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ABRASIVE DETERGENT COMPOSITIONS

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This invention relates to new improved abrasive detergent compositions. More particularly it relates to abrasive detergent powders containing, as their essential constituents, a major proportion of silica powder of particular particle size range and a minor proportion of a synthetic detergent.

Abrasive detergent compositions, usually in powder form, have been employed for years in industry and the home for the elimination of stubborn soils, greases, stains and burnt materials which are not easily removed by the ordinary light-duty non-abrasive soaps and detergents. Originally, minerals capable of scouring were ground and used directly as scouring powders. Later, inorganic salts, inorganic detergents and soaps were added to the abrasive materials. In recent years synthetic detergents have supplanted soaps in some of these products.

For household use and in other applications too, it is often either highly desirable or even essential that the cleanser should possess excellent cleaning power while still being extremely mild to the substratum, which may be almost any material but most often is either porcelain, aluminum, copper, stainless steel, or glass. Sometimes scouring cleansers are also used on painted and enameled materials, linoleums, plastics, and other easily marred surfaces. A cleanser comprising an abrasive that seriously scratches these surfaces will destroy their beauty. Even if one application does no apparent harm to the surface, repeated use will eventually cause an objectionable dulling or loss of surface luster. Most of the present commercial scouring cleansers meet with a high degree of consumer acceptance but nevertheless, comparative tests of consumer preference indicate a strong prior choice for the milder powders if all other characteristics are maintained equal.

In an attempt to make scouring cleansers and similar preparations that are not too harsh for industrial and consumer acceptance, various techniques of manufacture have been employed and many others have been suggested. These processes have usually been restricted to control of the abrasive ingredients since scratching by the other components of a scouring powder ordinarily is negligible.

It has been suggested that the abrasive should be of a softer material such as crushed limestone, preferably of organic origin. Diatomaceous earth and calcined diatomaceous earth have also been advocated as mildly abrading ingredients.

Others have favored reducing the particle size of the harder abrasive materials to prevent deep scratching. In some instances the material has been reduced to below 10 microns. In other cases, the maximum particle size limit has been set at levels ranging from 60 mesh through 400 mesh and down to below 2 microns.

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Sometimes the abradant has been coated with an alkali metal silicate while in other products the abrasive action has been cushioned by incorporation of materials such as bentonite, cellulose derivatives and water soluble salts of smaller particle size.

The use of the processes listed above either does not result over-all in a sufficiently improved scouring cleanser or is inherently too costly to be supported by this highly competitive low priced product. Removal of the larger abrasive particles alone does not produce an acceptable scouring cleanser of excellent cleaning power.

In accordance with the present invention, there is provided a preferred abrasive detergent composition of reduced scratching properties while still being a good cleaner, which composition consists essentially of a major proportion of silica having a particle size range between about 14 microns and the maximum which will allow the silica to pass a 200 mesh sieve, and a minor proportion, up to about 20%, of a water soluble synthetic organic detergent.

Silica is the abrasive ingredient of the invented compositions. Of the materials suggested in the art for this purpose, it is the only one of the many tried that has the requisite scouring ability, size reduction processing and classification characteristics, non-hygroscopicity, color and density, as well as ready availability, in quantity and at low cost. Usually it is obtained from clean sand, the colorless type being especially favored for use in household cleansers. While quartz is the most common crystalline form of silica, the other crystalline and amorphous forms may also be used providing they possess the required hardness and are processable. Thus, tridymite, cristoballite, opal and chalcedony are also useful forms of silica although the latter two are obviously too expensive for commercial exploitation in scouring powders.

Silica comprises the major part of the abrasive detergent composition, the silica content usually being from 75-95% and preferably from 85-95% by weight on a dry basis.

The silica particles are most preferably within the 14 micron to 200 mesh range because, when of that size, the abrasive detergent powders made therefrom are surprisingly excellent cleaners acting to polish rather than to scratch scoured surfaces. When the abrasive particles are between 6 microns and 140 mesh the scouring powders are still mild polishing agents but are not as good in cleaning as are the 14 micron-200 mesh products.

