United States Patent Office

3,223,644

Patented Dec. 14, 1965

3,223,644

LIQUID DETERGENT-SANITIZER

Andrew B. Law, Levittown, Pa., assignor to Rohm & Haas Company, Philadelphia, Pa., a corporation of Delaware

No Drawing. Filed Nov. 12, 1964, Ser. No. 410,720

9 Claims. (Cl. 252—106)

This application is a continuation-in-part of my application Serial No. 146,016 which was filed on October 18, 1961, and which has since been abandoned.

This invention relates to a liquid detergent-sanitizer of high hard water tolerance. It has particular reference to a composition containing a quaternary ammonium composition as the sanitizer and a nonionic as the detergent.

One of the principal components of the present invention is an outstanding commercially available sanitizer which consists of an aqueous solution of a mixture of alkyl dimethyl benzyl ammonium chlorides. The mixture consists of alkyl dimethyl benzyl ammonium chlorides whose alkyl groups can range from C_8 to C_{18}, although its most effective germicidal components are those whose alkyl groups are C_{12} (lauryl or dodecyl), C_{14} (myristyl or tetradecyl), and C_{16} (cetyl or hexadecyl). The proportions of the C_8–C_{18} components can vary, depending upon the manufacturer and the particular batch of the product. However, for the purposes of the present invention the proportions are not critical, the sanitizer being effective in its various proportions, some to a greater and others to a lesser degree, in the invention as described hereinbelow.

One of the most outstanding features of this conventional quaternary sanitizing composition is its exceptional effectiveness in hard water. The sanitizing dilution for quaternaries which is considered "standard" in the United States and in most foreign countries is 200 p.p.m., and in many states and local governments this requirement is specified by law. At this dilution the hard water ceiling for the quaternary mixture described above is 550 p.p.m. hard water. This means that the mixture is capable of killing 99.999 percent of specified test organisms, in 30 seconds, in water containing up to 550 p.p.m. (32 grains per gallon) hardness calculated at $CaCO_3$ when tested by the method of Chambers (J. Milk & Food Tech., vol. 19, No. 7 (1956), pp. 183–187). This method is also known as the Association of Official Agricultural Chemists, Official Method of Evaluation of Germicidal and Detergent Sanitizers (cf. Methods of A.O.A.C., 9th ed., 1960, Washington, D.C., pp. 70–72). In accordance with this procedure an inoculum containing a known number of bacteria is added to hard water solutions of the acid-detergent-sanitizer formulations. Aliquots of the solutions are then removed at timed intervals and the quaternary inactivated by diluting 1:10 with a lecithin-Tween 80 solution known commercially as "Letheen." "Tween" is a fatty acid ester of anhydrosorbitols which have been solubilized by etherifying the free hydroxyl groups with ethylene oxide. Agar pour plates are prepared from the Letheen solutions, incubated at 37° C. for 48 hours and counted for surviving bacteria. It should be understood that, for some applications, this stringent kill/time requirement need not be met. For example, a killing power of 99.999 percent in 60 seconds for water of the same hardness may be acceptable under appropriate circumstances.

With the development of this quaternary it was believed that the need for a liquid detergent-sanitizer of high hard water tolerance, particularly for use in the dairy and restaurant fields, could easily be met. However, when the quaternary was combined with any one of a number of well-known nonionic surfactants that are commonly used in detergent-sanitizer formulations, it was discovered that the hard water tolerance of the quaternary was greatly reduced. The detergent efficiency of the nonionics generally being so high, it became desirable to devise a detergent-sanitizer which would have the detersive advantages of the nonionics without appreciably sacrificing the hard water tolerance of the quaternary.

The present invention exceptionally satisfies the need just described. It consists of a detergent-sanitizer formulation of which the sanitizer is the mixture of alkyl dimethyl benzyl ammonium chlorides defined above, and the detergent is a mixture of an ethoxylated 11–14 carbon amine having the general structural formula

$$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_nH$$

in which n=1 to 80. The carbon values for this amine, it should be understood, are average values. Thus, a C_{11} amine is a mixture and may have as its constituents some compositions that are below as well as some that are above a value of C_{11}, but the average will be about C_{11}. The same applies to each of the other amines in the indicated range.

Optionally, there can be incorporated in the formulation one or more alkaline builders or sequestering agents. Examples of suitable additives are sodium hydroxide, sodium tripolyphosphate, tetrasodium pyrophosphate, trisodium phosphate, sodium metasilicate, and the sodium and potassium salts of ethylenediamine tetraacetic acid.

