

UNITED STATES PATENT OFFICE

2,480,579

DETERGENT PRODUCTS AND THEIR PREPARATION

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No Drawing. Application October 21, 1943, Serial No. 507,185

5 Claims. (Cl. 252—138)

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The present invention relates to a process of treating particles of synthetic detergents and, more particularly, to a process for treating water-soluble non-soap organic detergents of the type of organic sulphates and sulphonates in sprayed and granulated form to impart desirable properties thereto and to the product of such process.

During recent years, various synthetic detergents have been developed and many, especially those of the type of organic sulphates and sulphonates, have exhibited properties which have caused them to be regarded as more suitable than soap for certain uses. This has been true to such an extent that there is now a wide market for a great variety of such detergent products. In general, because of greater technical facility of manufacture and relative ease of solution in water, most of these detergents are produced and sold in particulate form.

Although generally more satisfactory in the form of particles for many uses, synthetic detergents in such form have certain disadvantages. One of these is that the product comprises an appreciable portion of fines, some of which are small enough to cause a dust nuisance. A small amount of the dust may be incidental to the manufacture of the particulate product, but the more undesirable, extremely fine particles are apparently produced during handling, packaging and transportation by mechanical action of larger particles against each other, resulting in their disintegration. Moreover, particles of most synthetic detergents are dried to very low moisture content to reduce tackiness, and in this dry condition they are frangible and tend to break down to fines far more readily when subjected to adventitious shocks, abrasion and the like than when moist.

Most of the dry synthetic detergents are also somewhat hygroscopic and, particularly in humid atmospheres, absorb enough moisture to become tacky, causing caking of the particles during filling operations and in the package. This is a considerable disadvantage in industrial use, as well as from a household consumer merchandising aspect. A further disadvantage is low "apparent density," by which term, as applied to the product of the process, is meant the weight of an amount of the material which occupies a unit volume, including the volume of interstitial spaces, pores and cavities. Because of the nature of these materials, no method of tower control has been found adequate for varying the apparent density of spray-dried detergent particles to the extent desired.

It is an object of the present invention to pro-

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vide a process for producing spray-dried particles of synthetic detergents having relatively high apparent density.

It is another object of the invention to provide a novel process for treating water-soluble non-soap organic detergents in the manufacture of said detergents in sprayed, granulated and chip forms, to reduce dust.

It is also an object of this invention to provide a process for treating particles of water-soluble non-soap organic detergents to minimize tackiness.

Another object of the invention is to provide a process for controlling the apparent density of beads and granules of synthetic detergents.

The present invention also has as an object the provision of spray-dried synthetic detergents of relatively high apparent density.

The invention further provides water-soluble non-soap organic detergents, particularly of the type of organic sulphates and sulphonates, which are free-flowing and of only slight dust-forming tendency.

Other objects and advantages of the invention will be apparent from the following description.

According to the present invention, the apparent density of particles of water-soluble, non-soap, organic detergents may be controlled by applying to the particles a moistening agent and impacting said particles while in a plastic condition. While it may be preferred to carry out both of these steps in order to obtain the best results in density control, either step may be separately employed to vary the apparent density, and, where both steps are used, the impacting operation may be performed before, after or simultaneously with the application of the moistening agent. Additional benefits of the invention may be realized by proper selection of a moistening agent containing a material to be deposited upon the particles to reduce dust and/or to minimize tackiness in the product. In order to reduce dust therein, the deposit thus applied to the detergent particles is a material capable of inhibiting or retarding disintegration of detergent particles when dry. Tackiness may be minimized by depositing upon the particles a material which is capable of setting or drying to non-tacky condition and which is preferably non-hygroscopic. A suitable deposit or coating agent may be adapted both to reduce dust and to minimize tackiness in the detergent particles.

