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[54] DIAZO COPYING MACHINE ROLL CLEANER PACKAGE

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[58] **Field of Search** .....206/84, 47 A, 47 R; 215/6; 252/90, 99

[56] **References Cited**

UNITED STATES PATENTS

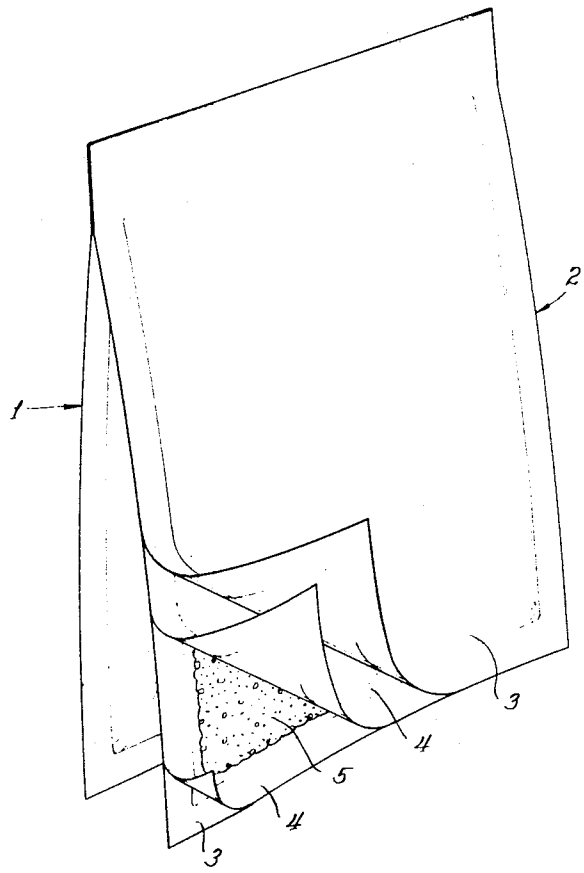
3,528,921	9/1970	Gray	252/99
3,198,740	8/1965	Dunlop, Jr. et al.	252/90
3,462,070	8/1969	Corella	206/47 A
3,012,695	12/1961	Lerner	206/47 A

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Attorney—Darbo, Robertson & Vandenburgh

[57] **ABSTRACT**

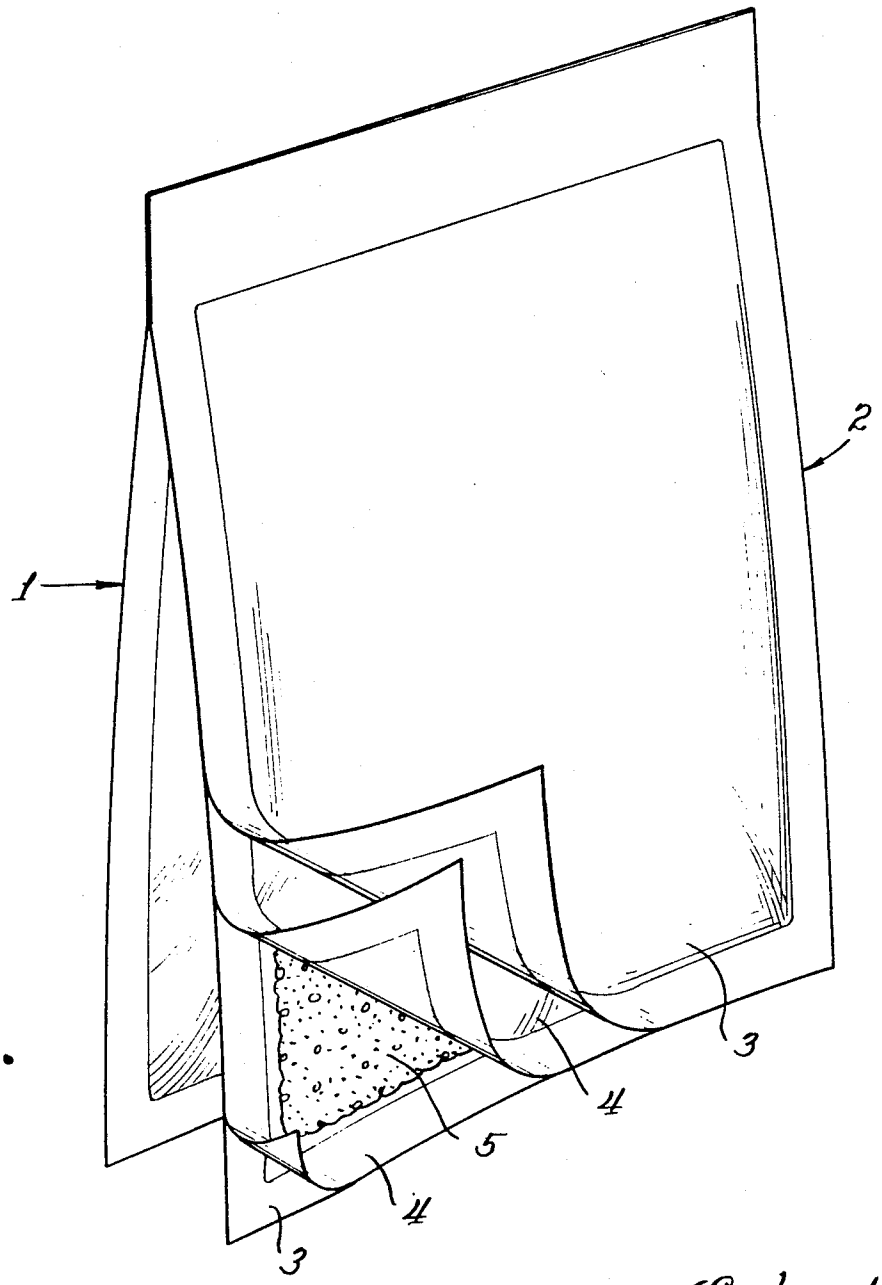
An aqueous cleaner for restoring synthetic rubber squeegee roll comprising critical levels of anionic surfactant, nonionic surfactant, water-soluble wax solvent, and halogen-containing oxidizing agent. A novel, dry, i.e., free-flowing, mixture which is readily packaged in commercial equipment, and which is storage stable for prolonged periods of time is provided for solution in water to provide the cleaning medium.