The other essential ingredient of the abrasive detergent powders is a synthetic organic detergent. Soaps are not considered to be synthetic organic detergents. They are not desirable as detergents in the present compositions because of their reaction with metal ions in hard water to form insoluble soaps which do not easily rinse off the surfaces to be cleaned.

The synthetic organic detergents that are used in the present compositions may be either anionic, cationic or nonionic or compatible mixtures thereof. Usually they should be solids but liquid materials find use where they can be absorbed on a component of the composition by procedures known to the art.

Among the anionic detergents contemplated as within the invention, are the sulfated and sulfonated synthetic detergents, especially those having about 12 to 26 carbon atoms in the molecule. Of the latter suitable sulfated and sulfonated detergent compounds it is preferred to employ the alkyl aromatic sulfonates and aliphatic sulfates and sulfonates of about 12 to 22 carbon atoms.

The alkyl aromatic sulfonates may be mono- or polynuclear in structure. Particularly, the aromatic nucleus may be derived from benzene, toluene, xylene, phenol, cresol, phenolic ethers, naphthalene, phenanthrene and the like. The alkyl group may be straight or branched. It may consist of radicals such as dodecyl, pentadecyl, octadecyl, octyl, nonyl, decyl, keryl, mixed alkyls derived from fatty materials, cracked paraffin wax olefins, polymers of monoolefins and so forth.

Some specific examples of these alkyl aryl sulfonates are the sulfonated alkylated benzene compounds wherein the alkyl group is from 10-18, preferably 12-16 carbon atoms and where the alkyl group is obtained by polymerizing propylene or butylene according to methods known in the trade.

Other suitable detergents are sulfated and sulfonated aliphatic compounds having alkyl groups of 12 to 22 carbon atoms. Within this group are the sulfuric acid esters of polyhydric alcohols incompletely esterified by higher fatty acids, e.g., coconut oil monoglyceride monosulfate, tallow diglyceride monosulfate; the long chain alcohol sulfates, e.g., lauryl sulfate, cetyl sulfate; the higher fatty acid esters of a sulfonic acid, e.g., oleic acid ester of isethionic acid; the fatty acid alkylolamide sulfates; the fatty acid amides of amino alkyl sulfonic acids, e.g., lauric acid amide of taurine and the like. As examples of the cationic detergents may be noted the long chain alkyl quaternary ammonium salts, e.g., cetyl pyridinium chloride. The cationic detergents will usually be compounded with a nonionic detergent. Among nonionic compounds it is preferred to employ block copolymers of ethylene oxide and propylene oxide, such as those of the formula $\text{HO}(\text{EO})_a(\text{PO})_b(\text{EO})_c\text{H}$, whose molecular weight is 1000 to 2000 and wherein the ethylene oxide constitutes from 20-90% by weight. Such a material is sold under the trade name Pluronic F-68.

Specific examples of anionic, cationic and nonionic detergents have been listed above but detergents other than those listed are also contemplated providing only that they are of satisfactory detergency ability. It will be noted that the synthetic detergents listed are all of the foaming type. This is so because these detergents are preferred, it having been established that the foam generated coats with the silica, helping to lift off and float away grease or other soiling agent while at the same time aiding in keeping the silica particles in motion. The motion of the silica results in a continually new presentation of scouring surfaces to the film to be removed and also prevents cementitious action of the very small particles on the larger, better cleaning sizes and consequent insulation of the better cleaners from the undesirable film. In some applications, it may be desirable to employ non-foaming detergents, or detergents may be used in conjunction with other compounds which limit their foaming, e.g., with silicones for coating scoured surfaces.