The process of the present invention thus provides a method for treating synthetic detergents in particulate form to control and preferably to

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Increase their apparent density and/or to reduce dust therein and/or to minimize tackiness. While, according to the preferred embodiments of this invention, all of these desirable properties may be imparted to synthetic detergent particles, the invention also contemplates modifications of the coating agent and/or process steps to impart these properties individually or in any desired combination. The products thereby produced are also within the contemplation of the invention.

The non-soap detergents which may be treated in accordance with the present invention are water-soluble salts of organic-substituted, polybasic, oxygen-containing inorganic acids, including sulphates and sulphonates, borates and sulpho-borates, ortho-, tetra-, pyro- and polymetaphosphates, phosphites, etc., and are preferably of the type known as organic sulphonate salts, that is, salts of an organic sulphuric or true organic sulphonic acid. The organic elements with which the inorganic acid radical is combined may have not only organic substituents, such as alkoxy, acyloxy and ketonic groups, etc., but may also have inorganic substituents, such as unesterified hydroxyl groups, thiosulphates, halogens, halogenoids including cyanides, cyanates, thiocyanates, etc., and the like. The organic sulphonate salts are preferably produced by neutralization with bases or alkalis of the products of the sulphation or sulphonation of various materials, including fatty oils, saturated and unsaturated fatty acids, mineral oils, mineral oil extracts, mono- and di-glycerides, partial esters or ethers of polyglycerols, esters or ethers of glycols, polyglycols and polyalcohols, aromatic and alkylated aromatic compounds, long-chain alcohols and olefines, coal tar distillates, and numerous other organic compounds and mixtures of compounds.

These organic compounds, the sulphates or sulphonates of which may be neutralized as aforesaid with an alkaline or basic material, can be sulphonated by any of several methods and may form any of several products, depending upon the method of sulphation or sulphonation employed. The sulphated or sulphonated organic compounds include sulphonated mineral oil; conventional mineral oil refinery sludges; sulphonated mineral oil extracts, including the products described in U. S. Patents Nos. 2,149,661, 2,149,662 and 2,179,174; sulphonated fatty acids and oils, including sulphonated castor oil, sulpho-ricinoleic acid, sulphonated olive oil, and sulpho-oleic acid; long-chain aliphatic sulphonates and sulphates, including cetyl sulphuric acid, dodecyl acid sulphate, and tetradecanehydroxy sulphonic acid-1,2; aliphatic ether and ester sulphonates, including the dodecyl ether of hydroxy ethyl sulphonic acid, the cetyl ether of glyceryl sulphonic acid, tallow monoglyceride monosulphate, and coconut oil fatty acid monoesters of beta methyl glycerine sulphonic acid; sulphonates prepared by treatment of organic materials with sulphur dioxide and chlorine in the presence of light and hydrolysis of the product; sulphonates prepared by treatment of organic bodies with sulphuryl chloride and an activating agent in the presence of light and hydrolysis of the product; fatty acid amides of amino alkyl sulphonic acids, including lauric amide of taurine and tall oil acid amide of amino glyceryl sulphonate; sulphonic acids of naphthenes and naphthenic acids; lignin sulphonic acids; aromatic and alkylated aromatic sulphonic acids, including naphthalene sulphonic acid, dodecyl benzene sulphonic acid, and octadecyl naphthalene sulphonic acid; the product of

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a mineral oil extract sulphonated while dissolved in liquid sulphur dioxide; and innumerable other organic sulphonic and sulphuric acid derivatives or mixtures thereof.

The synthetic detergents may be produced in particulate form by any suitable method, including spraying solutions of material during or after neutralization to form beads or grains; drum- or roll-drying to produce flakes and chips; granulation of flakes and chips thus prepared or produced by other methods; granulation or chipping of the detergent in massive form, etc.

