bag style. However, the use of other water soluble bag and water soluble container styles is possible for this invention.

[0059] The water soluble bag 3 should have dimensions such that it will fit within a dispenser which it is designed to be used in conjunction with. Article 16 can be used in a variety of dispensers having a variety of sizes.

[0060] The dispenser should have a volume sufficient to contain at least one article 16 or more.

Pelletized Functional Material

[0061] The water soluble bag 3 contains enough pellets 4 in order to provide for multiple uses when the water soluble bag 3 is placed in a dispenser 5 and contacted with water.

[0062] The water soluble bag 3 contains a sufficient amount of pellets 4 to provide for at least 2 uses, preferably 4 to 20 uses for reasons of customer convenience and most preferably 8 to 12 uses for reasons of customer convenience. Besides being dependent upon the amount of pelletized material, the number of uses is also dependent upon the water temperature, water pressure, pellet composition, water flow rate, water soluble bag composition and length of time the pellets are contacted with water during each use.

[0063] The mass of each pellet 4 typically ranges from 2 to 30 grams, preferably 5 to 15 grams for reasons of dissolution, and most preferably 7 to 8 grams for reasons of preferred dissolution rate. If the 4 pellets are too large the

rate of dissolution will be too low. If the rate of dissolution is too low the solution formed will have too low of a concentration of dissolved functional material. If the pellets 4 are too small the rate of dissolution will be too high. If the rate of dissolution is too high the solution formed will have too high of a concentration of dissolved functional material. Typically, the detergent solution is transferred to a washing or cleaning apparatus which has a concentration monitoring device which controls the length of time water is sprayed through the nozzle 11 onto the pelletized material 4. If the solution enters at the machine in a highly concentrated form, the concentration could reach too high of a level before the sensor would detect the concentration and shut off the flow of water to the dispenser 5. In addition, concentrations that are too high could affect product performance.

[0064] A pellet 4 can have the following dimensions: a width ranging from 5 to 30 mm, a height ranging from 10 to 80 mm, and a depth ranging from 10 to 30 mm. Preferably each pellet has about a width of about 19 mm, a height of about 30 mm and a width of about 15 mm for preferred dissolution.

[0065] As used herein, the terms "pellet" 4, "pelletized functional material" 4, and "pelletized functional composition" are used interchangeably. The terms also include but are not limited to the following: briquettes, tablets, pellets, nuggets, etc.

[0066] The terms "concentrate", "solution" and "use solution" are used interchangeably herein.

[0067] The shape of the pellets 4 used in the water soluble bag 3 of the present invention can vary. The shape of a pellet 4 can include any regular geometric shape including but not limited to the following: spherical, pyramidal, cubic, oblate spheroid, prismatic, cylindrical, etc.

[0068] Preferably, the pellets 4 used in the water soluble bag 3 of the present invention are spheroid shaped for reasons of manufacturing ease.

Moisture Impervious Outerwrap

[0069] In order to protect the article 16 which comprises a water soluble bag 3 containing a multiple use amount of a pelletized functional material 4 during storage, shipping and handling, a water impervious outerwrap 2 can be provided to prevent damage from atmospheric moisture such as high humidity, rain and dew and from accidental contact with water by splashing or wet hands. This water impervious outerwrap 2 can be provided for either an individual article 16 or groups of articles 16, whichever appears to be most desirable for the individual case. Preferably, the water impervious outerwrap 2 is provided individually for each article 16 for reasons of customer safety and convenience and product protection. Once the water impervious outerwrap 2 is removed, the article 16 should either be protected from water contact or promptly inserted into the dispenser 5.

[0070] The terms "water impervious outerwrap" 2 and "moisture impervious outerwrap" are used interchangeably herein.

[0071] Suitable materials for the water impervious outerwrap 2 include but are not limited to the following: polyolefin films such as polyethylene or polypropylene, Kraft paper which can be moisture-proofed with polyethylene, moisture-proofed cellophane, glassine, metal foils, metallized polymer films, polyester, polyvinyl chloride, polyvinylidene chloride or waxed paper and combinations of these materials as in laminates. The selection of material for the water impervious outerwrap 2 is determined by a number of factors including the cost of the material and the strength required. Preferably, the water impervious outerwrap 2 comprises a polyethylene film for reasons of cost of material and moisture barrier properties.

[0072] A preferred polyethylene film available from several manufacturers for -use in the production of the water impervious outerwrap 2 has the following properties:

Structure	
Antistatic coating	
High density polyethylene	20%
White linear low density polyethylene	60%
Surlyn (sealant layer)	20%
Caliber: absolute minimum thickness 6.858×10^{-3} cm (2.70 mils).	

Properties	Value
Clarity (% light transmission)	34.4%
Yield cm ² /Kg (sq. in./lb.)	150213 cm ² /Kg (10,561)

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(continued)

Properties	Value
Heat seal range	93.3-121°C (200-250°F.), 4.1 x 10 ⁵ Pa (60 psi), 1/2 second dwell
Water vapor transmission rate WVTR (g/6.451 x 10 ² cm ² (gm/100 sq. in.)/24 hours at 37°C (100°F.), 90% R. H.)	0.18
Oxygen transmission test O ₂ trans (cc/6.451 x 10 ² cm ² (100 sq. in.) 24 hours/1 atm./22.77 (73°), 50% R.H.)	95.0

Performance Properties	Value
Tensile strength (at break)	2.275 x 10 ⁷ (3300) min. - 2.688 x 10 ⁷ (3900) max. Pa(psi)
Tear strength	616g MD/536G MD
Elongation	663% MD/620% CD
Dart impact (50% failure)	214G

[0073] Materials useful as the water impervious outerwrap 2 should have certain minimum properties in order to be successfully utilized as the water impervious outerwrap 2:

[0074] The material should have a water vapor transmission rate (WVTR) of no more than about 0.5 g 6.451 x 10² cm² (100 sq. in.)/24 hours at 37.77°C (100°F.), 90% R.H.

[0075] The material should have a minimum tensile strength (at break) of about 2.07 x 10⁷ Pa (3000 psi).

[0076] The water impervious outerwrap 2 should have a minimum wall thickness of about 35 microns..

[0077] The water impervious outerwrap 2 should have a minimum capacity of about 200 grams.

[0078] The disposal of the moisture impervious outerwrap 2 presents no health or pollution hazard as does the disposal of the normal package for potentially harmful material. Since the moisture impervious outerwrap 2 has not contacted the contents of the water soluble bag 3, no residual amounts of the potentially harmful contents remain in it. The water soluble bag 3 itself, of course, completely dissolves and, therefore, creates no disposal problems.

[0079] Bags to serve as the moisture impervious outerwrap 2 are made by the same method as for the water soluble film bags 3 by heat sealing three edges except that the films are typically cut to be 2.54 to 7.62 cm (1 to 3 inches) wider and 2.54 to 10.16 cm (1 to 4 inches) longer than the water soluble bag 3 which it contains.

[0080] A margin of the moisture impervious outerwrap 2, preferably the side margin, can contain a slit 2a which extends part way through the margin to aid the user in opening the moisture impervious outerwrap 2.

[0081] A polyethylene water impervious outerwrap 2 having the following dimensions can be used to enclose a water soluble bag 3 containing 1.81 Kg (4 lbs.) of pelletized functional composition 4.

Dimensions:	
Inside dimension (not including seal area)	
Width (opening)	22.22 cm (8-3/4")
Length	32.38 cm (12-3/4")
Thickness	6.858 x 10 ⁻³ cm (0.0027") min.
Dimensional tolerance	+/- 0.635 cm (1/4")
Style: Flat bag style	
Seals: 3-side-seal with 10 mm seals.	

[0082] The fourth side is sealed by means of heat in order to provide at least a 10mm margin.

[0083] The water impervious outerwrap 2 can comprise a variety of forms including but not limited to the following: a box, a carton, an envelope, a bag, a tub, a pail, a can and a jar. Preferably the water impervious outerwrap comprises a flexible bag for reasons of ease of handling and storage.

[0084] The outside of the moisture impervious outerwrap 2 can have printed thereupon directions for use and appropriate warnings.

Method of Use

[0085] The enclosed pelletized functional material 4 is typically used by placing the article 16 inside the dispenser 5 after removing the water impervious outerwrap 2. The water soluble bag 3 of the present invention contains too large of an amount of pelletized functional material 4 to be placed directly in a warewashing or cleaning apparatus for a single use cycle.

[0086] The article 16 can be used in various types of dispensers. The article 16 is used in a dispenser 5 comprising a dispenser housing 14, a perforated grate 6, a safety grate 9, and a nozzle 11. (See Fig. 1.)

[0087] The dispenser 5 typically has a hinged lid 15 or other access means in order to allow the insertion of the article 16 into the dispenser 5.

[0088] The dimensions of the dispenser 5 can vary depending upon the size and number of articles 16 that one desires the dispenser 5 to contain.

[0089] The perforated grate 6 is typically situated in the lower portion of the dispenser housing 14. The perforated grate 6 can be cooperatively connected to the walls of the dispenser housing 14 or it can rest directly on a narrow ledge 8 situated around the inner periphery of the dispenser housing 14.

[0090] The perforated grate 6 serves to support the water soluble bag 3 containing the pellets 4 within the dispenser 5.

[0091] The perforated grate 6 is preferably flat in order to facilitate contact of the water soluble bag 3 and pellets 4 with the water being sprayed from below.

[0092] The perforated grate 6 contains a number of openings 7. The openings 7 must be of a sufficient size and number to allow an adequate amount of water to spray through the perforated grate 6 in order to dissolve the water soluble bag 3 and the pellets 4 contained therein. To facilitate dispensing it is preferable that the perforated grate 6 contain as many openings 7 as possible in order to facilitate contact of water from the nozzle 11 below with the pellets 4 and the water soluble bag 3 which are supported by the perforated grate 6. The openings 7 should not be so numerous that the perforated grate 6 is too weak to support the weight of the water soluble bag 3 and pellets 4 or to permit the pellets to pass through the grate openings.