Because of the various physical properties of the many synthetic detergents the amount of synthetic detergent should be adjusted in each formula for maximum effectiveness. Generally, the least amount of detergent that will give a good cleaning effect is the right amount to use. Some satisfactory compositions can be made with as little as 0.5% synthetic organic detergent although most often 2% or more is used. Almost always less than 10% synthetic organic detergent will be employed although in some instances as much as about 20% may be found desirable to effect superior cleaning. Above 20% organic detergent content, the character of the abrasive cleaning composition undergoes an undesirable change. It tends to become less free flowing, to cake in the package and to rinse poorly.

Other adjuvants may complement the essential abrasive detergent composition. Foam-enhancing additives such as lauric myristic diethanolamide may be employed. Inorganic salts, particularly polyphosphates such as so-

dium tripolyphosphate, tetrasodium pyrophosphate and sodium hexametaphosphate may be used because of their own detergency or synergistic effect on detergency of the essential anionic synthetic detergent. Anti-corrosion additives, e.g., sodium silica of $\text{Na}_2\text{O}/\text{SiO}_2$ ratio about 2.3, and anti-caking agents such as magnesium trisilicate or bentonite find use, as do gums and soil-suspending agents such as carboxymethyl cellulose. Chemical agents for removing oxide films, e.g., organic acids, are desirable components of cleaning and polishing compositions such as copper brighteners. Bleaching agents of the oxygenating type, e.g., sodium perborate, or of the chlorinating type, e.g., trichlorocyanuric acid, may be incorporated in cleansers because of their sanitizing ability and power to remove stains. Of course, perfumes are usually desirable for aesthetic reasons. For the most part the present compositions will be manufactured in dry powder form but, when desirable, suspensions, pastes or gels in aqueous or non-aqueous media may also be made.

As has already been indicated, the silica abrasive, which constitutes a major proportion of the present abrasive detergent composition, is most preferably of particle size range from 14 microns to 200 mesh. In the science of particle size measurement, there are various "diameters" and other measurements or calculated factors used to describe particles and their size distribution. In sieving it is a combination of sieve opening and breadth of a particle that is controlling. In measuring particle size microscopically, it is usual to record the minor dimension (which corresponds to breadth because particles tend to lie flat on the microscope slide, the thickness not being visible to the viewer). In determining particle size by sedimentation methods, the diameter of an equivalent spherical particle is calculated.

It is clear that particles can differ greatly in shape and still have the same breadths, minor dimensions or equivalent spherical diameters. As a practical matter, however, the smaller or "sub-sieve size" silica particles powdered for use in the present scouring cleansers are, for the greater part, of a shape approaching the spherical, being many faceted polyhedrons and not needles or plates. Results obtained by applying Stokes' law to sedimentation data show that the diameter of an equivalent sphere is close to the minor diameter of such a sub-sieve size particle as viewed through a microscope. Particles larger than 325 mesh are not as regular as those of sub-sieve size and usually the minor diameters (microscopic) or breadths of such particles are slightly larger than the side of the sieve opening. For instance silica passing a 200 mesh sieve will have a maximum particle size of about 88 microns while that passing a 140 mesh sieve will be, at most, about 125 microns. Sedimentation data to which Stokes' law has been applied establish that the largest particles through a 200 mesh standard sieve are of 80-84 microns equivalent spherical diameter while those passing a 140 mesh sieve are of 115-120 microns equivalent spherical diameter. In this specification the upper particle size limit is set relative to sieve size and the lower limits correspond to microscopically determined breadth or equivalent spherical diameter.

The silica particles in the 14 micron to 200 mesh range are those that will pass a 200 mesh sieve and which have had removed by a sedimentation method the particles smaller than 14 microns. In the present abrasive detergent powders, made by removing undersize and oversize particles from a silica already size-reduced to a suitable range by the conventional commercial means, a spectrum of particles between 14 microns and 200 mesh is present. A weight distribution curve or histogram of particle size (range) and weight (not cumulative) of a typical such silica reveals greater amounts of fine particles with steadily decreasing amounts (by weight) of the larger units, the negative slope being greater in the range from

about 14 to 50 microns after which it flattens perceptibly.