By way of comparison, Table I shows the results of Chambers tests of the compatibility of a number of excellent nonionic detergents with the hard water tolerance of the quaternary mixture. It will be seen that all the combinations thus tested failed to show the required bactericidal effect even in water hardness of only 500 p.p.m.

TABLE I

[Chambers tests comparing compatibility of several nonionic detergents with the hard water tolerance of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer using an AOAC synthetic hard water.]

Detergent		Exposure Time in Seconds		
		15	30	60
None	T.S./ml.[1]	6,200	20	0
	Percent Kill	99.9943	99.9999	100
Octylphenoxyethanol (9–10 ethoxy groups)	T.S./ml	[2] TNC	TNC	23,400
	Percent Kill	99	99	99.9785
Octylphenoxyethanol (12–13 ethoxy groups)	T.S./ml	TNC	410,000	2,600
	Percent Kill	99	99.6239	99.9976
Octylphenoxyethanol (7–8 ethoxy groups)	T.S./ml	TNC	TNC	125,000
	Percent Kill	99	99	99.8853

See footnotes at end of table.

TABLE I—Continued

Detergent		Exposure Time in Seconds		
		15	30	60
Nonylphenoxyethanol (9.5 ethoxy groups)	T.S./ml.	TNC	TNC	TNC
	Percent Kill	99	99	99
Octylphenoxyethanol (30 ethoxy groups)	T.S./ml.	468,000	1,690	0
	Percent Kill	99.5706	99.9984	100
Octylphenoxyethanol (20 ethoxy groups)	T.S./ml.	TNC	36,400	240
	Percent Kill	99	99.9666	99.9998
Octylphenoxyethanol (16 ethoxy groups)	T.S./ml.	TNC	TNC	9,100
	Percent Kill	99	99	99.9917
Nonylphenoxyethanol (9–10 ethoxy groups)	T.S./ml.	TNC	TNC	TNC
	Percent Kill	99	99	99

NOTE.—No. organisms/ml. at 0 time=109,000,000.
[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count.

NOTES:

(1) The final concentration of active quaternary was 200 p.p.m.

(2) The final concentration of active detergent was 200 p.p.m.

(3) The water hardness was 500 p.p.m.

Even the addition of an alkaline builder or sequestering agent which helps to raise the hard water ceiling of some compositions failed to provide the required bactericidal effect except when abnormally large, impractical amounts were added. This is shown in Table II which follows.

TABLE II

[Chambers tests in which various amounts of sodium tripolyphosphate were added to attempt to raise hard water tolerance of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer and octylphenoxyethanol (9–10 ethoxy groups)]

	Concentration of Sodium Tripolyphosphate		Exposure Time in Seconds		
			15	30	60
A	None	T.S./ml.[1]	[2] TNC	TNC	470,000
		Percent Kill	99	99	99.5104
	200 p.p.m.	T.S./ml.	TNC	TNC	300,000
		Percent Kill	99	99	99.6875
	400 p.p.m.	T.S./ml.	TNC	TNC	7,600
		Percent Kill	99	99	99.9921
	800 p.p.m.	T.S./ml.	240,000	240	0
		Percent Kill	99.7500	99.9998	100
B	None	T.S./ml.	TNC	TNC	TNC
		Percent Kill	99	99	99
	200 p.p.m.	T.S./ml.	TNC	TNC	TNC
		Percent Kill	99	99	99
	400 p.p.m.	T.S./ml.	TNC	TNC	TNC
		Percent Kill	99	99	99
	800 p.p.m.	T.S./ml.	TNC	161,000	60
		Percent Kill	99	99.8323	90.9999
	1,000 p.p.m.	T.S./ml.	147,000	0	0
		Percent Kill	99.8469	100	100

NOTE.—No. organisms/ml. at 0 time=96,000,000.
[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count

NOTES:

(1) The final concentration of active quaternary was 200 p.p.m.

(2) The final concentration of active detergent was 200 p.p.m. in (A) the first four tests and 400 p.p.m. in (B) the last five tests.

(3) The water hardness was 500 p.p.m.

The use of several combinations of alkaline builders and/or sequestering agents likewise failed to raise to satisfactory levels the bactericidal effect and hard water tolerance of another nonionic detergent-sanitizer combination as shown in Table III which follows.