[0093] As used herein, a "perforated grate" includes but is not limited to the following: a screen, a grate having a plurality of holes or openings, and a trap having a plurality of holes or openings.

[0094] The openings 7 contained in the perforated grate 6 can vary in size. Preferably each opening 7 has an area ranging from about 0.5 to 5 cm², preferably about 1 to 4 cm² for reasons of product support and most preferably about 1 to 3 cm² for reasons of most effective dispensing.

[0095] The openings 7 should be smaller than the pellets 4 contained in water soluble bag 3 so that the pellets 4 do not fall through the openings 7 in perforated grate 6 as soon as the water soluble bag 3 dissolves.

[0096] The openings 7 in the perforated grate 6 can be of various shapes including but limited to the following: circular, oval, square, rectangular, slit shaped, cylindrical, diamond. Preferably, the openings 7 are diamond shaped for reasons of ease of manufacture.

[0097] The perforated grate 6 can comprise a number of materials including but not limited to the following: metal and plastic. Preferably, the perforated grate 6 comprises metal for reasons of support and ease of manufacture. A preferred perforated grate 6 comprises an expanded metal grate 6.

[0098] A safety grate 9 is typically situated below the perforated grate 6. The safety grate 9 serves to collect any subdivided pellet 4 particles which have been eroded to a size small enough to fall through an opening 7 contained in perforated grate 6. The safety grate 9 typically has a size such that a particle comprising about 5 mm X 5 mm or larger cannot fit through the openings 10 contained in safety grate 9.

[0099] The safety grate 9 can comprise a number of materials including but not limited to the following: plastic, metal, and wire mesh.

[0100] Preferably, the safety grate 9 comprises plastic for economic reasons.

[0101] The safety grate 9 prevents pellet 4 particles from entering and clogging the line 13 leading from the dispenser 5 to the unit such as a warewashing machine that uses the use solution. Water which has been sprayed through nozzle 11, through perforated grate 6 and onto the water soluble bag 3 and pellets 4 supported by perforated grate 6 dissolves the pellets 4 resulting in the formation of a use solution. The use solution thus formed flows back down through the perforated grate 6 and safety grate 9 and out of the dispenser 5 through line 13. Pellet 4 particles which have fallen onto safety grate 9 are dissolved upon contact with the use solution as it flows out of the dispenser 5.

[0102] A nozzle 11 or other fluid dispersing means is typically positioned such that water or other dissolving fluid can be directed onto the water soluble bag 3 and pellets 4 resting on the perforated grate 6 in order to form a solution.

[0103] Nozzle 11 can be situated below perforated grate 6 in such a manner that water can spray through nozzle 11 into article 16 resting on perforated grate 6 from below. Alternatively, the nozzle 11 contained in the dispenser 5 can be situated such that it sprays water onto the water soluble bag 3 from an alternate direction such as the top 11' or side 11" rather than below. Thus, the nozzle 11 can be situated in a number of positions including but limited to the following above 11' the water soluble bag 3, to the side 11" of the water soluble bag 3, and below 11 the water soluble

bag 3, etc.

[0104] A valve 17 serves to prevent water from spraying through nozzle 11 whenever lid 15 is open. The use of such a valve 17 serves as a safety measure to protect the user from being sprayed with water or solution. Suitable valves include but are not limited to the following: a solenoid valve.

[0105] The dispenser 5 has the following dimensions and characteristics:

Preferably, the perforated grate 6 is circular and has a diameter of about 17 cm.

[0106] Preferably the openings 7 in the perforated grate 6 are diamond shaped and have an area of about 1 by 2.5 cm.

[0107] Preferably, the safety grate 9 is circular and has a diameter of about 7 cm.

[0108] Preferably, the openings 10 in the safety grate 9 have an area of about 5 by 5 mm.

[0109] Preferably, the safety grate 9 is situated about 4 centimeters below the perforated grate 6.

[0110] Preferably, the nozzle 11 is situated about 1 cm, above the safety grate 9.

[0111] Preferably, the dispenser housing 14 comprises an upper cylindrical housing having a funnel shaped bottom portion 14b. An inlet 12 is connected to dispenser 15 at the funnel shaped bottom portion 14b of the dispenser housing 14. Together the inlet 12 and the nozzle 11 comprise the water or fluid access means.

[0112] Preferably, the safety grate 9 and nozzle 11 are situated in the funnel shaped bottom portion 14b of the dispenser housing 14. The perforated grate 6 rests upon a narrow ledge 8 having a width of about 3 mm situated around the inner periphery of the dispenser housing 14 at the point where the cylindrical portion 14a of the dispenser housing 14 meets the funnel shaped portion 14b.

[0113] Preferably, the cylindrical portion 14a of the dispenser housing 14 has a diameter of about 18 cm.

[0114] Preferably, the top of the cylindrical portion 14a is angled such that it has a height of about 14 cm in front and a height in the rear portion where the hinges 15a and 15b of lid 15 are situated. Preferably, the volume of the dispenser above the perforated grate 6 is 4000-6000 cubic centimeters.

[0115] The rate of dissolution of the water soluble bag 3 and the pellets 4 contained therein is dependant upon a number of factors including the water temperature and the pressure of the water sprayed upon the water soluble bag 3 and the pellets 4 contained therein. The higher the water pressure the higher the dissolution rate of the water soluble bag 3 and pellets 4. Likewise, the higher the water temperature the higher dissolution rate of the water soluble bag 3 and pellets 4. The size of the pellet 4 itself also affects the dissolution rate.

[0116] The smaller the pellet 4 the higher its dissolution rate. Conversely, the larger the pellet 4 the lower its dissolution rate.

[0117] A pellet's 4 dissolution rate is also affected by whether the pellet 4 has been previously wetted. If a pellet 4 has been wetted during a pervious solution formation cycle then it will have a higher dissolution rate during subsequent solution formation cycles.

[0118] The dissolution rate of a pellet 4 is also affected by the pellet's 4 density. The higher the density of a pellet 4, the slower it dissolves.

[0119] The pellets 4 used in the water soluble bag 3 of the present invention can have a density ranging from 1.0 to 3.0 g/ml, preferably 1.7 to 2.0 g/ml for reasons of dispensing and most preferably 1.8 to 1.9 g/ml for reasons of friability and dispensing.

[0120] A warewashing pellet 4 for use in the article 16 of the present invention has a dissolution rate such that it does not completely dissolve in less than 7-10 minutes when contacted with water having a temperature of the range of water typically used in consumer dishwashers.

[0121] The rate of dissolution is also dependent upon the composition of the water soluble bag 3 itself and upon the compositions of the pellets 4 contained therein.

[0122] The water soluble bag of the present invention should dissolve within 0.5 to 3 minutes upon contact with water having a temperature of 4.4 ° C (40° F.) to 82.2 °C (180° F.) or higher and a pressure of 1.72×10^5 to 2.07×10^5 Pa (25 to 30 psig.).

[0123] The article 16 should dissolve at a rate such that the desired concentration of functional material at the use location can be obtained.

[0124] Preferably, the pelletized functional material is contacted with a water spray having a sufficient temperature and pressure in order to form a concentrate which can be dispensed to its use location within 0.5 - 5 minutes. Preferably, the dispensing time necessary in order to achieve the desired concentration of functional material at the use location is less than 3 minutes.

[0125] The temperature of the water sprayed through the nozzle 11 onto the article 16 can vary depending upon the composition of the water soluble container 3 and the pelletized functional material 4.

[0126] Preferably, the water has a minimum temperature of about 1.1°C (34 ° F.) in order to dissolve the water soluble container. The minimum water temperature is also dependent upon the composition of the pelletized functional material.

[0127] Preferably, the temperature of the water sprayed through nozzle 11 onto the article 16 according to the method of this invention can range from 26.6 to 71.1 ° C (80 to 160° F.), more preferably 37.7 to 60°C (100 to 140 degrees F.), and most preferably 43.3 to 60°C (110 to 140 degrees F.) for reasons of effective dispensing.

[0128] The pressure of the water sprayed through nozzle 11 onto the article 16 according to the method of this invention can vary. Preferably, the water pressure range from 8.27×10^4 to 4.14×10^5 Pa (12 to 60 lbs./in.²) most preferably 1.72×10^5 to 2.07×10^5 Pa (25 to 30 lbs./in.²) for reasons of effective dispensing.

[0129] The contact of water with the pelletized functional material 4 within the dispenser 5 results in the formation of a solution. Such solution is directed by means of a line 13 into a washtank, bucket or wherever the solution is needed.

[0130] An ionic sensor or other concentration monitoring device can be used to determine the concentration of solution formed by action of the water on the pellets 4 contained within the dispenser 5. The ionic sensor serves to regulate the length of time water is sprayed through the nozzle 11, thus insuring a high accuracy with regards to the functional material solution concentration.

[0131] It is possible that the article 16 could be used in various other dispensers including but not limited to the following: water in reservoir dispensers and hydraulic dispensers.

[0132] The dispenser 5 previously described is preferred in that the user by means of the ionic sensor device or other concentration monitoring device can accurately control the concentration of functional material contained in the solution.

[0133] The dispenser 5 used to dissolve the article 16 can be used by itself in order to form a solution from the pellets 4 contained in the water soluble bag 3. Alternatively, the dispenser 5 can be mounted directed onto a machine such as a warewashing machine, laundry machine, etc. which the dispenser 5 is being used in conjunction with. Alternatively, the dispenser 5 can be situated on the floor next to the machine it is being used in conjunction with, or mounted on a nearby wall.

Pelletized Functional Composition

[0134] The article 16 can contain a multiple use amount of a pelletized functional material 4 including but not limited to a fabric treatment composition, a warewashing composition, a laundry composition, a pot and pan cleaner or presoak composition, a silverware cleaner or presoak composition, a floor cleaner composition, a rinse additive composition, a disinfectant composition, a general purpose cleaner composition, etc. The pelletized materials are room temperature solids. The materials are solidified by a variety of mechanisms, including compressive molding, compressive pelletizing, casting, hydration hardening, the use of organic hardening agents, etc.