A typical classified silica of this invented composition contains about 50% by weight over 34 microns and about 30% over 44 microns. The silica to be classified may initially contain particles in the 0 to 250 microns range obtained from sand by the usual ball mill, hammer mill, or other equivalent size-reduction techniques. This silica should be at least 50% by weight below 200 mesh. Particles over 200 mesh are usually removed by mechanical sifting through a U.S. Bureau of Standards screen. Particles under 14 microns may be removed by sedimentation techniques, e.g., by air separation. In air separation, centrifugal force causes heavier particles in a moving air medium to be thrown to the outside of a circular path more rapidly than smaller particles. By using special throttles the lighter or heavier (smaller or larger) particles can be removed. It is not necessary to perform complete separations in single operations and in many cases it will be desirable to separate part of the material rather accurately and recycle the balance. Any other apparatus or method of classification may be used providing that the character of classification is the same.

In the above discussion, certain limits on silica particle sizes have been set but due to the nature of the classification and analytical methods, it is not practicable precisely to separate or analyze particles according to size.

No matter how carefully and exactly a separation is made, when dealing with silica flours there will always be present a considerable number of oversized or undersized particles due to the inherent difficulty of fractionation and the limitations of equipment and expense of processing. At best a rather sharply defined separation can result.

The upper size limit on silica can be fairly accurately obtained by screening but some oversize particles will unavoidably be present, usually less than 5%, when sedimentation methods are used to remove coarser particles. More difficulty is encountered in eliminating the undersize particles. In good practice the proportion of undersize fines will be less than 10% and in some instances it has been held to under 2%. However, even if the limitations of the equipment prevent more than 60-70% removal of undersize (leaving up to 15% below specification size) the product obtained will still be of use.

Despite the fact that it is well recognized in the art that oversize and undersize particles are usually present, it is customary to describe particle size limitations in absolute terms, it being understood that such boundary figures are significant but not of ultimate precision. When microscopically analyzing powdered silica for particle size, suitable narrow cuts of particles are taken and deposited on a slide after which counts are made according to the known methods using a filar micrometer. The minor diameters of all particles counted are tabulated and the limitations are determined by inspection of the data. In one method of reporting results every noted particle is considered in establishing the size range of the composition and a uniformity coefficient is reported to enable the reader to know in which range most of the particles lie. In this specification the reported ranges are those representative of the silica tested, unrepresentative or accidental particles being omitted. The accuracy of the microscopic analysis is usually within about 10%.

In the above discussion of size distribution, for the sake of simplicity, a single preferred silic of 14 microns to 200 mesh was mentioned but it is clear that much of that explanation also applies to a similar composition in the 6 micron to 140 mesh range.

The particle size of the synthetic organic detergent and other non-abrasive adjuvants used is not critical because these materials are present in minor amounts and do not contribute appreciably to the abrading or scratching power of the present compositions. The particles of synthetic detergent, adjuvant, or synthetic detergent combined with adjuvants should be small enough so as not to create a

heterogeneity, apparent to the eye or sense of touch and objectionable, or sufficient to cause stratification. Usually these granules or beads will be less than 200 microns.

To make the disclosed compositions, it is possible merely to mechanically mix the classified silica with dried synthetic organic detergent. Initially, the synthetic detergent may be mixed with some or all of the other adjuvant materials. In one process it is first crutched with builders and then spray dried. The resulting built detergent is then well mixed with the silica; if desired, the mixture may be homogenized by passage through a subsequent mixing or size-reduction apparatus, providing that such treatment does not subdivide the silica so much as to make it too fine for the present compositions.

The invented abrasive detergent compositions are far superior to the usual scouring powders. When compared to a typical commercially successful scouring powder the present composition was found to excel in cleaning and it did not scratch test surfaces as the other cleanser had done.

