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CLEAR, UNIFORM LIQUID DETERGENT COMPOSITION

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This application is a continuation-in-part of our copending application Serial No. 697, filed January 6, 1960, and now abandoned.

The present invention pertains to detergent compositions, and more particularly to liquid detergent compositions especially adapted for the cleansing of hard surfaces.

Liquid detergent compositions for the cleansing of hard surfaces, such as walls, floors, woodwork and kitchen appliances, should be uniform in order to achieve optimum cleaning and customer acceptance. When such cleansers are formulated from an ethanolamide nonionic detergent and an inorganic phosphate in an aqueous medium, the resulting formulations are not uniform liquids, but rather they are heterogeneous liquids or gels or solids. If high molecular weight soaps, i.e., alkali metal salts of fatty acids having at least 16 carbon atoms, are added to such formulations in an attempt to make them uniform liquids, the resulting formulations are still not uniform liquids.

This is clearly illustrated by the eight examples set forth below in Table 1. Examples 1 through 4 show detergent formulations containing an inorganic phosphate and an ethanolamide nonionic detergent in water and Examples 5 through 8 show such compositions to which a high molecular weight soap has been added. All of the formulations of Examples 1 through 8 were heterogeneous liquids or gels or solids at room temperature of about 80° F. The amounts of the components are expressed in percent by weight of the compositions.

TABLE 1

Example No.	1	2	3	4	5	6	7	8
Tetrapotassium pyrophosphate	5	20	5	20	5	20	5	20
Lauric diethanolamide	4	4	15	15	4	4	4	4
Sodium palmitate	-----	-----	-----	-----	4	4	-----	-----
Sodium stearate	-----	-----	-----	-----	-----	-----	4	4
Water	81	76	80	65	87	72	87	72

It is, therefore, an object of the present invention to provide liquid detergent compositions especially adapted for the cleansing of hard surfaces wherein the compositions are substantially clear and uniform even though they contain an inorganic phosphate and an ethanolamide nonionic detergent in an aqueous medium. It is a further preferred object of the invention to provide hard surface liquid cleansers which are substantially clear and uniform and have a viscosity which can be varied from about 3 centipoises to about 10,000 centipoises.

It was found that the above problems could be solved and the objects of the invention met provided a low molecular weight soap, and in the preferred embodiment of the invention a low molecular weight soap plus a high molecular weight soap, are added to an inorganic phosphate and an ethanolamide nonionic detergent in an aqueous medium. The compositions of the invention, therefore, are substantially clear uniform liquid detergent compositions consisting essentially of an aqueous solution of an inorganic phosphate, an ethanolamide nonionic detergent, and at least one low molecular weight soap or at least one low molecular weight soap plus at least one high molecular weight soap.

The inorganic phosphate component serves as a cleansing agent. Typical inorganic phosphates which can be used are tetrapotassium pyrophosphate and pentapotassium tripolyphosphate.

The ethanolamide nonionic detergent component also serves as a cleansing agent. The ethanolamide nonionic detergents which can be employed include the following fatty acid mono- and diethanolamides: caprylic monoethanolamide, capric monoethanolamide, oleic monoethanolamide, caprylic diethanolamide, capric diethanolamide, lauric diethanolamide, myristic diethanolamide, palmitic diethanolamide and oleic diethanolamide. It was surprisingly found that the following alkylolamides cannot be used as the nonionic detergent component in the compositions of the invention, because the resulting compositions are heterogeneous liquids or gels or solids at room temperature: lauric monoethanolamide, myristic monoethanolamide, tallow monoethanolamide, stearic diethanolamide and lauric isopropanolamide.

The low molecular weight soap component acts as a hydrotrope to solubilize the ethanolamide nonionic detergent in the presence of the inorganic phosphate and to solubilize any high molecular weight soap present in the compositions. The low molecular weight soap component is a water-soluble alkali metal fatty acid soap having from 6 to 14 carbon atoms. One or more of such low molecular weight soaps may be present in the compositions. Typical useful low molecular weight soaps include sodium and potassium caproate, caprylate, caprate, laurate, and myristate.

The remaining essential component of the compositions is the solvent medium, namely water.