1. LAUNDRY COMPOSITION

[0135] Formula I comprises a detergent pellet whereas Formula II comprises a fabric softening pellet which also serves to lower the pH (i.e. acidify or sour) the water in which the pellet is dissolved.

FORMULA I

[0136]

SILICATE LAUNDRY DETERGENT PELLET				
		Narrow	Preferred	Broad
1.	Alkali metal silicate	48-52	30-60	5-90
2.	Alkali metal hydroxide	20-50	20-60	0-80
3.	Sequestering agent	15-30	10-60	1-90
4.	Antiredeposition agent	2-4	2-8	0-10
5.	Dye	0.018-0.022	0.005-0.05	0-0.5
Optional Ingredients				
6.	Optical brightener		0.1-1.0	0-5
7.	Nonionic surfactant		20-30	0-50
8.	Anionic surfactant		5-15	0-20
9.	Fragrance		0.05-0.5	0-1.0
10.	Sodium carbonate			0-80
11.	Water of hydration			0-30

[0137] Preferably the openings 7 in the perforated grate 6 are diamond shaped and have an area of about 1 by 2.5 cm.

[0138] Preferably, the safety grate 9 is circular and has a diameter of about 7 cm.

[0139] Preferably, the openings 10 in the safety grate 9 have an area of about 5 by 5 mm.

[0140] Preferably, the safety grate 9 is situated about 4 centimeters below the perforated grate 6.

[0141] Preferably, the nozzle 11 is situated about 1 cm. above the safety grate 9.

[0142] Preferably, the dispenser housing 14 comprises an upper cylindrical housing having a funnel shaped bottom portion 14b. An inlet 12 is connected to dispenser 15 at the funnel shaped bottom portion 14b of the dispenser housing 14. Together the inlet 12 and the nozzle 11 comprise the water or fluid access means.

[0143] Preferably, the safety grate 9 and nozzle 11 are situated in the funnel shaped bottom portion 14b of the dispenser housing 14. The perforated grate 6 rests upon a narrow ledge 8 having a width of about 3 mm situated around the inner periphery of the dispenser housing 14 at the point where the cylindrical portion 14a of the dispenser housing 14 meets the funnel shaped portion 14b.

[0144] Preferably, the cylindrical portion 14a of the dispenser housing 14 has a diameter of about 18 cm.

[0145] Preferably, the top of the cylindrical portion 14a is angled such that it has a height of about 14 cm in front and a height in the rear portion where the hinges 15a and 15b of lid 15 are situated. Preferably, the volume of the dispenser above the perforated grate 6 is 4000-6000 cubic centimeters.

[0146] The rate of dissolution of the water soluble bag 3 and the pellets 4 contained therein is dependant upon a number of factors including the water temperature and the pressure of the water sprayed upon the water soluble bag 3 and the pellets 4 contained therein. The higher the water pressure the higher the dissolution rate of the water soluble bag 3 and pellets 4. Likewise, the higher the water temperature the higher dissolution rate of the water soluble bag 3 and pellets 4. The size of the pellet 4 itself also affects the dissolution rate.

[0147] The smaller the pellet 4 the higher its dissolution rate. Conversely, the larger the pellet 4 the lower its dissolution rate.

[0148] A pellet's 4 dissolution rate is also affected by whether the pellet 4 has been previously wetted. If a pellet 4 has been wetted during a pervious solution formation cycle then it will have a higher dissolution rate during subsequent solution formation cycles.

[0149] The dissolution rate of a pellet 4 is also affected by the pellet's 4 density. The higher the density of a pellet 4, the slower it dissolves.

[0150] The pellets 4 used in the water soluble bag 3 of the present invention can have a density ranging from 1.0 to 3.0 g/ml. preferably 1.7 to 2.0 g/ml for reasons of dispensing and most preferably 1.8 to 1.9 g/ml for reasons of friability and dispensing.

[0151] A warewashing pellet 4 for use in the article 16 has a dissolution rate such that it does not completely dissolve in less than 7-10 minutes when contacted with water having a temperature of the range of water typically used in consumer dishwashers.

[0152] The rate of dissolution is also dependent upon the composition of the water soluble bag 3 itself and upon the compositions of the pellets 4 contained therein.

[0153] The water soluble bag should dissolve within 0.5 to 3 minutes upon contact with water having a temperature of 4.4°C (40°F.) to 82.2°C (180°F.) or higher and a pressure of 1.72×10^5 to 2.07×10^5 Pa (25 to 30 psig.).

[0154] The article 16 should dissolve at a rate such that the desired concentration of functional material at the use location can be obtained.

[0155] Preferably, the pelletized functional material is contacted with a water spray having a sufficient temperature and pressure in order to form a concentrate which can be dispensed to its use location within 0.5 - 5 minutes. Preferably, the dispensing time necessary in order to achieve the desired concentration of functional material at the use location is less than 3 minutes.

[0156] The temperature of the water sprayed through the nozzle 11 onto the article 16 can vary depending upon the composition of the water soluble container 3 and the pelletized functional material 4.

[0157] Preferably, the water has a minimum temperature of about 11°C (34° F) in order to dissolve the water soluble container. The minimum water temperature is also dependent upon the composition of the pelletized functional material.

[0158] Preferably, the temperature of the water sprayed through nozzle 11 onto the article 16 according to the method of this invention can range from 26.6 to 71.1°C (80 to 160° F.), more preferably 37.7 to 60°C (100 to 140 degrees F.), and most preferably 43.3 to 60°C (110 to 140 degrees F.) for reasons of effective dispensing.

[0159] The pressure of the water sprayed through nozzle 11 onto the article 16 according to the method of this invention can vary. Preferably, the water pressure range from 8.27×10^4 to 4.14×10^5 Pa (12 to 60 lbs/in.²)

Optical Brightener

[0160] The laundry detergent pellet may also comprise 0-5 wt-% of an optical brightener, preferably 0.1-1.0 wt-%.

Nonionic Surfactant

[0161] The laundry detergent pellet may also comprise 0-50 wt-% of a nonionic surfactant, preferably 10-40 wt-%, and most preferably 20-30 wt-%. Suitable nonionic surfactants include but are not limited to the following: propoxylated and/or ethoxylated alkyl phenols, propoxylated and/or ethoxylated aliphatic alcohols and carboxylic esters. For reasons of effective detergency, low cost, ease of availability, and low foam, the preferred nonionic surfactants are ethoxylated nonyl phenols having 9-10 moles of ethoxylate and C₁₂-C₁₅ linear alcohols having 7-9 moles of ethoxylate.

Anionic Surfactant

[0162] The laundry detergent pellet may also comprise 0-20 wt-% of an anionic surfactant, preferably 5-15 wt-% for reasons of particulate soil dispersion. Suitable anionic surfactants include but are not limited to the following: linear alkyl benzene sulfonate, alcohol sulfate, alcohol ether sulfate and alpha olefin sulfonates. Preferably the anionic surfactant comprises a linear alkyl benzene sulfonate for reasons of cost and efficacy.

Sodium Carbonate

[0163] The laundry detergent pellet may also comprise 0-80 wt-% sodium carbonate.

Fragrance

[0164] The laundry detergent pellet may also comprise 0-1.0 wt-% of a fragrance, preferably 0.05-0.5 wt-%.

Water of Hydration

[0165] The laundry detergent pellet may also comprise 0-30 wt-% water of hydration, preferably 0 to 15 wt-% for reasons of ensuring a strong pellet that resists breakage and dusting and concentrating the product actives.

Example 1

[0166] The following Example demonstrates the good dissolution rate of a water soluble bag containing a pelletized silicate laundry detergent functional composition. A water soluble bag having the following dimensions: 19.05 cm (7-1/2 inches) length, 25.4 cm (10 inches) width and a thickness of 3.81 x 10⁻³ cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A containing 1.36 Kg (3 lbs.) of pellets is inserted into a dispenser. The silicate laundry detergent pellets have the following composition:

Ingredients		Wt-%
1.	Sodium metasilicate	40
2.	Sodium hydroxide	27
3.	Sodium tripolyphosphate	20
4.	Carboxymethyl cellulose	3
5.	Dye	0
6.	Optical brightener	1
7.	Nonyl phenol ethoxylate with 9.5 moles of ethoxylate	3
8.	Linear alkyl benzene sulfonate	1
9.	Fragrance	0
10.	Water of hydration	5

The water soluble bag containing the pellets is contacted with water having a temperature of 57.2-68.3°C (135-155°F.) in order to form a solution. The solution is formed and transferred to a 136.38 ℓ (30 gallon) tank containing 113.65 ℓ (25 gallons) of fresh water. By means of an ionic sensor it is determined that it takes less than about 3 minutes for the tank to reach the desired concentration.

1(b). LAUNDRY COMPOSITION - FORMULA II - LAUNDRY SOFTENING PELLET

[0167] Formula II comprises a laundry softening pellet.

Moderate pH Acid

[0168] The laundry softening pellet can comprise 50-100 wt-% of a moderate pH acid, preferably 70-90 wt-% for reasons of reducing linen pH to prevent skin irritation and enhance rinsing of water hardness salts. Suitable moderate pH acids include but are not limited to the following: ammonium silico fluoride, sodium silicofluoride, tartaric acid, citric acid, oxalic acid, sodium acid fluoride and ammonium acid fluoride. Preferably the moderate pH acid comprises ammonium silico fluoride for reasons of solubility, toxicity and cost.

[0169] A moderate pH acid is an acid wherein at a concentration in water of the acid of 0.25 wt-%, a pH of 2 and ideally above 4 is obtained.

Quaternary Surfactant

[0170] The laundry softening pellet also comprises 50-100 wt-%, preferably 10-50 wt-%, and most preferably 20-40 wt-% of a quaternary surfactant.

[0171] Suitable quaternaries include but are not limited to the following: quaternary ammonium chlorides, quaternary ammonium methyl sulfate, imidazolinium-type quaternaries, dialkyl dimethyl quaternaries, monoalkyl trimethyl quaternaries, and diamide amine based quaternaries. Preferably the quaternaries utilized are solid and have a melting point above about 48.8°C (120°F). Quaternaries used in the present invention should have fabric softening capabilities and static reduction capabilities. Preferably the quaternary comprises distearyl dimethyl ammonium chloride for reasons of efficacy and melting point.