When scouring powders, identical except for silica particle size, were made, those comprising a silica in the range 14 micron to 200 mesh were clearly much milder in scratching action than most other powders tested. Surprisingly, they were also better in cleaning power than scouring powders made from silic of a larger average particle size.

These results are very important because good cleaning and scouring powder without objectionable abrasion are the prime requisites of a superior scouring powder. No reason is known for the unexpectedly superior cleaning power of the 14 micron to 200 mesh product but a general theory explains the salutary effect of removing the coarser and finer silica particles.

Removal of the coarse particles is desirable because, being larger, they make deeper pits when pressed against surfaces to be cleaned. They also tend to slide, rather than roll, and thereby generate long scratches instead of the less noticeable pits. Although the coarser particles are removed the medium particles left are still good cleaners. They function mechanically to dislodge soil from substrata, being abrasive to the soil but not the surface underneath. However, the removal of coarse material increases the proportion of fines and, when slurried in a liquid these fines are then sufficient in number to fill the interstices and form a relatively immobile dispersion in which the medium particles are surrounded by smaller ones. The extreme fines are too small to be good cleaners (they cannot sufficiently abrade the soil) and the moderately sized particles are insulated by them. Thus, the removal of the fines enables medium particles to clean satisfactorily, and without scratching.

In evaluating the invented products cleaning power was tested by removing completely a baked grease mixture from a vitreous surface. This test simulated cleaning of an oven, range or grease-coated sink. Scratching and pitting were checked by examination of microphotographs and by a machine for detecting surface irregularities as small as a millionth of an inch.

The following examples are given to illustrate the invention. All amounts and percentages in the specification and claims are by weight unless otherwise indicated.

EXAMPLES

A commercial silica (quartz) flour was classified by sieve and air separation until it contained particles within the range of 14 microns (breadth dimension) to 200 mesh. Other classifications were made to yield silicas of 6 microns to 200 mesh, 6 microns to 140 mesh and 14 microns to 140 mesh. The accuracy of separation was such that only about 4% of the particles in any cut were outside the range and the distribution was about equal between the oversize and undersize.

The commercial silica was size analyzed by passing

through U.S. Bureau of Standards sieves with the following results:

Table I

	Size Range, Microns (screen dimension)	Parts (by weight)
Through 60 on 80 Mesh	250-177	0.2
Through 80 on 100 Mesh	177-149	0.4
Through 100 on 120 Mesh	149-125	0.0
Through 120 on 140 Mesh	125-105	2.1
Through 140 on 170 Mesh	105-88	3.4
Through 170 on 200 Mesh	88-74	4.7
Through 200 on 230 Mesh	74-62	5.3
Through 230 on 270 Mesh	62-53	5.5
Through 270 on 325 Mesh	53-44	7.1
Through 325 mesh	44-0	70.4
Total		100.00

The sub-sieve size material was separated into additional fractions by Dietert Micro Particle Classifier and also by a standard sedimentation method. Particles were measured (minor axis) microscopically with the following result:

Table II

DIETERT CLASSIFIER

Size Range, Microns (microscopic measurement)	Parts (by weight)
34-44	8.7
26-34	14.6
14-26	17.6
6-14	22.1
0-6	7.4
Total	70.4

SEDIMENTATION SEPARATION

34-44	10.6
20-35	17.3
10-20	20.4
5-10	11.4
0-5	10.7
Total	70.4

From the classified silica, various silex mixtures were made. Some of these are compared to the original silex in Table III following.

The silexes of Table III were each made into an abrasive detergent powder of the formula:

Silex	Percent
Heavy duty detergent ¹	85.4
Sodium tripolyphosphate	10.6
Perfume	4.0
	q.s.
	100.00

¹ Made by pulverizing a detergent composition obtained by spray drying to about 8% moisture a slurry of approximate dry analysis: 35 parts sodium dodecyl benzene sulfonate (the alkyl group being propylene tetramer), 40 parts sodium triphosphate, 7 parts sodium silicate ($\text{Na}_2\text{O}/\text{SiO}_2=2.35$) and 8.3 parts sodium sulfate.