3 Claims, 1 Drawing Figure



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DIAZO COPYING MACHINE ROLL CLEANER PACKAGE

BACKGROUND OF THE INVENTION

In the moist diazo copying process, the image to be copied (from a translucent page) is placed face to face with another sheet of paper called a copy page. The other sheet, or copy page, is filled with diazonium compound. The two sheets are held together by moving belts which transport them to a source of ultraviolet light. The light decomposes the diazonium compound in the translucent nonimage areas; the opaque image blocks the ultraviolet light and prevents "burnout" of the diazonium compound in the image areas. After burnout, the original is returned, while the copy page, containing the remaining diazonium compound, is treated with an alkaline solution of a dye coupler to "couple" the diazonium compound into a permanent, visible image of the original.

The developer solution is contained within a trough and reservoir in the copying machine. The sensitized copy page is immersed into the liquid developer by means of:

1. developer pickup roll (hard plastic),
2. applicator roll (hard plastic), and
3. two soft, synthetic rubber, squeegee rolls which remove excess developer from the paper, and return excess to the trough. (A heavy pressure roll applies extra weight to the squeegee rolls.)

Typical large diazo copying machines are rheostat controlled to operate at speeds ranging from 10 to 75 feet per minute. One of the reasons for the variable speed control is the need to permit an operator to vary the speed depending on whether the produced copies are damp or dry.

Increased output could be achieved, of course, if the machine could be operated at or near the maximum, namely, 75 feet per minute. However at that speed;

1. The squeegee rolls do not have sufficient time to "dig in" and remove excess developer liquid, and
2. The air-drying fan does not have time to dry out the copy because of the excess developer liquid. As a result, a wet, messy copy tends to be delivered at the 75 feet/minute rate.

New squeegee rolls are relatively soft and porous. When new squeegee rolls are used, a satisfactory operating speed of about 40 feet/minute is attainable. Faster than 40 feet/minute would deliver wet copy. Recommended top operating speed with new rolls is typically about 30 feet/minute.

At speeds below 10 feet/minute, the air fan has plenty of time to dry out the copy. However the copy sheet has been in contact with the developer liquid for such a long time that the paper is saturated, and even when dry, the copy sheet is typically wrinkled.

In normal usage, thousands upon thousands of pieces of diazonium-coated papers may be "run" in a week. Particles of dirt, wax, latex, dried diazonium salt, oxidation products, cellulose fibers, water scale and the like become embedded in the porous squeegee rolls and make them hard and not resilient. After about a week these rolls begin to feel like typewriter rolls that are several years old.