Optical Brightener

[0172] The laundry softening pellet may also comprise 0-2 wt-% of an optical brightener, preferably 0.1-0.4 wt-%.

Fragrance

[0173] The laundry softening pellet may also comprise 0-2 wt-% of a fragrance, preferably 0.1-0.5 wt-%.

Iron Control Agent

[0174] The laundry softening pellet may also comprise 0-20 wt-% of an iron control agent, preferably 5-15 wt-% for reasons of reducing yellowing caused by iron deposits. Suitable iron control agents include but are not limited to the following: oxalic acid, citric acid, such as HEDP (hydroxyethylene diphosphonic acid), sodium or ammonium acid fluoride and organic amino polycarboxylated compounds such as nitrilotriacetic acid and ethylene diamine diacetic acid.

Water of Hydration

[0175] The laundry softening pellet may also comprise 0-43 wt-% water of hydration, preferably 0-15 wt-% for reasons of reducing the percentage of inactive materials in the formulation.

Enzyme

[0176] The laundry softening pellet may also comprise 0-5 wt-% of an enzyme, preferably 1-4 wt-% for reasons of protein and starch stain removal. Suitable enzymes include but are not limited to the following: amylase, protease, lipase and cellulase.

[0177] The enzyme may be encapsulated. Suitable materials for the encapsulation of the enzyme include but are not limited to the following: inorganic salts, substituted celluloses, polyethylene glycols and waxes.

Example 2

[0178] The following Example demonstrates the good dissolution rate of a water soluble bag containing a laundry softening pelletized functional composition. A water soluble bag having the following dimensions: 19.05 cm (7-1/2 inches) length, 15.24 cm (6 inches) width and a thickness of 3.81×10^{-3} cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A containing 0.454 Kg (1 lb.) of pellets is inserted into a dispenser.

[0179] The laundry softening pellet composition is as follows:

Ingredients		Wt-%
1.	Ammonium silico fluoride	60
2.	Quaternary surfactant distearyl dimethyl ammonium chloride	25
3.	Optical brightener	1
4.	Fragrance	0.5
5.	Iron control agent - citric acid	13.5
6.	Water of hydration	

[0180] The water soluble bag containing the pellets is contacted with water having a temperature of 57.2-68.3°C (135-155° F.) in order to form a solution. The solution is transferred to a 136.38 ℓ (30 gallon) tank containing 113.65 ℓ (25 gallons) of fresh water. By means of an ionic sensor it is determined that it takes less than 3 minutes for the tank to reach the desired concentration.

2. WAREWASHING COMPOSITION

[0181] We believe that a multiple use amount of a pelletized warewashing composition may be used in the water soluble bag.

[0182] Formula I comprises a metasilicate based warewashing composition whereas Formula II comprises a caustic based warewashing composition.

2(a). WAREWASHING COMPOSITION - FORMULA I - METASILICATE BASED

[0183]

Raw Material		Narrow	Broad	Preferred
1.	Sequestering agent		10-70	30-40
2.	Alkali metal silicate	40	10-70	30-60
3.	Secondary sequestering agent		0-10	0-4
4.	Filler	18-22	0-60	0-40
5.	Bleaching source	2-3	0.1-10	1-6
6.	Defoaming surfactant	0-1	0-10	0-4
7.	Dye		0-10	
8.	Fragrance		0-10	

Sequestering Agent

[0184] The pelletized metasilicate based warewashing composition preferably comprises 10 to 70 wt-%, of a sequestering agent, preferably 30 to 40 wt-% for reasons of effective sequestering of hardness ions.

[0185] The service water commonly employed in cleaning baths contains substantial proportions of hardness ions, most commonly calcium and magnesium ions, which can react with detergent components to decrease cleansing effectiveness and/or leave unsightly deposits upon the substrate being cleaned. Sequestrants act to prevent or delay crystal growth of calcium or magnesium compounds and thereby eliminate their reaction with other components and/or their precipitation.

[0186] Useful inorganic sequestering agents include but are not limited to the following: condensed phosphate compositions such as water soluble alkali metal orthophosphates, polyphosphates, pyrophosphates and metaphosphates. Preferably the sequestering agent is an inorganic sequestering agent for reasons of cost.

[0187] For reasons of cost, sodium tripolyphosphate is the preferred inorganic sequestering agent.

Alkali Metal Silicate

[0188] The pelletized metasilicate based warewashing composition can comprise about 10 to 70 wt-% of an alkali metal silicate. Preferably the pelletized warewashing composition comprises 30 to 60 wt-% of an alkali metal silicate for reasons of supplying alkalinity, and most preferably 40 wt-% of an alkali metal metasilicate for reasons of supplying sufficient alkalinity.

[0189] Alkali metal silicates are the reaction product of an alkali metal oxide (M_2O) and silicon dioxide (SiO_2) and have the general chemical formula $(M_2O)_x:(SiO_2)_y$ wherein x and y indicate the molar ratio of alkali metal oxide to silicon dioxide.

[0190] Methods of manufacturing alkali metal silicates having various x:y mole ratios are well known as demonstrated by the general disclosure in the Kirk-Othmer Encyclopedia of Chemical Technology, 2d Ed., Vol. 18, pp. 139-141. The desired properties and benefits of the pelletized warewashing composition described herein can be obtained using an alkali metal silicate having an x:y ratio of 1:1-3:1, preferably 1:1. At these ratios, the alkali metal silicate has sufficient alkaline character to clean effectively and sufficient silicon dioxide to protect aluminum, china, glassware, etc. from the etchant effect of basic components in the composition.

[0191] For reasons of high cleaning performance, delicate ware protection and low cost, the most preferred alkali metal silicate is sodium metasilicate having an $Na_2O:SiO_2$ ratio of about 1:1.

Secondary Sequestering Agent

[0192] The pelletized metasilicate based warewashing composition can comprise 0 to 10 wt-% of a secondary sequestering agent. Preferably, the pelletized warewashing composition comprises 0 to 4 wt-% of an secondary sequestering agent for reasons of better product performance.

[0193] Suitable secondary sequestering agents include a polyelectrolyte such as polymeric polycarboxylic acids of molecular weight 1000-3000, EDTA (ethylene diamine tetra acetic acid), NTA (nitrilotriacetic acid), citric acid.

[0194] Preferably the secondary sequestering agent is an organic sequestering agent for reasons of product performance.

[0195] Preferably the secondary sequestering agent is sodium polyacrylate for reasons of performance.

Filler

[0196] The pelletized metasilicate based warewashing composition can also comprise 0 to 60 wt-% of a filler. Preferably the pelletized warewashing composition comprises 0-40 wt-% of a filler for reasons of cost. and most preferably 18-22 wt-% for reasons of cost.

[0197] Suitable fillers include but are not limited to the following: sodium carbonate, and sodium sulfate.

[0198] The more fillers the pellet contains, the less expensive the pellet. Preferably, the filler comprises sodium carbonate for economic reasons and the fact that sodium carbonate services as an additional source of alkalinity.

Bleaching Source

[0199] The pelletized metasilicate based warewashing composition may also comprise 0.1-10 wt-% of a bleaching source. Preferably the pelletized warewashing composition contains 1-6 wt-% of a bleaching source, for reasons of detaining, and most preferably 2-3 wt-% for reasons of cost coupled with good destaining.

[0200] Bleaches suitable for use in the pelletized warewashing composition include any of the well known bleaching agents capable of removing stains from such substrates as dishes, flatware, pots and pans, textiles, countenops, appliances, flooring, etc. without significantly damaging the substrate. A nonlimiting list of such bleaches include bleaches such as hypochlorites, chlorites, chlorinated phosphates, chloroisocyanates, chloroamines, etc., and peroxide compounds such as hydrogen peroxide, perborates, percarbonates etc. Preferred bleaches include those bleaches which liberate an active halogen species such as Cl^+ , Br^+ , OCl^- or OBr^- under conditions normally encountered in typical cleaning processes. Most preferably, the bleaching agent releases Cl^+ or OCl^- . A nonlimiting list of useful chlorine releasing bleaches includes calcium hypochlorite, lithium hypochlorite, chlorinated trisodium phosphate, sodium dichloroisocyanurate, potassium dichloroisocyanurate, pentaisocyanurate, trichloromelamine, sulfondichloroamide, 1,3-dichloro-5,5dimethyl hydantoin, n-chlorosuccinimide, n,n'-dichloroazodicarbonimide, n,n'-chloroacetyl urea, n,n'-dichlorobiuret, trichlorocyanuric acid, and hydrates thereof.

[0201] Because of their higher activities and high bleaching efficiencies the most preferred bleaching agents are the alkali metal salts of dichloroisocyanurates and the hydrates thereof.

Defoaming Surfactant

[0202] The pelletized metasilicate based warewashing composition may also comprise 0-10 wt-% of a defoaming surfactant.

[0203] Preferably the warewashing composition contains 0-4 wt-% of a defoaming surfactant for reasons of defoaming performance and most preferably 0-2 wt-% for reasons of maximum defoaming without interfering with product performance.

[0204] A defoamer is a chemical compound with a hydrophobe/hydrophile balance suitable for reducing the stability of protein foam. The hydrophobicity can be provided by an oleophilic portion of the molecule; e.g., an aromatic alkyl or alkyl group, an oxypropylene unit or oxypropylene chain, or other oxyalkylene functional groups other than oxyethylene; e.g., tetramethylene oxide. The hydrophilicity can be provided by oxyethylene units, chains, blocks and/or ester groups; e.g., organophosphate esters; salt-type groups, or salt-forming groups. Typically, defoamers are nonionic organic surface-active polymers having hydrophobic groups, blocks or chains and hydrophilic ester groups, blocks, units or chains; but anionic, cationic, and amphoteric defoamers are known. For a disclosure of nonionic defoaming surfactants, see U.S. Patent No. 3,048,548, issued August 7, 1962 (Martin et al), U.S. Patent No. 3,334,147, issued August 1, 1967 (Brunelle et al, and U.S. Patent No. 3,442,242, issued May 13, 1969 (Rue et al). Phosphate esters are also suitable, e.g. esters of the formula $RO-(PO_3M)_nR$, wherein n is a number ranging from 1 to about 60, typically less than 10 for cyclic phosphates, M is an alkali metal and R is an organic group or M, with at least one R being an organic group such as an oxyalkylene chain.