The above scouring powders were comparatively tested for scratchiness, cleaning efficiency, rinsability, foaming, flowability, and density.

The tendency to scratch was compared by a mechanically reproducible method simulating actual use. In this test glass plates were rubbed with various scouring powders in slurry form. The test was run in triplicate and twelve readings were taken on each plate of the deepest scratches or pittings on the plate. The average depth of these 36 readings was approximately 20% greater for sample E than for sample A. Sample E also pitted to a greater depth than B, but most important of all, samples A and B caused no unsightly long scratches while sample E made many. When test glasses scoured with different scouring cleansers were viewed under a microscope, that to which sample E had been applied show several well-defined scratches passing all the way across a 2 millimeter field but sample B gave only traces of very short faint scratches and sample A caused no scratches at all. Samples A and B also pitted noticeably less than sample E.

In a test of cleaning power porcelain squares were coated with a layer of hydrogenated vegetable fat mixed with linseed oil and were then baked in an oven at 280° F. for 22 minutes. After cooling, a mechanical arm, equipped with a stroke counter, was used to rub a slurry of scouring cleanser against the coated plates. The number of strokes required to completely remove the baked-on grease was recorded. Three tests of each powder were run and averages were taken. Similar tests were run on scouring cleansers made from silica from which only the larger size particles had been removed.

It is seen that the non-scratching composition A is as good a cleaner as the controls E and H and that B powder is the next best cleanser. The difference between A and the poorer cleansers C and D is both significant and important. The unusually good cleaning efficiency of A is unexpected. Previous work under the present inventor had established that cleaning power (as well as

Table III

Composition Designator	Parts by Weight and Weight Percent in Size Range									
	A		B		C		D		E	
Size Range, microns (Screen dimension or microscopic measurement):										
250-177									0.2	0.2
177-149									0.4	0.4
149-125									0.9	0.9
125-105									2.1	2.1
105-88			3.4	3.8			3.4	5.1	3.4	3.4
88-74			4.7	5.3			4.7	7.0	4.7	4.7
74-62	5.3	9.0	5.3	6.0	5.3	6.5	5.3	7.9	5.3	5.3
62-53	5.5	9.4	5.5	6.2	5.5	6.8	5.5	8.2	5.5	5.5
53-44	7.1	12.1	7.1	8.0	7.1	8.8	7.1	10.6	7.1	7.1
44-34	8.7	14.8	8.7	9.8	8.7	10.7	8.7	13.0	8.7	8.7
34-26	14.6	24.8	14.6	16.4	14.6	18.1	14.6	21.8	14.6	14.6
26-14	17.6	29.9	17.6	19.8	17.6	21.7	17.6	26.4	17.6	17.6
14-6			22.1	24.7	22.1	27.4			22.1	22.1
6-0									7.4	7.4
Total	58.8	100.0%	89.0	100.0%	80.9	100.0%	66.9	100.0%	100.0	100.0%

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Table IV

Composition Designator	Silica Particle Size	Cleaning Inefficiency Strokes Over Control
A.....	14 microns—200 mesh.....	1
B.....	6 microns—140 mesh.....	11
C.....	6 microns—200 mesh.....	14
D.....	14 microns—140 mesh.....	17
E control.....	0-250 microns.....	10
F.....	0 microns—200 mesh.....	47
G.....	0 microns—140 mesh.....	38
H control.....	0-250 microns.....	10

¹ About 140 strokes needed to clean perfectly.

scratchiness) increased with particle size but in the present case the D cleanser contains more coarse particles and nevertheless the 15 micron-200 mesh composition is superior. Likewise the 6 micron-140 mesh powder is better than the D cleanser. And, of course, both the A and B powders are greatly superior to the F and G compositions. Thus, a non-scratching scouring powder has been made which is of cleaning efficiency equal to that of a commercially successful coarser cleanser.