Synthetic detergent particles, especially in the form of grains and beads, are generally of relatively low apparent density. This can be appreciably raised to desirable higher values by subjecting them to impact. The impacting action may be produced in various ways, e. g., by tumbling the particles in a rotating drum, hurling or blowing them against a surface, etc. The particles should be in a plastic or semi-plastic condition during such impacting action to avoid breakage of the particles with consequent formation of a fine dust. Such plasticity may be obtained by controlling the amount of moisture left in the untreated particles after its formation and/or by applying thereto any moistening agent, whether water, other volatilizable liquid or a plasticizer. The moistening agent may be one, such as water, which subsequently evaporates off in large part, or it may be a solution or suspension which, upon drying, leaves a deposit upon the particles. The deposit may be of such nature as to affect the apparent density of the product and/or to reduce dust therein and/or to minimize tackiness.

The apparent density of synthetic detergents in particulate form can be varied by applying to the particles a material of different density therefrom. Various methods of applying the material may be employed, such as spraying the particles with the material to be deposited thereon in a liquid vehicle, preferably during agitation of the particles, e. g., by passage of said particles through a rotating drum; spraying the particles, with a liquid vehicle containing the material to be deposited, in the tower in which the detergent particles are made by spray-drying, or spraying them in a second (or "post-drying") tower; spraying the material and liquid vehicle therefor upon a cascade of synthetic detergent beads or grains before and/or after cooling; tumbling beads or grains of the detergent, particularly after cooling, through a fine stream of a liquid vehicle containing the material to be deposited; tumbling said detergent grains or beads, while plastic and tacky, together with the material in dry form, etc. According to one of these methods, the detergent in plastic, semi-plastic or dissolved form is sprayed into an air stream in a tower, and the resulting grains or beads are passed to a cooling drum in the usual manner, the detergent particles are tumbled in the drum, and the coating material (or material to be deposited) in a liquid vehicle is sprayed upon the particles during the tumbling operation. The coating material may be dissolved or suspended in the liquid vehicle, or it may be present in the colloidal state or emulsified therewith. A material of lower density than the detergent particles tends to reduce the apparent density of the treated product, but this effect may be masked by an increase in apparent density due to impacting the particles while in plastic condition.

In general, in practicing the invention, when it is desired to raise the apparent density of

particles of a synthetic detergent, the particles are preferably sprayed with a moistening agent, whether or not containing a material to be deposited, and are thereafter tumbled to provide an impacting action. If it is desired to obtain detergent particles of lighter apparent density, the particles are preferably first cooled and thereafter sprayed with a coating agent without subsequent tumbling. It will be understood from the foregoing, that, where desired, detergent particles may be sprayed with a moistening agent, with or without a material to be deposited contained therein, at or near either end of a cooling drum or throughout the entire cooling operation.

The temperature at which the moistening agent is applied to the detergent particles may vary widely. Thus a colder liquid body is of assistance in removing heat from the particles. Another advantage that the application of a colder solution or suspension (e. g., one at about room temperature) has is that, when it comprises a material to be deposited, it sets faster and forms a coating upon the particles more quickly than when a hot solution is used. In spite of these factors which favor the use of cool treating agents, it is sometimes advisable to use a hot solution. Thus, with other factors the same, the higher the temperature of the coating agent, the greater is the apparent density of the coated product. In general, temperatures of about 70° F. to about 150° F., and particularly temperatures for the coating agent of about 110° F. to about 130° F., provide satisfactory results in the preparation of detergent particles.

In selecting a moistening agent for application to synthetic detergents in particulate form, the choice may be made with a view to appreciably reducing, or even eliminating, dust formed in the process of manufacturing the particles or from adventitious causes in handling, packing and shipping these detergents. While agitation of the particles with almost any moistening agent, even water, may be employed to produce agglomerates and to reduce dust, many such agents are easily volatilized and may leave a product which disintegrates after packaging to form dust. It is therefore preferred to provide a moistening agent which coats the particles with a material capable of inhibiting disintegration of the detergent particles after removal of volatilizable liquid. It is also preferred that, where a moistening agent containing a material to be deposited on the particles is used, such material have little tendency to powder, although a brittle material may be employed in combination with a binder or plasticizer.