In this condition they no longer have the original ability to squeegee off the desired quantity of developer solution. The weight of developer solution now left on the copy sheet will be excessive and the copies will invariably be slightly damp even after passing through the drying section. In this condition the rolls now need cleaning to remove the hard impregnation. A typical roll cleaning procedure recommended by a national equipment manufacturer is as follows:

1. Drain developer solution.
2. Remove excess developer solution.
3. Rinse with tap water while machine is operating.
4. Drain rinse water.
5. Add cleaning solution.
6. Operate machine with cleaner for 20 minutes at 30 feet/minute rate or faster, without paper, unless foaming develops.
7. Drain cleaner and discard.
8. Remove excess cleaner.

9. Rinse with tap water while machine is operating.
10. Drain rinse water and wipe rollers and trough dry.

In step 6, the cleaning solution is carried, in most machines, from the trough to the squeegee rolls by way of a transfer roll, or rolls. If the squeegee rolls are not wet by the cleaning solution in normal operation of a particular machine, they should be removed therefrom and immersed in the cleaning solution for cleaning.

Various test procedures have been suggested to determine the effectiveness of the squeegee rolls. The same test procedure, employed before and after a roll is cleaned, gives an indication of the effectiveness of the roll-cleaning treatment.

A test procedure used by one large diazo copying machine manufacturer to determine the effectiveness of roll cleaners is based on the weight of developer solution left on the copy paper before cleaning of the roll as compared to the weight left on the copy paper after cleaning of the roll with that cleaner at the normal recommended 30 feet/minute machine speed.

In order to judge the effectiveness of a cleaner, the test procedure is followed before, and after the rolls are cleaned. In accordance with a typical test procedure, therefore, a diazonium-bearing copy sheet is burned out in the ultraviolet section on the machine, but "caught" just before it enters the developer solution. The sheet is weighed to the nearest 0.01 gram. One 8½×11 inches sheet of this paper will usually weigh approximately 7.3 to 7.6 grams. This weight is recorded as "-before-dry." That weighed sheet is then "fed" into the series of applicator-squeegee rolls where the developer liquid is first applied and subsequently removed. The "cleaned" sheet is again caught, this time just before it enters the drying-fan section, and is reweighed immediately. This weight is recorded as "before-wet." The difference in weight is the weight of the developer solution remaining after the squeegee roll treatment. With new squeegee rolls at 30 feet/minute the added weight will range between 1.10 and 1.30 grams; and this is the typical specification for the effectiveness of new rolls at that speed. When the weight of developer solution remaining on the copy page after squeegee roll is between 1.60 and 1.90, the rolls need to be recleaned; the finished copy will be damp.

In theory, cleaning of new rolls should bring the rolls back within the specification effectiveness of 1.10 to 1.30 grams added weight prior to drying. In practice the cleaners previously used will produce apparently desirable results for approximately six to 10 weekly cleanings. However, since the "life" of the roll between cleanings is increasingly shortened, each weekly cleaning has been less effective than the previous cleaning. This has become progressively worse until, perhaps after the 10th or 12th weekly cleaning, 1.6 to 1.9 grams remain on the copy page even when freshly cleaned squeegee rolls are used. Thus, in this condition, prints are damp even after roll cleaning.

This problem has been encountered for approximately ten years and a large number of cleaning solutions have been suggested for use in restoring the diazo machine squeegee rollers. Nonetheless, none of the solutions heretofore suggested have been satisfactory. The recommended procedures usually involved the mixing of "messy" chemicals, a task shunned by well groomed secretaries. Inadvertent spills of strong bleach solutions frequently left dresses, shirts or hose full of holes. In spite of the regular cleaning procedures, a leading manufacturer and servicer of diazo copy equipment routinely sent a service van periodically to customers to remove squeegee rolls with "uncleanable" buildup from the machine, replacing the removed rolls with new or refurbished rolls. The "uncleanable" rolls were returned to the factory, where the outermost surface of the roll was removed in a lathe by abrasion, the "rebuilt" roll then being used to replace another, no longer cleanable, roll in a customer's machine.