The amounts of the components present in the compositions will vary depending upon the specific phosphate, ethanolamide nonionic detergent, and low molecular weight soap employed in formulating the compositions. In general, however, as the amount of phosphate is increased, the amount of low molecular weight soap must also be increased except for the shorter chain length low molecular weight soaps. Also as a general rule the amount of low molecular weight soap and ethanolamide nonionic detergent is increased when shorter chain length low molecular weight soaps are used. A further general principle in determining the amounts of the components present in the compositions of the invention is that as the amount of phosphate is increased, the longer chain length low molecular weight soaps become less effective as hydrotropes or solubilizing agents.

Taking the above variables into consideration, the amount of phosphate is from about 5% to about 20% by weight, and preferably about 10% by weight, of the composition. The amount of low molecular weight soap is from about 1% to about 15% by weight of the composition. The amount of caprylic monoethanolamide or capric monoethanolamide is from about 1.5% to about 7% by weight of the composition, the amount of oleic monoethanolamide is from about 1.5% to about 13% by weight of the composition, while the amount of caprylic diethanolamide, capric diethanolamide, lauric diethanolamide, myristic diethanolamide, palmitic diethanolamide or oleic diethanolamide is from about 1.5% to about 16% by weight of the composition. In view of the above mentioned variables the above amounts of phosphate, soap and ethanolamide are further adjusted to maintain the composition substantially clear and uniform.

Some of the liquid detergent compositions of the invention will have a viscosity as low as about 3 or 4 centipoises. Such compositions are thin liquids which have the advantage of spreading rapidly in use. Such thin liquids, however, have some disadvantages in that they

drip from the spout of the container on pouring and give the false impression of being watery and weak. While this condition is only true of some of the compositions of the invention, it nevertheless is desirable to be able to regulate the viscosity of the compositions to a higher level where desired.

This is achieved by adding a high molecular weight soap to the compositions. The high molecular weight soap increases the viscosity of the compositions and contributes of the detergency and grease emulsification properties thereof. They also serve to provide the proper suds desirable in a hard surface cleanser.

The high molecular weight soap component is a water-soluble alkali metal fatty acid soap having at least 16 carbon atoms and in general from 16 to 18 carbon atoms. Typical examples thereof are sodium and potassium palmitate, stearate and oleate. If desired, one or more of such high molecular weight soaps can be used. Thus, the soaps produced from the naturally occurring mixture of fatty acids present in tallow can be utilized.

The high molecular weight soap component constitutes a small amount of the compositions. In general, the amount is not higher than about 10% by weight of the composition. Usually the amount thereof is not over about 5% by weight. The preferred amount of the high molecular weight soap component is from about 1% to about 4% by weight.

Various compatible adjuvants can also be present in the compositions of the invention. Typical of such materials are perfumes, dyes, preservatives, wetting agents, storage stabilizers, and auxiliary hydrotropes.

The compositions are readily prepared by merely mixing the components thereof together.

The compositions of the invention will be further illustrated by the following examples. In these examples the amounts of the components are expresed in percent by weight of the total composition. All of the compositions in these examples were substantially clear uniform liquid detergent compositions which readily functioned as hard surface cleansers. The term "substantially clear" means that the compositions at room temperature of about 80° F. were in most every instance completely clear, although in a few instances the compositions were faintly hazy due to suspended particles or a small amount of sediment which was readily removable by filtration to yield a clear product. The viscosities set forth therein were measured with a Brookfield viscosimeter Model LVF.

Examples 9 through 11 in Table 2 below disclose the use of the sodium caproate as the hydrotrope or solubilizing agent in compositions containing tetrapotassium pyrophosphate and lauric diethanolamide in an aqueous medium.

TABLE 2

Example No.	9	10	11
Tetrapotassium pyrophosphate	5	10	20
Lauric diethanolamide	4	4.8	5.6
Sodium caproate	4	3.2	2.4
Water	87	82	72
Viscosity (cps.)	10.0	11.0	10.5

Examples 12 through 17 in Table 3 below illustrate the use of sodium caprylate as the hydrotrope in aqueous tetrapotassium pyrophosphate-lauric diethanolamide detergent compositions.