[0205] Suitable defoaming surfactants include but are not limited to the following: ethylene oxide/propylene oxide block nonionic surfactants, fluorocarbons, and alkylated phosphate esters.

[0206] Preferably the defoaming surfactant comprises an alkyl sulfate ester for economic reasons.

Additional Ingredients

[0207] The pelletized warewashing composition may also further comprise 0-10 wt-% a dye and 0-10 wt-% fragrance.

[0208] The pelletized functional composition can be manufactured by a number of processes, included but not limiting to the following: a batch process and a continuous process.

[0209] In the batch process, sodium metasilicate, low density tripolyphosphate, surfactant, soda ash, and dry polyacrylate are added in any order to a ribbon blender or a Nauta mixer. The last item added is the chlorine source (sodium dichloroisocyanurate dihydrate). The various dry ingredients are mixed for 5-10 minutes, collected in drums and fed through a belt feeder to the pelletizer.

[0210] In the continuous process, each dry ingredient is fed in the proper proportions to a 4.57 m (15 foot) ribbon blender at a combined flow rate of 453.6 Kg (1,000 pounds) per hour. The ribbon blender is used as a continuous mixer, in order to form the premixed product, i.e., material is fed in one end and removed continuously from the other end.

[0211] The premixed product is fed to a model 25C59 pelletizer manufactured by Strong-Scott which is equipped with a double roll and a vertical screw. The screw serves to force the premixed product between the rolls. The rolls rotate at about 15 r.p.m. and form pellets at a rate of 453.6 Kg (1,000 pounds) of pellets per hour. The hydraulic pressure is set at 1.51×10^7 Pa (2,200 psig). Pellets formed at the pelletizer drop onto a 0.914 m (3 foot) diameter screener equipped with a 1.27 cm (1/2 inch) mesh screen. The screen serves to deburr the pellets. Fines are recycled back to the ribbon blender or Nauta mixer. The finished pellet product is collected and packaged.

[0212] The various dry ingredients are typically added in any order to the ribbon blender or Nauta mixer. The chlorine source is typically added last to minimize the length of time that the chlorine source is in contact with the other ingredients.

Example 3

[0213] The following Example demonstrates the good dissolution rate of pellets 2.26 Kg (5 lbs.) of metasilicate based warewashing pellets having the following composition:

Ingredients		Wt-%
1.	Sodium tripolyphosphate	29.2
2.	Sodium metasilicate	45.0
3.	Sodium polyacrylate	1.9
4.	Sodium dichloroisocyanurate dihydrate	2.4
5.	Sodium carbonate	20.6
6.	Alkyl phosphate ester	0.9

were inserted into a dispenser and contacted with water sprayed through a nozzle having a temperature of 57.2-68.3°C (135-155°) in order to form a solution. The solution thus formed was transferred to a 136.38 ℓ (30 gallon) tank containing 113.65 ℓ (25 gallons) of fresh water. By means of an ionic sensor it was determined that it took only 2 minutes for the tank to reach the desired concentration.

Example 4

[0214] The following Example demonstrates the good dissolution rate of a water soluble bag containing a pelletized functional composition. A water soluble bag having the following dimensions: 35.56 (14 inches) length, 19.05 cm (7 1/2 inches) width and a thickness of 3.81×10^{-3} cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A and containing 2.26 Kg (5 lbs.) of pellets was inserted into a dispenser. The pellets had the same composition as the pellets disclosed in Example 3. The water soluble bag containing the pellets was contacted with water having a temperature of 57.2-68.3°C (135-155°F.) in order to form a solution. The solution thus formed was transferred to a 136.38 ℓ (30 gallon) tank containing 113.65 ℓ (25 gallons) of fresh water. By means of an ionic sensor it was determined that it took only 3 minutes and 7 seconds for the tank to reach the desired concentration.

Table B

[0215] The following test data demonstrates the superior performance exhibited by the formerly described metasilicate based warewashing pellets contained in a water soluble bag when compared with powdered warewashing detergents.

[0216] The test was run as follows: For six months, three different powdered detergents were utilized in dispensers for institutional warewashing machines in a number of test machines. The performance of the powders were evaluated to determine whether staining, filming and spotting of cups, glassware and silverware occurred.

[0217] For the next two or three months, the described article comprising a water soluble container containing pelletized warewashing composition was utilized in the dispensers in place of the powdered detergents.

[0218] It was determined that the warewashing results obtained from use of the above mentioned pellets were equal to the results obtained by use of the powdered compositions, even though a lower usage of the pelletized products was used as compared to the powdered products.

[0219] It was also observed that the described pellets did not cause dusting and spillage problems as did the powders.

[0220] The metasilicate based warewashing pellets which were tested. Pellet A and Pellet B, had the following formulas:

[0221] The Pellet A pellets had the formula set forth in Example 3.

[0222] The Pellet B pellets had the following formula:

Wt-%	Ingredient
59.6	sodium metasilicate
4.0	sodium polyacrylate
5.4	sodium dichloroisocyanurate dihydrate
29.8	sequestering agent sodium tripolyphosphate
1.2	alkyl phosphate ester

2.26 Kg (Five pounds) of Pellet B pellets were contained in a water soluble bag having the properties of the water soluble bag described in Example 4. 2.26 Kg (Five pounds) of Pellet A pellets were contained in a water soluble bag as described in Example 4.

[0223] The three powdered products, which we tested our article containing Pellet A and our article containing Pellet B pellets against, had the following, formulas:

Powdered Product I	
Wt-%	Ingredient
18.0	sodium tripolyphosphate
48.8	sodium carbonate
2.6	sodium polyacrylate
29.0	sodium metasilicate
1.6	sodium dichloroisocyanurate dihydrate

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Powdered Product II	
Wt-%	Ingredient
4.2	sodium carbonate
1.5	sodium polyacrylate
1.8	sodium dichloroisocyanurate dihydrate
8.8	sodium chloride
1.0	alkyl phosphate ester
22.4	sodium hydroxide
22.5	sodium tripolyphosphate

Powdered Competitor Product III	
Wt-%	Ingredient
14.3	sodium tripolyphosphate
35.7	sodium carbonate
1.0	sodium polyacrylate
1.0	sodium dichloroisocyanurate dihydrate
22.0	sodium chloride
1.0	alkyl phosphate ester
25.0	sodium hydroxide

Test No.	Average usage of pellet product	Average usage of powdered product to obtain equal results	Number of Tests
1.	Pellet A - 72,5 g (0.16 lb))	104,3 g (0.23 lb) Product II	7
2.	Pellet B - 57,6 g (0.127 lb)	87,1 g (0.192 lb) Product I	4
3.	Pellet A - 77,1 g (0.17 lb)	99,7 g (0.22 lb) Product III	6
4.	Pellet B - 60,8 g (0.134 lb)	84,8 g (0.187 lb) Product II	4
5.	Pellet B - 58,9 g (0.13 lb)	90,7 g (0.2 lb) Product II	5
6.	Pellet B 52,2 g (0.115 lb)	65,7 g (0.145 lb) Product III	5

[0224] As the data above demonstrates in each test a larger usage of the powder products had to be utilized in order to achieve a result equal to that obtained with a smaller usage of the described articles containing pelletized functional composition.

2(b). WAREWASHING COMPOSITION - FORMULA II - CAUSTIC BASED

[0225] The following table sets forth the formula and preparation procedure for a caustic warewashing pellet 4 which could be used in the water soluble bag 3.

Raw Material		Wt-% Broad Range	Wt-% Preferred Range	Wt-% Most Preferred Range
1.	Alkali metal hydroxide	15-70	25-50	40
2.	Inorganic sequestering agent	10-50	25-45	35
3.	Bleaching source	0-8	2-6	5
4.	Sodium carbonate	0-40	10-30	15
5.	Organic sequestering agent	0-7	2-5	3
6.	Defoaming surfactant	0-5	1-3	2

Alkali Metal Hydroxide

[0226] The caustic warewashing pellet may comprise 15-70 wt-% of an alkali metal hydroxide, preferably 25-50 wt-%, and most preferably 40 wt-% for reasons of cleaning performance. Suitable alkali metal hydroxides include but are not limited to the following: potassium hydroxide, sodium hydroxide, or mixtures of potassium and sodium hydroxide.

Inorganic Sequestering Agent

[0227] The caustic warewashing pellet may comprise 10-50 wt-% of an inorganic sequestering agent, preferably 25-45 wt-% for reasons of hard water control, and most preferably 35 wt-% for reasons of economy and legal restrictions on phosphorous content. Suitable inorganic sequestering agents include but are not limited to the following: tetrasodium pyrophosphate, tetrapotassium pyrophosphate, sodium tripolyphosphate, potassium tripolyphosphate. The preferred inorganic sequestering agent is sodium tripolyphosphate, for reasons of availability and economy of use.

[0228] An organic sequestering agent can be substituted for the inorganic sequestering agent. Preferably, however, an inorganic sequestering agent is utilized for economic reasons.

Bleaching Source

[0229] The caustic warewashing pellet may comprise 0-8 wt-% of a bleaching source, preferably 2-6 wt-% for reasons of economy, and most preferably 5 wt-% for reasons of cost effectiveness. Suitable bleaching sources include but are not limited to the following: calcium hypochlorite, lithium hypochlorite, chlorinated sodium phosphate, sodium dichloroisocyanurate dihydrate, potassium dichloroisocyanurate dihydrate, sodium dichloroisocyanurate, and potassium dichloroisocyanurate. Preferably, the bleaching source comprises sodium dichloroisocyanurate dihydrate for reasons of availability and economy.

