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TWO PART LIQUID CAR WASH SYSTEM

Albert Jay Lancz, Piscataway, N.J., assignor to Colgate-Palmolive Company, New York, N.Y.

No Drawing. Continuation-in-part of abandoned application Ser. No. 789,940, Jan. 8, 1969. This application Oct. 11, 1972, Ser. No. 296,509

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ABSTRACT OF THE DISCLOSURE

A liquid concentrate for automatic car wash machines designed to be stored in two parts, one of said parts containing $K_4P_2O_7$ and nitrilotriacetic acid trisodium salt, these constituting 30–60 weight percent of said part and the other part containing an ethoxylated nonionic surfactant, a hydrotrope, a viscosity controlling agent and monoethanolamine as a pH stabilizer. The two parts are mixed in a volume ratio from 1:2 to about 2:1 with a quantity of water to produce a stock solution.

RELATED APPLICATIONS

This application is a continuation-in-part of copending application Ser. No. 789,940 filed Jan. 8, 1969, now abandoned, entitled "Two Part Car Wash System."

BACKGROUND OF THE INVENTION

The present invention relates to a liquid formulation suitable for washing automobiles and including as the primary active ingredients detergent and builder components present in an aqueous solution. The new formulation is stored by the car washing facility in two parts, namely an aqueous detergent solution and an aqueous builder solution, that are mixed together prior to use with a quantity of water. Preferably the individual detergent and builder solutions are formulated so that equal parts of each are mixed with a large quantity of water, to form a stock solution that is ultimately utilized to wash automobiles or the like.

A good built liquid car wash formulation should contain certain essential ingredients, i.e., a nonionic surfactant, inorganic builders, water softeners, solubilizers, and viscosity modifiers. It has not been possible to combine these various ingredients at optimum levels into a stable liquid formulation. Unfavorable cloud points and gelling have dogged past attempts at developing a commercially superior car wash concentrate.

In efforts to overcome such disadvantages, resort has been had to a number of undesirable devices. Most common, of course, is to reduce the proportions of the essential ingredients of the liquid formulations, but this results in poorer performance unless proportionately larger amounts of the detergent are used in the washing operation (which results in higher cost to the consumer). Another device is to resort to expensive combinations of specially purified surfactants with unduly large proportions of solubilizers. These latter substances should be kept to a minimum owing to the fact that they increase the cost of the built liquid detergent without contributing appreciably to detergency.

BRIEF SUMMARY OF INVENTION

It is an object of this invention to provide a built liquid detergent formulation and a method of making same which contains optimal concentrations of the foregoing ingredients. Furthermore, it is another object of this invention to provide a method of mixing and diluting storage components of this detergent in such a manner as to provide an automobile detergent capable of adequately cleaning automobiles at a low consumer cost.

According to the invention the detergent concentrate is stored in two moieties which are mixed and diluted shortly before use. One of the said moieties is a liquid solution containing tetrapotassium pyrophosphate and nitrilotriacetic acid sodium salt in a combined amount of 30–60 weight percent. The other part contains an ethoxylated nonionic surfactant and a hydrotrope (sufficient in amount to solublize the ingredients of both parts when mixed with water to form a stock solution). Also present are viscosity controlling agents and monoethanolamine, the latter being present in order to stabilize the pH of this part.

DETAILED DESCRIPTION OF THE INVENTION

Part I of the two part liquid car wash formulation contains two builders, the trisodium salt of nitrilotriacetic acid (triglycollamic acid) and tetrapotassium pyrophosphate. Both builders possess water softening properties. NTA–Na_3 (nitrilotriacetic acid trisodium salt) should be present in Part I in a concentration of between 0 and 50 percent by weight and $K_4P_2O_7$ should comprise between 0 and 60 percent by weight. However, the total of these two ingredients should remain between 30 and 60 percent by weight the remainder being water. For commercial purposes, a small amount of dye will normally be added to such an aqueous solution.

These ingredients are uniquely compatible with Part II of the car wash product in terms of proper buffering and the stability and detergency of a stock solution of the two parts.

Part II of the car wash formulation contains a nonionic detergent as its primary active ingredient. Nonionic surface active agents include those surface active or detergent compounds which contain an organic hydrophobic group and a hydrophilic group which is a reaction product of a solubilizing group such as carboxylate, hydroxyl, amido or amino with an alkylene oxide, e.g., ethylene oxide or with the polyhydration product thereof, e.g., polyethylene glycol.