TABLE 3

Example No.	12	13	14	15	16	17
Tetrapotassium pyrophosphate	5	20	5	20	5	20
Lauric diethanolamide	2.8	2.8	2	2	12	10.5
Sodium caprylate	1.2	1.2	2	2	3	4.5
Water	91	76	91	76	80	65
Viscosity	7.5	6.5	3.0	4.0	23.0	15.5

In Table 4 below Examples 18 through 23 illustrate the use of sodium caprate as the hydrotrope in tetrapotassium pyrophosphate-lauric diethanolamide aqueous liquid detergent compositions.

TABLE 4

Example No.	18	19	20	21	22	23
Tetrapotassium pyrophosphate	5	10	20	5	10	20
Lauric diethanolamide	6.4	5.6	4.8	1.6	1.6	1.6
Sodium caprate	1.6	2.4	3.2	6.4	6.4	6.4
Water	87	82	72	87	82	72
Viscosity	63	27	44	4.0	4.0	5.5

In Table 5 below Examples 24 through 29 illustrate the use of sodium laurate as the low molecular weight soap hydrotrope in tetrapotassium pyrophosphate-lauric diethanolamide aqueous detergent compositions.

TABLE 5

Example No.	24	25	26	27	28	29
Tetrapotassium pyrophosphate	5	20	5	20	5	20
Lauric diethanolamide	2.8	2	5.6	2.4	10.5	6
Sodium laurate	1.2	2	2.4	5.6	4.5	9
Water	91	76	87	72	80	65
Viscosity	140	16	290	510	395	370

Examples 30 and 31 in Table 6 below show the use of sodium myristate as the hydrotrope in tetrapotassium pyrophosphate-lauric diethanolamide liquid detergent compositions.

TABLE 6

Example No.	30	31
Tetrapotassium pyrophosphate	5	10
Lauric diethanolamide	4.8	3.2
Sodium myristate	3.2	4.8
Water	87	82
Viscosity	500	1,550

In Table 7 below there are set forth Examples 32 through 41 which illustrate the use of various fatty acid ethanolamides as the nonionic detergent component of the substantially clear uniform liquid detergent compositions of the invention.

TABLE 7

Example No.	32	33	34	35	36	37	38	39	40	41
Tetrapotassium pyrophosphate	5	20	5	20	5	20	5	20	5	20
Caprylic monoethanolamide	4	4								
Oleic monoethanolamide			4	4						
Caprylic diethanolamide					4	4				
Capric diethanolamide							4	4		
Oleic diethanolamide									4	4
Sodium caprylate	4	4	4	4	4	4	4	4	4	4
Water	87	72	87	72	87	72	87	72	87	72

Examples 42 and 43 in Table 8 depict the use of pentapotassium tripolyphosphate as the phosphate component and the use of a low molecular weight potassium soap as the hydrotrope in the substantially clear uniform liquid detergent compositions.

TABLE 8

Example No.	42	43
Pentapotassium tripolyphosphate	10	10
Lauric diethanolamide	4	4
Sodium caprylate	3	
Potassium caprylate		3
Water	83	83
Viscosity	4	6

In Table 9 below Examples 44 through 46 show that the compositions can contain more than one low molecular weight soap as the hydrotrope component thereof.

TABLE 9

Exaple No	44	45	46
Tetrapotassium pyrophosphate	5	10	20
Lauric diethanolamide	4	5.6	4
Sodium caprate	0.8	1.6	2.4
Sodium laurate	3.2	0.8	1.6
Water	87	82	72
Viscosity	9	85	85

Examples 47 through 55 in Table 10 below illustrate compositions having high viscosities due to the incorporation therein of at least one high molecular weight soap, namely the sodium soaps formed from the mixture of fatty acids present in tallow.

TABLE 10

Example No	47	48	49	50	51	52	53	54	55
Tetrapotassium pyrophosphate	5	10	20	5	10	20	5	10	20
Laurice diethanolamide	2.4	4	2.4	6	6	7.5	4	3.2	1.6
Sodium caprate	0.8	1.2	1.6	3	3	2.25			
Sodium laurate							1.6	3.2	4.8
Sodium tallow soap	4.8	2.8	4	6	6	5.25	2.4	1.6	1.6
Water	87	82	72	80	75	65	87	82	72
Viscosity	10,000	570	6,500	550	6,600	580	4,250	630	1,390

In Table 11 below Examples 56 through 60 further show the use of a high molecular weight soap, namely sodium palmitate, to form high viscosity, substantially clear, uniform liquid detergent compositions.