Filler

[0230] The caustic warewashing pellet may comprise 0-40 wt-% of a filler, preferably 10-30 wt-%, and most preferably 15 wt-% for reasons of cost effectiveness. Suitable fillers include but are not limited to the following: sodium carbonate, sodium silicate, sodium metasilicate, sodium borate, and sodium chloride. Sodium carbonate is the preferred filler for reasons of cost effectiveness and that it provides an additional source of alkalinity.

Organic Sequestering Agent

[0231] The caustic warewashing pellet may also comprise 0-7 wt-% of an organic sequestering agent, preferably 2-5 wt-% for reasons of economy, and most preferably 3 wt-% for reasons of cost effectiveness.

[0232] Suitable organic sequestering agents include but are not limited to the following: citric acid, ethylene diamine tetra acetic acid (EDTA), nitrilotriacetic acid (NTA), polyacrylic acid, copolymers of acrylic acid, copolymers of itacinic acid, organic phosphonates such as amino trimethyl phosphonates, etc..

[0233] Preferred organic sequestering agents include polymeric sequestering agents such as the polyacrylates such as sodium polyacrylates for the reason that in addition to sequestering benefits they have dispersing capabilities which interfere with the crystallization of hardness ions.

Defoaming Surfactant

[0234] The caustic warewashing pellet may comprise 0-5 wt-% of a defoaming surfactant, preferably 1-3 wt-% for reasons of performance, and most preferably 2 wt-% for reasons of cost effectiveness.

[0235] A "defoamer" is a chemical compound with a hydrophobe/hydrophile balance suitable to reducing the stability of protein foam. The hydrophobicity can be provided by an oleophilic portion of the molecule (e.g. and aromatic alkyl or aralkyl group; and oxypropylene unit or oxypropylene chain, or other oxyalkylene functional groups other than oxyethylene, e.g. tetramethylene oxide). The hydrophilicity can be provided with oxyethylene units or chains or blocks and/or ester groups (e.g. organophosphate esters), salt-type groups, or salt-forming groups. Typically, defoamers are nonionic organic surface-active polymers having hydrophobic groups or blocks or chains and hydrophilic ester-groups, blocks, units, or chains, but anionic, cationic, and amphoteric defoamers are known. For a disclosure of nonionic defoaming surfactants, see U.S. Pat. No. 3,048,548, issued Aug. 7, 1962 (Martin et al), U.S. Pat. No. 3,334,147, issued Aug. 1, 1967 (Brunelle et al), and U.S. Pat. No. 3,442,242, issued May 13, 1969 (Rue et al). Phosphate esters are also suitable, e.g. esters of the formula $RO - (PO_3M)_nR$, wherein n is as defined previously and R is an organic group or M (as defined previously), at least one R being an organic group such as oxyalkylene chain.

[0236] Preferably the defoaming surfactant comprises a block polymer of ethylene oxide and propylene oxide such as pluronic 25-R2 available from BASF which has a molecular weight of approximately 2500 and 80% propylene oxide.

Preparation Procedure

[0237] To form the caustic warewashing pellets all ingredients can be dry blended in an appropriate mixer such as a ribbon mixer in order to form a uniform mixture. This mixture is then pelletized to form pellets having a mass of 5 to 15 grams using a pelletizing machine.

Example 5

[0238] The following Example demonstrates the good dissolution rate of a water soluble bag containing a caustic warewashing pelletized functional composition. A water soluble bag having the following dimensions: 30.48 cm (12 inches) length, 19.05 cm (7 1/2 inches) width and a thickness of 3.81×10^{-3} cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A containing 2.26 Kg (5 lbs.) of pellets is inserted into a dispenser.

[0239] The caustic based warewashing pellet composition:

Ingredients		Wt-%
1.	Sodium hydroxide	40
2.	Sodium tripolyphosphate	35
3.	Sodium dichloroisocyanurate dihydrate	5
4.	Sodium carbonate	15
5.	Sodium polyacrylate	mw 1000-5000
6.	Block polymer of ethylene oxide and propylene oxide	mw approximately 2500 80% propylene oxide

[0240] The water soluble bag containing the pellets is contacted with water having a temperature of 57.2-68.3°C (135-155° F.) in order to form a solution. The solution formed is transferred to a 136.38 ℓ (30 gallon) tank containing 113.85 ℓ (25 gallons) of fresh water. By means of an ionic sensor it is determined that it took less than 3 minutes for the tank to reach the desired concentration.

3. PRESOAK COMPOSITION

[0241] The pelletized functional composition may also comprise a presoak composition.

[0242] Various pelletized presoak compositions may be used in the water soluble bag. An example of a pelletized silverware presoak and detarnisher composition which could be used in the water soluble bag is the following:

Pelletized Presoak Composition

[0243]

Raw Material		Wt-% Most Preferred	Wt-% Broad	Wt-% Preferred
1.	Sequestering agent	24	10-34	20-30
2.	Conductive filler	62.74	10-70	50-70
3.	Nonionic surfactant	3.00	1-5	2-4
4.	Anionic surfactant	3.00	1-5	2-4
5.	Water	6.00	1-30	1-10
6.	Enzyme	1.0	0.01-5.0	0.5-2.0
7.	Dye	0.06	0-0.10	0.05-0.07
8.	Fragrance	0.20	0-0.5	0.05-0.3

[0244] The pelletized presoak composition may comprise 10-34 wt-% of a builder or a sequestering agent. Preferably the pelletized presoak composition contains 20-30 wt-% of a builder or sequestering agent and most preferably 24 wt-%. Suitable builders or sequestering agents include but are not limited to the following: sodium tripolyphosphate, EDTA

(ethylene diamine tetra acetic acid), tetrasodium pyrophosphate, zeolites, citric acid, polyacrylates, NTA (nitrilotriacetic acid), and sodium carbonate. Preferably the builder or sequestering agent comprises sodium tripolyphosphate for reasons of water hardness control and cost.

Conductive Filler

[0245] The pelletized presoak composition may also comprise 10-70 wt-% of a conductive filler, preferably 50-70 wt-% for reasons of cost and dispensing control and most preferably 62.74 wt-% for reasons of cost and dispensing control. The conductive filler serves to increase the conductivity of the water which is necessary in order to detarnish silverware. Suitable conductive fillers include but are not limited to the following: soda ash, sodium sulfate, sodium chloride, borax, sodium bicarbonate and sodium sesquicarbonate. Preferably the conductive filler comprises soda ash for reasons of cost, processing and dispensing control.

Nonionic Surfactant

[0246] The pelletized presoak composition may also comprise 1-5 wt-% of a nonionic surfactant, preferably 2-4 wt-% for reasons of wetting, and most preferably 3 wt-% of a nonionic surfactant for reasons of wetting.

[0247] The nonionic surfactant should exhibit good detergency (i.e., it should exhibit foaming properties and good wetting properties).

[0248] Suitable nonionic surfactants include but are not limited to the following: nonyl phenol ethoxylates, and linear alcohol ethoxylates. Preferably the nonionic surfactant comprises ethoxylated nonyl phenol for reasons of optimum wetting of the surface.

Anionic Surfactant

[0249] The pelletized presoak composition may also comprise 1 to 5 wt-% of an anionic surfactant, preferably 2 to 4 wt-%, for reasons of wetting, and most preferably 3 wt-% for reasons of wetting. Suitable anionic surfactants include but are not limited to the following: sulframin, alphaolefinsulfonate, sodium lauryl sulfate. Preferably, the anionic surfactant comprises sulframin for reasons of optimum wetting.

Enzyme

[0250] The pelletized presoak composition may also comprise 0.01 to 5.0 wt-% of an enzyme, preferably 0.5 to 2.0 wt-% for reasons of soil removal and most preferably 1.0 wt-% of an enzyme for reasons of soil removal. Suitable enzymes include but are not limited to the following: esperase, amylase, lipase, and combinations thereof. Esperase serves to break down protein, whereas amylase breaks down starch and lipase breaks down fats. If three enzymes are utilized in the presoak composition, the broad range for each enzyme would range from between 0.1 to 5.0 wt-%. Thus, the presoak can comprise up to 15 wt-% enzyme if three different enzymes are utilized.

Water

[0251] The pelletized presoak composition may also comprise 1-30 wt-% water, preferably 1-10 wt-% for reasons of dispensing control and cost, and most preferably 6.0 wt-% water for reasons of dispensing control and cost. Water helps aid in the pelletization process and also acts as a filler.

Dye

[0252] The pelletized presoak composition may also comprise 0 to 0.10 wt-% of a dye, preferably 0.05 to 0.07 wt-% for reasons of aesthetics, and most preferably 0.06 wt-% for reasons of aesthetics. Suitable dyes include any dye stable at pH's of above 10.

Fragrance

[0253] The pelletized presoak composition may also comprise 0 to 0.5 wt-% of a fragrance, preferably 0.05 to 3 wt-%, for reasons of aesthetics, and most preferably 0.20 wt-% for reasons of aesthetics. Suitable fragrances include any that are compatible in the overall system.

[0254] The pelletized presoak composition can be formed by either batch or continuous processing. The pelletized presoak composition can be manufactured according to the following procedure.

Presoak Pellet Preparation

[0255] The pelletized presoak composition can be formed by either batch or continuous processing. The following is an example of a batch production process. 25 wt-% of a dry, powdered or granular sequestering agent or builder (sodium tripolyphosphate) is charged to a 45.35 Kg (100 lb.) mix tank and agitation is begun. A dye is then dissolved in 4 wt-% water and sprayed onto the sodium tripolyphosphate while agitation continues until a uniform color is achieved.

[0256] Next, a conductive filler (soda ash), a nonionic surfactant (nonylphenol ethoxylate, 9.5 ethylene oxide units) an anionic surfactant (sulframin), a fragrance and an enzyme (esperase) are added in that order to the mix tank while agitation continues, resulting in the formation of a premixed product.

[0257] The premixed product is fed to a Model 25CS9 pelletizer manufactured by Strong-Scott which is equipped with a double roll and a vertical screw. The screw serves to force the premixed product between the rolls. The rolls rotate at about 15 r.p.m. and form pellets at a rate of about 453.5 Kg (1,000 lbs.) of pellets per hour. The hydraulic pressure is set at 1.517×10^7 Pa (2,200 psig.) Pellets formed at the pelletizer drop onto a 7.62 cm (3'') diameter screener equipped with a 1.27 cm (1/2'') mesh screen. The screen serves to deburr the pellets. Fines are recycled back to the mixer. The finished pellet product is collected and packaged.