Composition A rinses off a surface more readily than do B, C, or D which means less effort will be required by the user to remove traces of the powder from the cleaned surface. Composition A also compares favorably with B, C, D and the controls in other important properties, such as foaming power, density and freedom of flow.

The above invention has been described in conjunction with illustrative examples. It will be obvious to those skilled in the art that variations and modifications can be made without departing from the principles disclosed or going outside the scope of the invention or purview of the claims.

What is claimed is:

1. An abrasive detergent composition which is substantially non-scratching to porcelain and is of excellent cleaning power, which consists essentially of a major proportion of silica, the particle sizes of which are distributed throughout the range from about 6 microns to the maximum size which will pass a 140 mesh sieve, the weight distribution of the silica particles being that obtained by size-reducing sand so that a major proportion of the sand subjected to size reduction will pass a 200 mesh sieve and then removing particles outside the 6 micron to 140 mesh sieve range, and a minor proportion, up to about 20%, of a water soluble synthetic organic detergent.

2. An abrasive detergent composition which is substantially non-scratching to porcelain and is of excellent cleaning power, which consists essentially of a major proportion of silica, the particle sizes of which are distributed throughout the range from about 14 microns to the maximum size which will pass a 200 mesh sieve, the weight distribution of the silica particles being that obtained by size-reducing sand so that a major propor-

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tion of the sand subjected to size reduction will pass a 200 mesh sieve and then removing particles outside the 14 micron to 200 mesh sieve range, and a minor proportion, up to about 20%, of a water soluble synthetic organic detergent.

3. An abrasive detergent composition according to claim 2 in which the water soluble synthetic organic detergent is a member of the class consisting of sulfated and sulfonated water soluble foaming synthetic organic detergents.

4. An abrasive detergent composition according to claim 3 in which the water soluble synthetic organic detergent is present in a minor proportion, up to about 10%, and the composition also includes a minor proportion, up to about 10%, of water soluble phosphate.

5. A scouring cleanser which is substantially non-scratching to porcelain and is of excellent cleaning power, which consists essentially of a major proportion of silica, the particle sizes of which are distributed throughout the range from about 14 microns to the maximum size which will pass a 200 mesh sieve, the weight distribution of silica particles being that obtained by size-reducing sand so that a major proportion of the sand subjected to size reduction will pass a 200 mesh sieve and then removing the particles outside the 14 to 200 mesh sieve range, a minor proportion, up to 10% of sodium alkyl benzene sulfonate in which the alkyl group is a propylene polymer of 12 to 15 carbon atoms and a minor proportion, up to 10%, of sodium tripolyphosphate.

6. A scouring cleanser which is substantially non-scratching to porcelain and is of excellent cleaning power, which consists essentially of 75 and 95% of silica, the particle sizes of which are distributed throughout the range from about 14 microns to the maximum size which will pass a 200 mesh sieve, the weight distribution of the silica particles being such that about 50% thereof are over 34 microns and about 30% are over 44 microns, this weight distribution of the silica particles being that obtained by size-reducing sand so that a major proportion of the sand subjected to size reduction will pass a 200 mesh sieve and then removing particles smaller than 14 microns by air separation and removing any particles which will not pass a 200 mesh sieve by screening, 0.5 to 10% of sodium alkyl benzene sulfonate in which the alkyl group is a propylene polymer of 12 to 15 carbon atoms and a minor proportion, up to 10%, of sodium tripolyphosphate.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

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July 19, 1960

Ramon Bruno Diaz

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 55, for "ingredients" read -- ingredient --; column 4, line 5, for "silica" read -- silicate --; column 6, line 30, for "powder" read -- power --; column 7, Table I, under the heading "Size Range, Microns (screen dimension)", eighth item, for "62.53" read -- 62-53 --; column 9, line 17, for "15 micron-" read -- 14 micron- --.

Signed and sealed this 11th day of April 1961.

(SEAL)

Attest:

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