TABLE III

[Chambers tests in which various alkaline builders and sequestering agents were added to attempt to raise the hard water tolerance of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer and octylphenoxyethanol (12–13 ethoxy groups)]

Alkali or Sequestrant	Final Concentration of Alkali or Sequestrant		Exposure Time in Seconds		
			15	30	60
None		T.S./ml.[1]	199,000	1,250	50
		Percent Kill	99.8239	99.9989	99.999
Trisodium phosphate	100 p.p.m.	T.S./ml.	[2] TNC	TNC	53,000
		Percent Kill	99	99	99.9531
Soda ash	200 p.p.m.	T.S./ml.	TNC	TNC	234,000
		Percent Kill	99	99	99.7929
Versene [3]	50 p.p.m.	T.S./ml.	TNC	TNC	590,000
		Percent Kill	99	99	99.4779
Soda ash plus Versene [3]	200 p.p.m.	T.S./ml.	TNC	TNC	19,500
	50 p.p.m.	Percent Kill	99	99	99.9827
Soda ash plus Versene [3]	400 p.p.m.	T.S./ml.	TNC	300,000	780
	50 p.p.m.	Percent Kill	99	99.7345	99.9993

NOTE.—No. organisms/ml. at 0 time=113,000,000.
[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count.
[3] Versene=Sodium salt of ethylenediaminetetraacetic acid.

NOTES:

(1) The first test was run without any detergent.

(2) The final concentration of active quaternary was 200 p.p.m.

(3) The final concentration of active detergent was 200 p.p.m.

(4) The water hardness was 600 p.p.m.

Another series of well known, commercially available, and highly efficient surfactants were employed as the detergents in combination with a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer. These were the surfactants represented by the formula

$$t\text{-}C_{18-24}H_{37-49}NH(CH_2CH_2O)_nH$$

where n is an average of 5, 15 or 25. As shown in Table IV, this combination had a lower hard water tolerance than the quaternary alone, and certainly is an unsatisfactory detergent-sanitizer composition.

TABLE IV

[Chambers tests in which various ethoxylated t-carbinamines ($t\text{-}C_{18-24}H_{37-49}NH_2$) were screened for compatibility with a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer regarding the hard water tolerance of the mixture]

Detergent		Exposure Time in Seconds		
		15	30	60
None	T.S./ml.[1]	146,000	400	0
	Percent Kill	99.8719	99.9996	100
$t\text{-}C_{18-24}H_{37-49}NH(CH_2CH_2O)_5H$	T.S./ml.	[2] TNC	TNC	470,000
	Percent Kill	99	99	99.5877
$t\text{-}C_{18-24}H_{37-49}NH(CH_2CH_2O)_{15}H$	T.S./ml.	TNC	TNC	66,300
	Percent Kill	99	99	99.9418
$t\text{-}C_{18-24}H_{37-49}NH(CH_2CH_2O)_{25}H$	T.S./ml.	TNC	TNC	117,000
	Percent Kill	99	99	99.8974

NOTE.—No. organisms/ml. at 0 time=114,000,000.
[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count.

NOTES:

(1) The final concentration of active quaternary was 200 p.p.m.

(2) The final concentration of active detergent was 200 p.p.m.

(3) The water hardness was 600 p.p.m.

A comparison of the results in the foregoing tables with those in Table V clearly illustrates the unique and remarkable effectiveness of the present invention in which a particular type of ethoxylated t-carbinamide is employed as the detergent. This amine is the mixture represented by the formula

$$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_nH$$

where n is 1 to 80. As shown in Table V, these surfactants are quite compatible with the C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizers.

TABLE V

[Chambers tests in which various ethoxylated t-carbinamines ($t\text{-}C_{11-14}H_{23-29}NH_2$) were screened for compatibility with C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizers regarding the hard water tolerance of the mixture]