Example 6

[0258] The following Example demonstrates the good dissolution rate of a water soluble bag containing a pelletized presoak functional composition. A water soluble bag having the following dimensions: 35.56 cm (14 inches) length, 19.05 cm (7 1/2 inches) width and a thickness of 3.81×10^{-3} cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A containing 2.26 Kg (5 lbs.) of pellets is inserted into a dispenser.

Ingredients		Wt-%
1.	Sodium tripolyphosphate	24
2.	Soda ash	62.74
3.	Nonyl phenol ethoxylate. having 9.5 moles of ethoxylate	3.00
4.	Sulframin	3.00
5.	Water	6.00
6.	Esperase	1.00
7.	Dye	0.06
8.	Fragrance	0.20

[0259] The water soluble bag containing the pellets is contacted with water having a temperature of 57.2-68.3°C (135-155° F.) in order to form a solution. The solution formed is transferred to a 136.38 (30 gallon) tank containing 113.65 (25 gallons) of fresh water. By means of an ionic sensor it is determined that it took less than 3 minutes for the tank to reach the desired concentration.

4. GENERAL PURPOSE FLOOR AND WALL CLEANER AND MANUAL DISHWASHING PELLET

[0260] The following general purpose floor and wall cleaner and manual dishwashing pellet can be used in the water soluble bag.

Raw Material		Broad	Preferred
1.	Filler	0-85	5-35 (2 parts anionic surfactant to 1 part nonionic surfactant)
2.	Anionic surfactant	5-75	
3.	Nonionic surfactant	0-30	
4.	Low alkaline corrosion inhibitor	0-5	
5.	Dye	0-1	
6.	Fragrance	0-1	

Filler

[0261] The general purpose pellet can comprise 0-85 wt-% of a filler. Suitable fillers include but are not limited to the

following: sodium sulfate, sodium chloride, and other neutral soluble salts. Preferably the filler is sodium sulfate for reasons of minimizing corrosion to soft metals.

Anionic Surfactant

[0262] The general purpose pellet can comprise 5-70 wt-% of an anionic surfactant, preferably 5-35 wt-% for reasons of cost and performance. Suitable anionic surfactants include but are not limited to the following: linear dodecyl benzene sulfonate, alcohol ethoxy sulfates, alkano sulfonates, alkali and alkaline earth salts. A high concentration of anionic surfactant results in a pellet which can be pelletized easier and also a pellet which performs better when dissolved in water. However, a low concentration of anionic surfactant results in a pellet that is more inexpensive.

Nonionic Surfactant

[0263] The general purpose pellet comprises can comprise 0-30 wt-% of a nonionic surfactant. Preferably the non-ionic surfactant is included in an amount such that about 1 part nonionic surfactant is included for about every 2 parts of anionic surfactant. Suitable nonionic surfactants include but are not limited to the following: fatty acid amides, ethylene oxide, and/or propylene oxide adducts of alcohols.

Corrosion Inhibitor

[0264] The general purpose pellet may also comprise 0 to 5 wt-% of a corrosion inhibitor such as a low alkaline silicate such as sodium silicate or potassium silicate, preferably sodium silicate. Preferably the ratio of $M_2O:SiO_2$ is less than 1:1.

[0265] Optional ingredients include 0-1 wt-% of a dye and 0-1 wt-% of a fragrance.

[0266] The general purpose pellets are formed by conventional high-pressure pellet production methods. Such methods involve combining granular or powdered anhydrous materials, mixing them to form a premixed product and then transferring the premixed product to a pelletizer.

[0267] Optional ingredients include 0-3 wt-% of an emollient 1 0-10 wt-% of an organic sequestering agent and 0-30 wt-% of an inorganic sequestering agent. Another optional is a flow agent.

Example 7

[0268] The following Example demonstrates the good dissolution rate of a water soluble bag containing a pelletized general purpose functional composition. A water soluble bag having the following dimensions: 30.48 cm (12 inches) length, 19.05 cm (7 1/2 inches) width and a thickness of 3.81×10^{-3} cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A containing 1.81 Kg (4 lbs.) of pellets was inserted into a dispenser.

[0269] The pellets had the following composition:

Ingredients		Wt-%
1.	Sodium sulfate	82.4
2.	Linear dodecyl benzene sulfonate	14.7
3.	Low alkaline sodium silicate	1.0
4.	Dye	.0075
5.	Diatomaceous Earth - (flow agent)	1.0
6.	Emollient	.3925
7.	Sodium polyacrylate	.5

[0270] The water soluble bag containing the pellets was contacted with water having a temperature of 57.2-68.3°C (135-155°F.) in order to form a solution. The solution thus formed was transferred to a 136.38 ℓ - (30 gallon) tank containing 113.65 ℓ (25 gallons) of fresh water. By means of an ionic sensor it was determined that it took less than 3 minutes and 10 seconds for the tank to reach the desired concentration.

5. HARD SURFACE CLEANER PELLETS

[0271] The following pelletized hard surface cleaner can be used in the water soluble bag.

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Ingredient		Preferred wt-%	Broad Range Wt-%
1.	Buffering agent	15.0	12.0-18.0
2.	Alkalinity & Ammonium Source	10.0	8.0-12.0
3.	Alkalinity Source	10.0	8.0-12.0
4.	Inorganic Sequestering Agent	15.0	12.0-18.0
5.	Anionic Surfactant	25.0	22.0-28.0
6.	Nonionic Surtactant	15.0	12.0-18.0
7.	Organic Sequestering Agent	10.0	8.0-12.0

[0272] The pelletized hard surface can comprise 12.0 - 18.0 wt-% of a buffering agent, preferably 15.0 suitable buffering agents include but are not limited to the following: sodium bicarbonate, mixtures of sodium bicarbonate and sodium carbonate, disodium phosphate, trisodium phosphate, monosodium phosphate, mixtures of disodium phosphate and trisodium phosphate, borates such as sodium tetra borate and borax, and combinations of carbonates and phosphates. Suitable combinations of carbonates and phosphates have a weight ratio about 1:1 resulting in a pH of 9-10.

[0273] A preferred buffering agent comprises sodium bicarbonate.

[0274] The pelletized hard surface cleaner can comprise 8.0-12.0 wt-% of an alkalinity and ammonium source, preferably 10.0 wt-%. Suitable sources include but are not limited to the following: ammonium bicarbonate, ammonium phosphate, diammonium phosphate, a mixture of ammonium chloride and sodium carbonate and other sources capable of forming ammonium ions in solution.

[0275] The alkalinity and ammonium source provides a source of mild alkalinity and also serves as a source of ammonia which increases customer satisfaction.

[0276] The composition can also comprise 8.0-12.0 wt-% of an alkalinity source, preferably 10.0 wt-% suitable alkalinity sources include but are not limited to the following: soda ash (sodium carbonate), trisodium phosphate, borax, alkali metal silicates, etc.

[0277] The composition can also comprise 12.0-18.0 wt-% of an inorganic sequestering agent preferably 15.0 wt-%. Suitable sequestering agents include but are not limited to those set forth as being suitable for use in the laundry detergent pellet.

[0278] Preferably the sequestering agent comprises a low density sodium tripolyphosphate bead. A bead is preferred over a powder in that it can be crushed which results in a stronger nonfriable pellet.

[0279] Organic sequestering agents can be substituted for the inorganic sequestering agent.

[0280] The pelletized hard surface cleaner can also comprise 22.0-28.0 wt-% of an anionic surfactant, preferably about 25 wt-%. Suitable anionic surfactants include but are not limited to the following: sodium dodecyl benzene sulfonate, sodium lauryl sulfate and other anionic surfactants which result in a pellet that is non pasty.

[0281] Preferably the anionic surfactant comprises sodium dodecyl benzene sulfonate for cost reasons.

[0282] The pelletized hard surface cleaner can also comprise 22.0-28.0 wt-% of a nonionic surfactant preferably 15.0 wt-%. Such nonionic surfactants should be high foaming. Suitable nonionic surfactants include but are not limited to the following: fatty alcohol ethoxylates which are the reaction products of alkyl phenols such as nonyl phenol and octyl phenol with ethylene oxide.

[0283] The preferred nonionic surfactants include octyl and nonyl phenol with 7-10 moles ethylene oxide.

[0284] The pelletized hard surface cleaner can also comprise 8.0-12.0 wt-% of an organic sequestering agent, preferably 10.0 wt-%.

[0285] Preferably the organic sequestering agent comprises tetra sodium ethylene diamine tetra acetate.

Example 8

[0286] The following Example demonstrates the good dissolution rate of a water soluble bag containing a pelletized hard surface cleaner functional composition. A water soluble bag having the following dimensions: 35.56 cm (14 inches) length, 19.05 cm (7 1/2 inches) width and a thickness of 3.81×10^{-3} cm (1.5 mils) and comprising a polyvinyl alcohol film bag purchased from Chris Craft Industries, Inc. having the properties set forth in Table A containing 2.26 Kg (5 lbs.) of pellets 13 are inserted into a dispenser.

Ingredients		Wt-%
1.	Sodium Bicarbonate	15.0

(continued)

Ingredients		Wt-%
2.	Ammonium Bicarbonate	10.0
3.	Light Density Soda Ash	10.0
4.	Low Density Sodium Tripoly phosphate	15.0
5.	Sodium Dodecyl benzene sulfonate -90% flake	25.0
6.	Polyoxyethylated alcohol	15.0
7.	Tetrasodium ethylene diamine tetraacetate	10.0

[0287] The water soluble bag containing the pellets is contacted with water having a temperatures of 57.2-68.3°C (135-155° F.) in order to form a solution. The solution formed is transferred to a 136.38 ℓ (30 gallon) tank containing 113.65 ℓ (25 gallons) of fresh water. By means of an ionic sensor it is determined that it takes less than 3 minutes for the tank to reach the desired concentration.