It is an object of this invention to provide a cleaning medium which not only cleans the diazo squeegee roll, but moreover eliminates the heretofore incurable buildup of unknown factors which "irreversably" diminished the effective-

ness of the squeegee rolls. It is also an object of this invention to provide a cleaning solution which does not require the use of relatively dangerous concentrations of bleach or other halogen source. It is also an object of this invention to provide a dry free-flowing storage stable mixture which can be conveniently packaged using conventional packaging equipment, and which can be readily dissolved in tap water to provide the highly effective squeegee roll-restoring medium.

SUMMARY OF THE INVENTION

The above objects, and other objects which will be apparent hereinafter, are achieved in accordance with this invention by a cleaning mixture comprising critical levels of anionic surfactant, nonionic surfactant, water-soluble wax solvent, alkali metal phosphates, and halogen-type oxidizing agents.

DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing illustrates the two-compartment package embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In accordance with this invention, diazo copy equipment squeegee rollers are effectively cleaned with no detectable uncleanable buildup, using conventional cleaning procedure as outlined above, but using a cleaning medium as defined in Table I. The numbers set forth in Table I refer to weight percent of the particular ingredients, based on the weight of the aqueous solution.

TABLE I

In Aqueous Solution:	Weight Percent Range	Preferred
Anionic surfactant	0.002–0.060	0.030
Nonionic surfactant	0.001–0.020	0.010
Inorganic alkali metal phosphates	1.0–10.0	8.0
Water soluble wax solvent	0.8–2.0	1.5
Halogen-containing oxidizing agent to provide % as available chlorine	1.25–7.5	2.0

Balance = Water: note; compatible dissolved diluents may also be present.

One embodiment of this invention contemplates the use of a free-flowing powder which does not include the oxidizing agent and which can be conveniently packaged in commercial equipment. This powder can be dissolved in conventional household bleach, or dilutions such as 1:1 dilutions of the conventional household bleach and water to provide the novel cleaning medium of this invention. As set forth above, however, the handling of bleach solutions by well-groomed secretaries is generally considered not only distasteful, but moreover is considered hazardous to the clothing. Nonetheless, this embodiment is set forth in detail herein inasmuch as this embodiment constitutes a substantial advance over the procedure of the prior art as measured by cleaning effectiveness. The dry, i.e., free-flowing, powder is prepared by admixing the ingredients set forth in Table II.

TABLE II

Ingredient	Weight Percent Range
Anionic surfactant	0.02–0.60
Nonionic surfactant	0.01–0.2
Water soluble Wax solvent	8–20%
Alkali metal phosphate	5–75%
Balance water-soluble powder liquid-absorbent	

The mixture set forth in Table II is preferably packaged, in accordance with this invention, in a packet, e.g., plastic lined aluminum foil, to provide approximately 100 grams of the mixture per packet. The packaged material is storage stable, conveniently shipped, occupies little storage space, and is readily soluble in bleach or diluted bleach. Thus, in accordance with this invention, the 100-gram packet described above is opened and the contents emptied into approximately 1 liter of household type liquid bleach, or 1-1 diluted bleach to provide the aqueous cleaning medium. When using the cleaning procedures as outlined above the resulting aqueous solution is highly effective, and the "incurable buildup" observed on diazo machine squeegee rolls with prior art cleaners is not encountered.

In a more preferred embodiment of this invention, however, the chlorine-containing component is provided as a free-flowing solid in a separate package. Thus, it is unnecessary that bleach solutions be stored or maintained in inventory. All the ingredients of the cleaning medium are provided in dry, i.e., free-flowing powder form more preferably packaged in preweighed quantities so that the medium is prepared by simply dissolving the contents of the two preweighed packages in tap water. In the most preferred embodiment the concentration of the halogen-type oxidizing agent is sufficiently low to provide greatly reduced risk of fabric damage caused by inadvertent spills of the cleaning medium.

In this embodiment two separated, distinct, dry, i.e., free-flowing, mixes are utilized. One of the mixes includes the solid, halogen-containing oxidizing agent, and the other mix includes the surfactant and wax solvent and the two mixes are packaged in separate containers. In a preferred embodiment, preweighed quantities of each of the mixes are packaged in plastic lined aluminum foil packets. As shown in the drawing, each packet **1** and **2** comprises a bag made from aluminum foil **3** lined with plastic **4** and containing one of the mixes **5**. One packet of each mix is then attached to one packet of the other mix along the tops thereof to provide a product, i.e., an article of manufacture, which includes all of the ingredients necessary to be dissolved in a specified quantity of tap water to conveniently provide a highly effective cleaning medium in accordance with this invention. The resulting packaged product has been found to be storage stable and completely effective even after storage in excess of 1 year. Moreover inasmuch as the mixes are dry, i.e., free flowing, highly concentrated, it is unnecessary to ship or store voluminous quantities of aqueous solutions in order to provide a given quantity of cleaning medium.