Detergent		Exposure Time in Seconds		
		15	30	60
None	T.S./ml.[1]	410,000	2,380	0
	Percent Kill	99.5941	99.9976	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)H$	T.S./ml.	[2] TNC	41,600	910
	Percent Kill	99	99.9588	99.9991
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_3H$	T.S./ml.	TNC	70,200	1,950
	Percent Kill	99	99.9305	99.9981
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_5H$	T.S./ml.	TNC	22,100	550
	Percent Kill	99	99.9781	99.9995
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{7.5}H$	T.S./ml.	TNC	17,600	640
	Percent Kill	99	99.9826	99.9994
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_9H$	T.S./ml.	940,000	7,200	90
	Percent Kill	99.0693	99.9929	99.9999
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{10}H$	T.S./ml.	640,000	5,200	150
	Percent Kill	99.3663	99.9949	99.9999
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{12.5}H$	T.S./ml.	590,000	3,120	0
	Percent Kill	99.4158	99.9969	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{15}H$	T.S./ml.	123,000	1,280	0
	Percent Kill	99.8782	99.9987	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{17.5}H$	T.S./ml.	293,000	2,030	0
	Percent Kill	99.7099	99.9980	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{20}H$	T.S./ml.	105,000	460	0
	Percent Kill	99.8960	99.9995	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{22.5}H$	T.S./ml.	351,000	1,590	0
	Percent Kill	99.6525	99.9981	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{30}H$	T.S./ml.	410,000	1,330	0
	Percent Kill	99.5941	99.9987	100
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{40}H$	T.S./ml.	470,000	2,600	40
	Percent Kill	99.5347	99.9974	99.9999
$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{80}H$	T.S./ml.	176,000	2,860	30
	Percent Kill	99.8257	99.9972	99.9999

Note.—No. organisms at 0 time=101,000,000.
[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count.

NOTES:

(1) The final concentration of active quaternary was 200 p.p.m.

(2) The final concentration of active detergent was 200 p.p.m.

(3) The water hardness was 600 p.p.m.

As indicated above, the basic compositions of the present invention can be modified by the addition of various alkaline builders and/or sequestering agents. In no case is the hard water tolerance lessened, and in most cases it is increased. To illustrate, in Table VI there are listed

several formulations of the compositions of this invention. Table VII indicates the hard water ceilings of some of those formulations. Table VIII discloses the effect of various sequestering agents on one of those formulations.

TABLE VI.—FORMULATIONS MADE IN ACCORDANCE WITH PRESENT INVENTION

No. of Composition	Percent by Volume							
	1	2	3	4	5	6	7	8
C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer	10	10	10	10	10	10	10	10
t-$C_{11-14}H_{23-29}NH(CH_2CH_2O)_{15}H$	10	----	10	10	10	5	----	20
t-$C_{11-14}H_{23-29}NH(CH_2CH_2O)_{20}H$	----	10	----	----	----	----	2.5	----
Distilled water	80	80	72.25	72.25	75.5	85	85	69.5
Trisodium phosphate	----	----	7.50	----	----	----	----	----
Sodium metasilicate	----	----	----	7.50	----	----	----	----
Versene*	----	----	0.25	0.25	0.5	----	0.5	0.5
Sodium hydroxide	----	----	----	----	4.0	----	2.0	----

*Sodium salt of ethylenediamine tetraacetic acid.

TABLE VII

A. Hard Water Ceilings of Composition No. 1 From Table VI

Final Concentratin of Active Quaternary	Water Hardness		Exposure Time in Seconds		
			15	30	60
200 p.p.m.	500 p.p.m.	T.S./ml.[1]	105,300	510	0
		Percent Kill	99.9007	99.9995	100
200 p.p.m.	550 p.p.m.	T.S./ml.	176,000	1,740	0
		Percent Kill	99.8340	99.9984	100
200 p.p.m.	600 p.p.m.	T.S./ml.	530,000	8,200	200
		Percent Kill	99.5000	99.9923	99.9998

No. organisms/ml. at 0 time=106,000,000

B. Hard Water Ceilings of Composition No. 2 From Table VI

200 p.p.m.	500 p.p.m.	T.S./ml.	53,000	260	0
		Percent Kill	99.9500	99.9998	100
200 p.p.m.	550 p.p.m.	T.S./ml.	240,000	820	70
		Percent Kill	99.7736	99.9992	99.9999
200 p.p.m.	600 p.p.m.	T.S./ml.	700,000	4,900	150
		Percent Kill	99.3396	99.9954	99.9999

No. organisms/ml. at 0 time=106,000,000

C. Hard Water Ceilings of Composition No. 3 From Table VI

200 p.p.m.	500 p.p.m.	T.S./ml.	41,000	50	0
		Percent Kill	99.9620	99.9999	100
200 p.p.m.	550 p.p.m.	T.S./ml.	293,000	460	0
		Percent Kill	99.7287	99.9996	100
200 p.p.m.	600 p.p.m.	T.S./ml.	760,000	1,830	0
		Percent Kill	99.2963	99.9983	100
200 p.p.m.	650 p.p.m.	T.S./ml.	[2]TNC	5,200	100
		Percent Kill	99	99.9952	99.9999