TABLE 11

Example No	56	57	58	59	60
Tetrapotassium pyrophosphate	5	10	20	5	10
Lauric diethanolamide	4	4	2.4	2.4	3.2
Sodium caprate	0.8	0.8	0.8		
Sodium myristate				4.8	4
Sodium palmitate	3.2	3.2	4.8	0.8	0.8
Water	87	82	72	87	82
Viscosity	3,900	1,720	2,360	3,800	1,240

Example 61 below demonstrates that the compositions can contain various compatible adjuvants.

Example 61

Tetrapotassium pyrophosphate	10.00
Lauric diethanolamide	3.85
Sodium caprylate	0.50
Sodium caprate	0.50
Sodium tallow soap	2.50
Sodium dodecylbenzene sulfonate	1.25
Sodium xylene sulfonate	0.50
Perfume	0.30
Preservatives	0.10
Water, dyes and miscellaneous	80.50

Addition exemplary compositions of the invention which were substantially clear uniform liquids are set forth in Table 12 below by Examples 62 through 74.

The numerous examples above amply show that substantially clear uniform liquid detergent compositions can be formed from an aqueous medium containing an inorganic phosphate and an ethanolamide nonionic detergent provided there is included therein at least one low molecular weight soap. The examples further show that the viscosities of such compositions can be readily adjusted to a range from about 4 to about 10,000 centipoises by the incorporation therein of an additional component, namely at least one high molecular weight soap.

It will be appreciated that numerous modifications and variations can be made in the compositions of the invention without departing from the spirit thereof. Accordingly, the invention is to be limited only within the scope of the appended claims.

What is claimed is:

1. A substantially clear, uniform liquid detergent composition consisting essentially of an aqueous solution of (1) from about 5% to about 20% by weight of a potassium phosphate selected from the group consisting of tetrapotassium pyrophosphate and pentapotassium tripolyphosphate (2) from about 1% to about 15% by weight of a water-soluble alkali metal fatty acid soap having from 6 to 14 carbon atoms, and (3) an ethanolamide nonionic detergent selected from the group consisting of (a) from about 1.5% to about 7% by weight of caprylic monoethanolamide, and capric monoethanolamide, (b) from about 1.5% to about 13% by weight of oleic monoethanolamide and (c) from about 1.5% to about 16% by weight of caprylic diethanolamide, capric diethanolamide, lauric diethanolamide, myristic diethanolamide, palmitic diethanolamide and oleic diethanolamide; the above amounts of phosphate, soap and ethanolamide being adjusted to maintain the composition substantially clear and uniform.

2. The composition as set forth in claim **1** which also contains an amount up to about 10% by weight of a water-soluble alkali metal fatty acid soap having from 16 to 18 carbon atoms.

3. The composition as set forth in claim **1** wherein the ethanolamide is lauric diethanolamide.

(References on following page)

TABLE 12

Example No	62	63	64	65	66	67	68	69	70	71	72	73	74
Tetrapotassium pyrophosphate				10	20	5	20	10	15	20	20	20	20
Pentapotassium tripolyphosphate	5	20	20										
Caprylic monoethanolamide						6							
Capric monoethanolamide			1.5		1.5			7					
Oleic monoethanolamide							13						
Caprylic diethanolamide									16				
Capric diethanolamide										13			
Lauric diethanolamide											16		
Myristic diethanolamide	2	1.5											
Palmitic diethanolamide				5									13
Oleic diethanolamide												13	
Sodium caproate	2	13.5											
Sodium caprylate							9	8			5		4
Sodium caprate			13.5	5		2			8	10		6.5	
Sodium laurate					13.5								
Water	91	65	65	80	65	87	58	75	60	57	59	60.5	63

References Cited by the Examiner

UNITED STATES PATENTS

2,527,076	10/1950	Preston	252—117
2,560,839	7/1951	Ayo et al.	252—109
2,859,182	11/1958	Carroll	252—137
2,860,107	11/1958	Lamberti et al.	252—137
2,913,416	11/1959	Fineman et al.	252—109
3,001,944	9/1961	Wei	252—117

OTHER REFERENCES

Schwartz et al.: "Surface Active Agents," Interscience Publishers, 1949, pp. 212–213, 307–313.

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