In accordance with a preferred, two-package, embodiment of this invention, mixtures are prepared as set forth in Table III.

TABLE III

Package A (100 g./l.)	Weight Percent Range	Preferred
1. Sodium carbonate	20–75	25.0
2. Sodium tripolyphosphate	10–90	44.6
3. Dodecyl diphenyl oxide sulfonate, sodium salt	0.2–0.6	0.3
4. Ethylene oxide polymer	0.01–0.20	0.1
5. Ethylene glycol n-butyl ether	8–20	15.0
6. Tetra potassium pyrophosphate	5–45	15.0
Package B (75 g./l.)		
1. Sodium metasilicate	0–5	1.0
2. Sodium tripolyphosphate	0.5–78.5	54.0
3. Potassium dichloro isocyanurate (59 % available chlorine)	27–99.5	45.0

In reference to the levels stated in the preferred embodiment in Table III, ingredient levels ±15 percent of the preferred level set forth in Table III, are also considered preferred.

DISCUSSION OF INGREDIENTS

In the embodiment set forth above in which sodium carbonate is included it should be noted that the sodium carbonate is merely a filler or carrier in the sense that it assists in providing free flowing character to the ingredients. A preferred commercially available form of sodium carbonate is "Flozan" (T.M. Diamond Alkali). This form has extremely high porosity and absorbancy.

The inorganic alkali metal phosphate used in accordance with this invention can include any of the soluble alkali metal phosphates conventionally used in the preparation of conventional cleaning solutions. Sodium tripolyphosphate, trisodium phosphate, and tetrasodium pyrophosphate, for example, are useful, widely available conventionally used cleaner ingredients.

The preferred anionic surfactant used in accordance with this invention is dodecyl diphenyl oxide sulfonate, sodium salt. However, generally speaking, any anionic surfactant may be used in accordance with this invention, particularly the alkylayrl sulfonates, more preferably the alkali metal salts thereof. A preferred anionic surfactant for use in accordance with this invention is commercially available as "Benax 2Al" (90 percent) (T.M. of Dow Chemical).

The nonionic surfactant used in accordance with this invention may include any of the conventional nonionic surfactants. However, a preferred nonionic surfactant for use in accordance with this invention has the generic formula

$$R - (CH_2 - CH_2 - O)_n - H,$$

wherein R is hydrogen, phenyl, alkoxy, and hydroxyalkoxy, and wherein n is the numeral 5 to 14 inclusive. These ethylene oxide adducts of benzene are widely available commercially, for example as DN-65 (T.M. Rohm and Haas). It should be emphasized that no cationic surfactant can be used in the cleaner. Thus, for example vinyl benzyl dimethyl ammonium chloride, or other cationic surfactant actually interferes with the cleaning, and leads to an undesirable, and unacceptable result.

The preferred halogen-containing oxidizing agents for use in accordance with this invention include the alkali metal hypohalite, e.g., aqueous sodium hypochlorite solutions, commonly available as household bleach or as chlorinated trisodium phosphate, and also includes the polyhalogen isocyanurates. As indicated above the sodium hypohalites are widely available as household bleaches and solution of these bleaches 1:1 with water in order to reduce the hazard, i.e., fabric-damaging concentration, is preferred. The use of polyhalogen isocyanurates, in otherwise free-flowing dry mixes is preferred, however, since this avoids the need for storage of aqueous alkali metal hypohalite solutions. Such materials are widely available in commerce, for example, as chlorinated trisodium phosphate, or as chlorinated cyanurates, such as ACL-59, ACL-85, ACL-90 (T.M. Monsanto Chemical), or as CDB-59, etc., (T.M. FMC Corporation).

The use of sodium metasilicate is preferred; however, any inorganic water-soluble dessicant can be used in its place in the two-package mix.

Also, the use of at least some tetrapotassium pyrophosphate is preferred as a portion of the alkali metal phosphate inasmuch as this ingredient dissolves extremely rapidly in water, and moreover serves as a dessicant for the mixture.