No. or organisms/ml at 0 time=108,000,000

D. Hard Water Ceilings of Composition No. 4 From Table VI

200 p.p.m.	550 p.p.m.	T.S./ml.	70,000	90	0
		Percent Kill	99.9352	99.9999	100
200 p.p.m.	600 p.p.m.	T.S./ml.	130,000	430	0
		Percent Kill	99.8796	99.9996	100
200 p.p.m.	650 p.p.m.	T.S./ml.	TNC	2,340	0
		Percent Kill	99	99.9978	100
200 p.p.m.	700 p.p.m.	T.S./ml.	TNC	6,600	40
		Percent Kill	99	99.9939	99.9999

No. organisms/ml. at 0 time=108,000,000

E. Hard Water Ceilings of Composition No. 5 from Table VI

200 p.p.m.	500 p.p.m.	T.S./ml.	500	0	0
		Percent Kill	99.9995	100	100
200 p.p.m.	550 p.p.m.	T.S./ml.	2,800	0	0
		Percent Kill	99.9972	100	100
200 p.p.m.	600 p.p.m.	T.S./ml.	17,200	30	0
		Percent Kill	99.9828	99.9999	100
200 p.p.m.	650 p.p.m.	T.S./ml.	38,000	570	0
		Percent Kill	99.9620	99.9994	100
200 p.p.m.	700 p.p.m.	T.S./ml.	96,000	1,880	0
		Percent Kill	99.9040	99.9981	100
200 p.p.m.	750 p.p.m.	T.S./ml.	250,000	5,100	0
		Percent Kill	99.7500	99.9949	100

No. organisms/ml. at 0 time=100,000,000

[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count.

TABLE VIII

[Chambers tests demonstrating effect of various sequestrants on the hard water tolerance of composition No. 1 from Table VI]

Alkali or Sequestrant		Exposure Time in Seconds		
		15	30	60
None	T.S./ml.[1]	410,000	910	0
	Percent Kill	99.6095	99.9991	100
None	T.S./ml	[2] TNC	6,500	90
	Percent Kill	99	99.9938	99.9999
Sodium tripolyphosphate	T.S./ml	TNC	5,200	50
	Percent Kill	99	99.9950	99.9999
Tetrasodium pyrophosphate.	T.S./ml	880,000	2,210	0
	Percent Kill	99.1619	99.9979	100
Trisodium phosphate	T.S./ml	350,000	1,300	0
	Percent Kill	99.6667	99.9988	100
Versene [3]	T.S./ml	640,000	1,580	0
	Percent Kill	99.3905	99.9985	100
Sodium metasilicate	T.S./ml	176,000	1,170	0
	Percent Kill	99.8324	99.9989	100

NOTE.—No. of organisms/ml.at 0 time=105,000,000.
[1] Total Survival/ml.
[2] TNC=Organisms too numerous to count.
[3] Versene=Sodium salt of ethylenediamine tetraacetic acid.

NOTES:

(1) The final concentration of active quaternary was 200 p.p.m.

(2) The final concentration of active alkali or sequestrant was 150 p.p.m.

(3) The water hardness was 600 p.p.m.

From the foregoing examples and comparisons it will be apparent that I have provided a new and highly useful liquid detergent-sanitizer; that the combination of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer and a mixture of ethoxylated amines having the formula t-$C_{11-14}H_{23-29}NH(CH_2CH_2)_nH$ in which n=1 to 80 surprisingly results in highly compatible detergent-sanitizers with hard water tolerances substantially as high as that of the quaternary alone; and that the novel detergent sanitizers are also highly compatible with and benefited by alkali builders or sequestering agents.

It will also be clear that, although the particular types of sanitizer and the particular class of detergents are critical to the successful performance of the novel compositions, it is possible to vary the combinations thereof quite widely. The disclosed specific combinations thereof, with or without addition of alkali or sequestrants, should therefore be understood to be merely illustrative and the invention is not limited thereto. If higher detergency is desired, a relative drop in the quantity of the sanitizer in the composition is necessary as more detergent is added. This would slow down the speed of reaction, i.e., the rate of bactericidal action. In turn, this would call for more sequestering agent in order to offset the drop in rate of reaction. Thus, although the nature of the amine detergents that are combined with the sanitizers is critical, the relative ratios of the two is not. Preferably, as shown by the data in Table VI above, a ratio of from 2.5 to 10 percent of the detergent to 10 percent of the sanitizer (both on a volume basis), is employed in a solution, the balance of which essentially is water. This range is extended so that there may, in some cases, be more detergent than the sanitizer present in a proportion of up to 30% of the former to 10% of the latter. Although the preferred ranges of the detergent to sanitizer thus are from 1:4 to 1:1, it should be understood that ranges of from 1:6 to 3:1 may prove acceptable in some applications. Selecting a use ratio of a given combination of components thus will depend upon one's own satisfaction level and can be determined quite simply by those skilled in the art.