As examples of such nonionic surface active agents there may be noted the condensation products of alkyl phenols with ethylene oxide, e.g., the reaction product of isooctyl phenol with about 6 to 30 ethylene oxide units; condensation products of alkyl thiophenols with 10 to 15 ethylene oxide units; condensation products of higher fatty alcohols such as tridecyl alcohol with ethylene oxide; ethylene oxide addends of monoesters of hexahydric alcohols and inner ethers thereof such as sorbitan monolaurate, sorbitol monooleate and mannitant monopalmitate, and the condensation products of polypropylene glycol with ethylene oxide.

Other nonionics include the alkylolamine condensates of higher fatty acids such as lauric and myristic mono- and di-ethanolamide; the higher alkyl amine oxides such as lauryl dimethylamine oxide, lauryl bis (hydroxyethyl) amine oxide; higher alkyl mono- and di-sulfoxides, phosphine oxides and the like.

Pursuant to the invention, the nonionic component of Part II is preferably a polyalkylene oxide ether of higher aliphatic alcohols. Suitable fatty alcohols having a hydrophobic character, preferably 8 to 22 carbons, are lauryl, myristic, cetyl, stearyl and oleyl alcohols which may be condensed with an appropriate amount of ethylene oxide, such as at least about 3 and, preferably, about 6 to 12 moles. Preferred in the practice of this invention is an ethoxylated (6.5 moles) C_{12}–C_{13} fatty alcohol such as "Neodol 23-6.5." Another typical product usable in this invention is oleyl alcohol condensed with 6 moles of ethylene oxide. The nonionic component should be at least 10 percent by weight of Part II and can vary up to nearly 100 percent.

A hydrotrope is incorporated into Part II in order to solubilize Part I and Part II ingredients in the stock solution. The formulation of this invention permits the use of very small amounts of the hydrotrope component (not more than about 10 percent in any case). In any event, the concentration of hydrotrope can be as little as about 0.1 percent by weight. A water-soluble alkali metal sulfonated hydrotropic salt is effective in promoting the compatibility of the ingredients. Suitable materials are the alkali metal or ammonium organic sulfonated salts having a lower alkyl group up to about 6 carbons, such as the sodium and potassium xylene, toluene, ethylbenzene and isopropylbenzene sulfonates. Any suitable isomeric mixture may be employed. Such hydrotropes should be present under 10 percent by weight. Alternatively, polyethoxylated tertiary aliphatic amines possessing one alkyl group ranging from C_8–C_{18} in chain length and two polyoxyethylene groups are suitable. These, as commercial formulations are, for example, available under the trademark Ethomeen. Such hydrotropes should be present in a concentration of less than 1 percent by weight.

In order to insure fluidity of the organic concentrate (Part II), it is desirable to incorporate compatible organic solvents. Examples of such are lower aliphatic monohydric alcohols such as ethanol, propanol and isopropanol, glycols, glycol ether and esters. A mixture of isopropanol and ethylene glycol alkyl ethers such as ethylene glycol monoethyl ether and glycol monobutyl ether are preferred. In any event, the solvent should be present in a concentration ranging from about 4 to about 20 percent and preferably from 8 to 12 percent by weight.

The compositions of the present invention may include ethanolamine in amounts ranging from 0 percent to about 1 percent. The monoethanolamine may contain trace amounts of NaOH (0.004 percent by weight). It has been found that this inclusion prevents a large pH draft. For example, inclusion of this in a concentration of 0.1 percent by weight lowered the change in pH to 0.35 pH units in one week after preparation of Part II from a pH drop of 2.8 pH units in one week found in a similar formula without the monoethanolamine. Less than 1 percent by weight of monoethanolamine is sufficient. Less than 1 percent by weight of monoethanolamine is sufficient and as will be seen in the examples can be used satisfactorily in extremely small concentrations (e.g., 0.1 percent by weight). The saline requirement with regard to monoethanolamine concentration is that such ingredient be present in amounts sufficient to stabilize the pH of the composition.