[0288] Other modifications of the invention will be apparent to those skilled in the art in light of the foregoing description. This description is intended to provide specific examples of individual embodiments which clearly disclose the present invention. Accordingly, the invention is not limited to these embodiments or the use of elements having specific configurations and shapes as presented herein. All alternative modifications and variations of the present invention which follows in the spirit and broad scope of the appended claims are included.

Claims

1. A method of dispensing functional material from a dispenser by directing water onto an article contained in said dispenser in order to form a concentrate and directing said concentrate to a use location wherein said article comprises:

(a) a sealed water soluble container, and

(b) an institutional multiple use amount of at least 200 grams of a pelletized, water soluble or dispersible functional composition, comprising:

(i) 5- 90 wt-% of an alkali metal silicate; and

(ii) 1- 90 wt-% of a sequestering agent.

2. A method for delivering an aqueous alkaline wash chemical, the method comprising:

(a) placing into a dispensing device an article comprising:

(i) a container comprising a sealed, water soluble film; and

(ii) an institutional multiple use amount of at least 200 grams of a pelletized, water soluble or dispersible wash chemical comprising a silicate, an alkali metal hydroxide or mixtures thereof contained within the container;

(b) directing water onto the article contained within the dispenser to open and to dissolve the film and to form a supply of an alkaline wash concentrate; and

(c) directing the supply of alkaline wash concentrate from the dispenser.

3. A method of dispensing multiple volumes of an aqueous solution of a wash chemical from a dispenser comprising the steps of:

(a) depositing a sealed water soluble article containing a wash chemical into said dispenser;

(b) repeatedly directing water onto an article contained in said dispenser in response to a concentration monitoring device in order to form a concentrate; and

(c) repeatedly directing said concentrate to a use location wherein said article comprises;

(i) a sealed water soluble container made of a flexible film, and

(ii) an institutional multiple use amount of at least 200 grams of a pelletized water soluble or dispersible

wash chemical comprising a silicate, an alkaline metal hydroxide or mixtures thereof contained within said sealed water soluble container made of a flexible film.

Patentansprüche

1. Verfahren zum Abgeben eines funktionellen Materials aus einem Spender, bei dem Wasser auf einen in dem Spender enthaltenen Artikel gerichtet wird, um ein Konzentrat zu bilden und dieses Konzentrat auf den Ort der Verwendung gerichtet wird, wobei der Artikel folgende Bestandteile aufweist:

- a) einen versiegelten, wasserlöslichen Behälter; und
- b) eine für den institutionellen Bereich für mehrere Anwendungen reichende Menge von mindestens 200g einer pelletisierten, wasserlöslichen oder -dispergierbaren funktionellen Zusammensetzung, mit:

- (i) 5 - 90 Gew.-% eines Alkalimetallsilikats; und
- (ii) 1 - 90 Gew.-% eines Maskierungsmittels.

2. Verfahren zur Freisetzung einer wässrigen alkalischen Waschchemikalie, wobei das Verfahren folgende Schritte umfasst:

- a) Einsetzen eines Artikels in eine Spendervorrichtung mit:

- (i) einem Behälter mit einer versiegelten, wasserlöslichen Folie; und
- (ii) einer für den institutionellen Bereich für mehrere Anwendungen reichende Menge von mindestens 200g einer pelletisierten wasserlöslichen oder -dispergierbaren Waschchemikalie, die ein Silikat, ein Alkalimetallhydroxid oder Mischungen daraus umfasst und in dem Behälter enthalten ist;

- b) Ausrichten von Wasser auf den im Spender enthaltenden Artikel, um die Folie zu öffnen und aufzulösen und einen Vorrat an einem alkalischen Waschkonzentrat zu bilden; und

- c) Herauslassen des Vorrats an dem alkalischen Waschkonzentrat aus dem Spender.

3. Verfahren zum Abgeben mehrerer Volumen einer wässrigen Lösung aus einer Waschchemikalie von einem Spender, mit folgenden Schritten:

- a) Einsetzen eines eine Waschchemikalie enthaltenden versiegelten wasserlöslichen Artikels in den Spender;
- b) wiederholtes Ausrichten von Wasser auf einen in dem Spender enthaltenen Artikel in Verbindung mit einer Vorrichtung zur Überwachung der Konzentration, um auf diese Weise ein Konzentrat zu bilden; und
- c) wiederholte Abgabe des Konzentrates zu einem Ort der Verwendung, wobei der Artikel folgende Bestandteile aufweist:

- (i) einen versiegelten wasserlöslichen Behälter aus einer flexiblen Folie, und
- (ii) eine für den institutionellen Bereich für mehrere Anwendungen reichende Menge von mindestens 200g einer pelletisierten wasserlöslichen oder -dispergierbaren Waschchemikalie, die ein Silikat, ein Alkalimetallhydroxid oder Mischungen daraus aufweist und in dem versiegelten wasserlöslichen Behälter aus einer flexiblen Folie enthalten ist.

Revendications

1. Procédé de distribution d'une substance active à partir d'un distributeur, en dirigeant de l'eau sur un article contenu dans ledit distributeur, afin de former un concentré et de diriger ledit concentré vers un point d'utilisation, ledit article comprenant:

- a) un conteneur hermétique hydrosoluble; et
- b) une quantité industrielle utilisable en plusieurs fois d'au moins 200 grammes d'une composition active granulée soluble ou dispersible dans l'eau comprenant:

- (i) 5 à 90 % en poids d'un silicate de métal alcalin; et

(ii) 1 à 90 % en poids d'un agent séquestrant.

2. Procédé destiné à déverser un produit chimique lavant, aqueux et alcalin, ledit procédé comprenant les étapes consistant à:

a) placer à l'intérieur d'un appareil de distribution un article comprenant:

(i) un conteneur constitué d'une pellicule hermétique, hydrosoluble; et

(ii) une quantité industrielle utilisable en plusieurs fois d'au moins 200 grammes d'un produit chimique lavant granulé soluble ou dispersible dans l'eau comprenant un silicate, un hydroxyde de métal alcalin ou des mélanges de ceux-ci, contenus à l'intérieur du conteneur;

b) diriger de l'eau sur l'article contenu dans le distributeur afin de percer et de dissoudre la pellicule, et de constituer une alimentation en concentré lavant alcalin; et

c) diriger l'alimentation en concentré lavant alcalin depuis le distributeur.

3. Procédé destiné à distribuer des volumes multiples d'une solution aqueuse d'un produit chimique lavant depuis un distributeur, et comprenant les étapes consistant à:

a) déposer dans ledit distributeur un article hermétique hydrosoluble contenant un produit chimique lavant;

b) diriger de manière répétée de l'eau sur un article contenu dans ledit distributeur en réponse à un appareil de contrôle de la concentration, afin de former un concentré; et

c) diriger de manière répétée ledit concentré vers un point d'utilisation, ledit article comprenant

(i) un conteneur hermétique hydrosoluble formé par une pellicule souple, et

(ii) une quantité industrielle utilisable en plusieurs fois d'au moins 200 grammes d'un produit chimique lavant, granulé soluble ou dispersible dans l'eau, comprenant un silicate, un hydroxyde de métal alcalin ou des mélanges de ceux-ci, contenu à l'intérieur dudit conteneur hermétique hydrosoluble formé par une pellicule souple.

FIG. 1

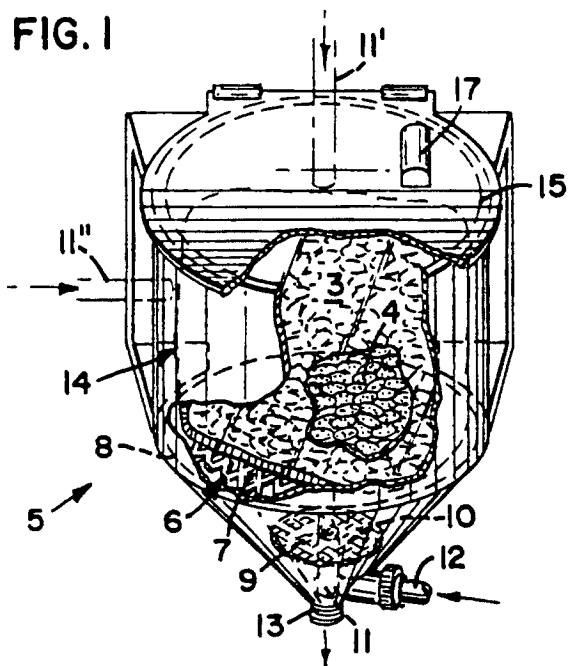


FIG. 2

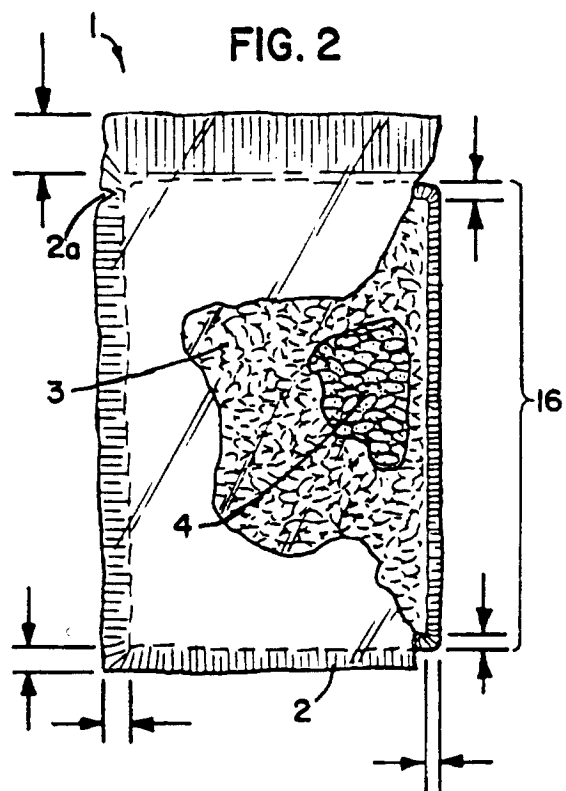


FIG. 3