I claim:

1. A liquid detergent-sanitizer solution whose principal active ingredients are present in a total amount ranging from about 12.5% to about 40%, by volume, the ratios of said ingredients ranging from 1 part detergent:6 parts sanitizer to 1 part sanitizer:3 parts detergent, the remainder of the solution consisting of 60% to 87.5% water, the detergent consisting of an ethoxylated amine having the general formula t-$C_{11-14}H_{23-29}NH(CH_2CH_2O)_nH$ in which n=1 to 80, the carbon values for the amine representing quantities which are averages coming within the indicated range, and the sanitizer consisting of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride.

2. A liquid detergent-sanitizer solution whose principal active ingredients, by volume, consist of from 2.5 to 30 percent of an ethoxylated amine detergent having the general formula t-$C_{11-14}H_{23-29}NH(CH_2CH_2O)_nH$ in which n=1 to 80, the carbon value for the amine representing quantities which are averages coming within the indicated range, 10 percent of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer, and the remainder of the solution consisting of about 60.0% to about 87.5% water.

3. The composition of claim 1 in which the sanitizer is a mixture principally consisting of a C_{12}, C_{14}, and C_{16} dimethyl benzyl ammonium chlorides.

4. The composition of claim 1 in which 0.5% to 7.75% of the water is replaced by an alkaline builder from the class consisting of sodium hydroxide, phosphate, silicate, and the sodium and potassium salts of ethylenediamine tetraacetic acid.

5. The composition of claim 4 in which the detergent, sanitizer and at least one of the alkaline builders are in the following proportions, all figures being represented as percent by volume: 10 percent of the sanitizer, 2.5 to 20 percent of the detergent, and 0.5 to 7.5 percent of the builder.

6. A liquid-detergent-sanitizer composition containing, in percent by volume, about 10 of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer, about 10 of an ethoxylated amine detergent having the general formula

$$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{15}H$$

and about 80 of distilled water.

7. A liquid-detergent-sanitizer composition containing, in percent by volume, about 10 of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer, about 10 of an ethoxylated amine detergent having the general formula t-$C_{11-14}H_{23-29}NH(CH_2CH_2O)_{15}H$, about 72.25 of distilled water, about 7.50 trisodium phosphate, and about 0.25 of an alkaline sequestering agent consisting of a sodium salt of ethylenediaminetetraacetic acid.

8. A liquid-detergent-sanitizer composition containing, in percent by volume, about 10 of a C_8–C_{18} alkyl dimethyl benzyl ammonium chloride sanitizer, about 10 of an ethoxylated amine detergent having the general formula

$$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{15}H$$

about 72.25 of distilled water, about 7.50 of sodium metasilicate, and about 0.25 of an alkaline sequestering agent consisting of a sodium salt of ethylenediaminetetraacetic acid.

9. A liquid-detergent-sanitizer composition containing, in percent by volume, about 10 of a mixture of alkyl dimethyl benzyl ammonium chloride sanitizer, about 10 of an ethoxylated amine detergent having the general formula

$$t\text{-}C_{11-14}H_{23-29}NH(CH_2CH_2O)_{20}H$$

about 75.25 of distilled water, about 0.5 of an alkaline sequestering agent consisting of a sodium salt of ethylene-

diaminetetraacetic acid, and about 4.0 of sodium hydroxide.

References Cited by the Examiner

UNITED STATES PATENTS

2,577,773	12/1951	Lambert	252—106 XR
2,871,266	1/1959	Riley	252—106 XR
2,950,253	8/1960	Kling et al.	252—152
2,950,255	8/1960	Goff	252—152

OTHER REFERENCES

Lesser, Soap and Sanitary Chemicals, "Detergent Sanitizers," August 1951, pp. 37–39, 67, 69, and 98.

Sequestrene, publ. of Geigy Industrial Chemicals, 1952, pp. 1, 20, 21, 25, and 26.

JULIUS GREENWALD, *Primary Examiner.*

ALBERT T. MEYERS, *Examiner.*