As in Part I, a suitable dye is commercially advantageous. The invention, as set forth above and in the examples, does not preclude the use of other known ingredients which may be desirable in certain situations such as compatible perfumes and corrosion inhibitors.

In accordance with the method of the invention, Part I and Part II formulations are separately prepared and subsequently mixed with a predetermined amount of water to form a stock solution. Parts I and II can be added to water in a ratio by volume of from about 1:2 to about 2:1, to form a stock solution, that contains up to 15 volume percent of the combined Parts I and II, preferably between 5 and 15 volume percent. The stock solution is diluted further by the car wash operator by water for direct use on automotive surfaces.

The liquid detergent and builder moieties are prepared in any suitable manner. In preparing the concentrates of the examples, the components were added and mixed in the order shown. No unusual procedural steps were required.

The following examples are further illustrative of the nature of the present invention, and it will be understood that the invention is not limited thereto. All amounts indicated are in approximate percent by weight.

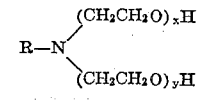
EXAMPLE 1

Part I Ingredients:	Percent by weight
Deionized water	11.44
1% D&C Green No. 8 dye	0.06
60% $K_4P_2O_7$ solution	73.50
40% Nitrilotriacetic acid trisodium salt (NTA-Na_3) solution	15.00

Part II Ingredients:	Percent by Weight
Deionized water	30.60
Ethylene glycol monoethyl ether [a]	8.00
Isopropanol	2.00
Monoethanolamine	0.10
Polyoxyethylene (15) cocoamine [b]	0.30
C_{12}–C_{13} fatty alcohol (PEO 6.5) [c]	55.00
0.1% Thymol Blue solution [d]	4.00

[a] Available under the mark "Cellosolve."

[b] Available under the mark "Ethomeen C/25." Ethomeen C/25 is derived from cocoamine and has the chemical structure:



wherein R is a C_8–C_{18} alkyl group and the sum of x and y is 15.

[c] Available under the mark "Neodol 23-6.5."

[d] Composed of:

Thymol Blue (Thymolsulphonphthalein) indicator	0.10
50% NaOH	0.02
Deionized water	99.88

Part I has a pH of 11.8±0.1, a fluorescent green color and a specific gravity of about 1.5 grams/cc. at 80° F. Part II has a maximum pH of 9.8 (a very small downward drift occurs even using monoethanolamine with a trace of NaOH), an amber color, a viscosity of less than 200 centipoises at 80° F., and a specific gravity of about 1.0 grams/cc. at 80° F.

Although particular dyes are included in this example, it should be understood that other dyes are useful. The dyes may be completely left out of such a formula and the same functional results are obtained.

A stock solution sufficient to wash at least 85 cars can be formed by mixing 3.5 gallons each of Parts I and II with 43 gallons of water. The resulting 14 volume percent stock solution has a pH of 10.8 and is a blue color (in contradistinction to Parts I and II which are green and amber, respectively). Seventy-five ounces of this stock solution mixed in twenty gallons of water during the washing operation is adequate for cleaning one car.

Both parts are quite stable. No change occurs within one week (minimum) at temperatures of 30° F. and 120° F.

EXAMPLES 2–10

These examples are formulations of Part I which are compatible, albeit in varying degrees, with the Part II of Example 1 or with those of Examples 11–17 hereinbelow.

Ingredient	2	3	4	5	6	7	8	9	10
NTA-Na_3	0	2.5	5.0	7.5	0	10	20	30	40
$K_4P_2O_7$	50	47.5	45.0	42.5	60	20	10	0	0
Deionized water	50	50.0	50.0	50.0	40	70	70	70	70

The formulation of Example 1 (44 percent $K_4P_2O_7$ and 6 percent NTA-Na_3) is the preferred embodiment. However, all these variations are compatible with the Part II composition of the invention in terms of pH and stability.

EXAMPLES 11–17

These are Part II formulations which are compatible, albeit in varying degrees, with the Part I compositions of Examples 1 to 10.