Tests using experimental mixtures in which peroxide-type oxidizing agents are used in place of the halogen-containing oxidizing agents, proved that the halogen-type oxidizing agents were essential, and that the use of the peroxide-type oxidizing agent would not provide the beneficial results of the mixtures of this invention.

The preferred water soluble wax solvent for use in accordance with this invention is the ethylene glycol n-butyl ether. This material is a liquid which is infinitely soluble in water. Alternatively, any polyalkylene glycol alkyl ethers can be used providing the material is a water soluble wax solvent. Examples of commercially available water-soluble wax solvents suitable for use in accordance with this invention are Dowanol EB (T.M. Dow Chemical), Polysolv EB (T.M. Union Carbide), Butyl-Cellosolve (T.M. Dupont). Experimental mixtures in which the water-soluble wax solvents were omitted proved that the water-soluble wax solvents must be present in accordance with this invention.

In the manufacture of the free-flowing powder mixes of this invention it should be noted that the ingredients need not be limited to those set forth above, and other water soluble ingredients can be included. However it is considered highly desirable that any organic material be excluded from the mix containing the halogen-type oxidizing agent.

ACHIEVEMENT

A leading manufacturer and servicer of diazo copy equipment recently adopted the mixtures of this invention for use in their recommended cleaning procedures. As a consequence of this development, the manufacturer was able to discontinue providing the service of replacing rolls. Use of the cleaning medium of this invention eliminates the heretofore troublesome problem of "incurable buildup" of unknown factors on the squeegee roll which caused the rolls to become hard and ineffective. Also, the low oxidizing agent levels in the preferred embodiments of this invention provide solutions which are relatively noninjurious to most fabrics. The great convenience of merely adding the contents of a package to a quart of tap water, for example, is considered a vast improvement over preparing solutions from liquid bleaches.

I claim:

1. As an article of manufacture a package of apparently dry, free-flowing solid ingredients, said package being divided into separate compartments to permit the use of highly active ingredients while insuring good shelf life of the package of ingredients, each compartment containing a predetermined quantity of a mixture;

a first compartment containing the mixture comprising sodium carbonate in the range 20–75 percent, sodium tripolyphosphate in the range 10–90 percent, sodium salt of dodecyl diphenyl oxide sulfonate in the range 0.2–0.6 percent, water-soluble ethylene oxide adduct in the range 0.1–0.2 percent, ethylene glycol n-butyl ether in the range 8–20 percent, tetrapotassium pyrophosphate in the range 5–45 percent; and

the mixture in the second compartment including sodium metasilicate in the range 0.5–78.5 percent, and potassium dichloroisocyanurate (59 percent available chlorine) in the range 27–55.5 percent;

the "percent" referring to percent by weight based on the weight of the particular mixture, unless otherwise specified.

2. As an article of manufacture of a two-compartment package of dry mixes, each compartment being separate from the other to permit the use of highly active ingredients while insuring good shelf life of the package of ingredients; a first compartment containing a first mix comprising:

about 25 percent sodium carbonate, about 45 percent sodium tripolyphosphate, about 0.3 percent dodecyl diphenyl oxide sulfonate, sodium salt, about 0.1 percent water soluble ethylene oxide adducts, about 15 percent ethylene glycol n-butyl ether, and about 15 percent tetrapotassium pyrophosphate;

a second compartment containing a second mix comprising about 1 percent sodium metasilicate, about 54 percent sodium tripolyphosphate, and about 45 percent potassium dichloro isocyanurate.

3. As an article of manufacture, a package of apparently dry, free-flowing solid ingredients, said package being divided into separate compartments to permit the use of highly active ingredients while insuring good shelf life of the package of ingredients; each compartment containing a predetermined quantity of a mixture;

a first compartment containing the mixture comprising anionic surfactant in the range 0.02–0.60 percent, nonionic surfactant in the range 0.01–0.02 percent, water-soluble wax solvent in the range 8–20 percent, alkali metal phosphate in the range 5–75 percent, dry free-flowing completely water-soluble solid in sufficient quantity to provide a dry free-flowing character to the mixture;

the mixture in the second compartment including sodium metasilicate in the range 0–5 percent, sodium tripolyphosphate in the range 0.5–78.5 percent, and potassium dichloroisocyanurate (59 percent available chlorine) in the range 27–55.5 percent;

the "percent" referring to percent by weight based on the weight of the particular mixture.

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