Ingredient	11	12	13	14	15	16	17
EGME[a]	5.00	-------	8.00	-------	2.00	-------	-------
Isopropanol	2.00	-------	1.50	2.00	1.00	-------	10.00
DGME[b]	-------	5.00	-------	1.00	-------	2.00	10.00
Ethanol	-------	2.00	-------	-------	-------	1.00	-------
Monoethanolamine	-------	1.00	1.00	0.50	0.10	0.10	0.10
Ethomeen C/25	-------	5.00	10.00	3.50	0.50	0.50	-------
40% SXS[d]	7.50	-------	-------	-------	9.50	-------	7.00
Neodol 23-6.5[e]	55.00	-------	50.50	71.00	25.00	-------	-------
Alfonic 1012-6[f]	-------	55.0	-------	-------	-------	25.00	-------
50% NaOH	0.15	-------	-------	-------	-------	-------	-------
Phenolphthalein	0.02	-------	-------	-------	-------	-------	-------
0.1% Thymol Blue [g]	-------	-------	-------	-------	4.00	3.00	3.00
1% Calcodur Turquoise GT	1.00	-------	-------	-------	-------	-------	-------
Deionized water	29.33	32.00	29.00	22.00	57.90	68.40	19.90
Oleyl alcohol [h]	-------	-------	-------	-------	-------	-------	50.00

[a] Ethyl glycol monoethyl ether available under the name "Cellosolve".
[b] Diethylene glycol monobutyl ether.
[c] Polyoxyethylene (15) cocoamine.
[d] Sodium xylene sulfonate.
[e] C_{12}–C_{15} fatty alcohol (PEO 6.5).
[f] C_{10}–C_{12} fatty alcohol (PEO 6.0).
[g] Thymol Blue indicator, 0.1 percent by weight; 50% NaOH, 0.02 percent by weight; deionized water, 99.88.
[h] Condensed with 6 moles of ethylene oxide.

In Examples 11 to 17, Ethomeen C/25 is preferred over sodium xylene sulfonate on the basis that it solubilizes the concentrates in water more efficiently (on a weight basis) and cheaply. Although not necessary to the invention, .004 percent by weight of Thymol Blue is preferred. This indicator changes color in the same pH range as phenolphthalein. Its acid form is yellow and its alkaline form is blue.

As stated previously, monoethanolamine with just a trace of NaOH drastically reduces (almost a 10 fold decrease in pH units) the loss in alkalinity of compositions not incorporating this. For this reason, a composition such as that of Example 11 is not desirable.

Although the present invention has been described with reference to particular embodiments and examples, it will be apparent to those skilled in the art that variations and modifications can be substituted therefor without departing from the principles and true spirit of the invention.

I claim:

1. Method of formulating a stock solution suitable for washing automobiles comprising the steps of

(a) separately preparing a builder solution and a detergent solution by mixing predetermined ingredients;

(b) said predetermined ingredients of said builder solution consisting essentially of from 0 to 60 percent by weight $K_4P_2O_7$ and from 0 to 40 percent by weight of the trisodium salt of nitrilotriacetic acid, the total quantity of these two materials being between about 30 and 60 percent by weight and the remainder water;

(c) said predetermined ingredients of said detergent solution consisting essentially of 10 percent to 100 percent by weight of an ethoxylated C_8–C_{22} fatty alcohol containing from 3 to 12 moles of ethylene oxide, from 0.1 to 10 percent by weight of at least one hydrotrope selected from the groups consisting essentially of alkali metal and ammonium sulfonates of xylene, toluene, ethylbenzene and isopropyl benzene and polyethoxylated tertiary aliphatic amines containing one C_8–C_{18} alkyl group and two polyoxyethylene groups having a total of 15 ethylene oxide units, 0 to 1 percent by weight of ethanolamine, and from about 4 to about 20 percent by weight of a water-miscible organic solvent selected from the group consisting of lower monohydric alkanols, lower alkyl ethers of ethylene glycol, and mixtures thereof;

(d) storing said builder and detergent solutions separately before use; and

(e) mixing said builder solution and said detergent solution in a volume ratio of from about 1:2 to about 2:1 with a quantity of water to produce a stock solution containing from about 5 to about 15 volume percent of said combined detergent and builder solutions.

2. The method of claim 1 wherein about 3.5 parts by volume of said builder solution and about 3.5 parts by volume of said detergent solution are mixed with about 43 parts by volume of water to form said stock solution.

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LEON D. ROSDOL, Primary Examiner

D. L. ALBRECHT, Assistant Examiner

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