Various materials may be employed as moistening agents for reducing dust-forming tendencies. These include solutions of water-soluble siliceous materials, such as water-soluble silicate salts including sodium and potassium silicates; alkali metal phosphates, such as disodium dihydrogen pyrophosphate; alkali metal borates, citrates, sulphates, etc.; sodium bicarbonate; glues; certain gums, resins and waxes including rosin and water-soluble polymerized ethylene oxide, etc.; and mixtures of these. It may also be desirable to include in the moistening agent one or more liquids having low vapor pressures, such as heavy white mineral oils, polyhydric alcohols including glycerol, sorbitol, mannitol, erythritol, etc., polyvinyl alcohol, and the like, or water-soluble polyhydric alcohols may be employed alone as the moistening agent. It is also a feature of the invention that the detergent particles can be

self-coated, applying a solution of the same or a different synthetic detergent to the particles to coat them. Such detergent solutions may also contain other coating or binding agents, such as those mentioned supra.

Some materials useful as moistening agents have the additional advantage of minimizing tackiness, even under humid atmospheric conditions. These agents usually comprise a liquid vehicle which is easily volatilized to leave a deposit or coating material which is solid at ambient temperatures and preferably non-hygroscopic. Among these are solutions of water-soluble siliceous materials, such as water-soluble silicate salts, including those mentioned in the preceding paragraph; alkali metal phosphates, especially non-hygroscopic phosphates, such as disodium dihydrogen pyrophosphates; glues; starch; certain gums and waxes including water-soluble polymerized ethylene oxide, and the like. Some coating materials are thus adapted both to reduce dust and to minimize tackiness.

When a moistening agent comprising a material for forming a solid deposit upon detergent particles is used, water is preferably employed as the liquid vehicle, although other easily volatilizable solvents, such as the lower monohydric alcohols, hydrocarbons, cyclic hydrocarbons, aromatic hydrocarbons, chlorinated hydrocarbons, etc., may alternatively be used. These include methyl and ethyl alcohols, hexane, octane, cyclohexane, benzene, carbon tetrachloride, etc.

The proportion of coating material in the product (on the dry basis) may vary widely. In general, a proportion of about 1% or higher up to less than an amount which adversely affects the detergency of the product is preferably employed, but the invention is not limited to these proportions. Thus, proportions considerably below 1% (e. g., 0.5% or less) of coating material are effective in reducing dust and/or minimizing tackiness. Similarly, while proportions of coating material above about 10% (on the dry basis) in the finished product are seldom employed, so that high detergency may be maintained, it will be understood from the foregoing that considerably higher proportions of coating materials may be used, if desired, particularly where the coating material has a deterative character, such as where the detergent particles are self-coated. If the presence of the coating material upon the particles tends to shift the pH of a solution obtained by dissolving said particles in water, the choice of ingredients in the coating and/or the proportions of said ingredients therein and/or the proportion which the weight of the coating bears to the total weight of the particle may become important.

After being sprayed with a moistening agent, the synthetic detergents in particulate form may be dried in any of various ways. They may be dried during the impacting action, if desired, as by passing a stream of air through the rotating drum in concurrent or countercurrent flow with respect to said particles, or they may be dried after spraying and/or impacting by being spread upon a conveyor or upon trays and passed through a drier, or in any other suitable manner.

Arbitrary tests for comparing the tackiness of various materials or their tendency to form dust have been set up, and it is believed that these tests provide good indices of dust-free and free-flowing characteristics in the materials tested. The dust-forming test is a visual test. The material to be tested is poured into a large funnel,

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the tip of the stem of which is twelve inches above the bottom of a receiving vessel. The material is suddenly dropped through the funnel, and the cloud of dust which arises is observed and estimated.

Comparisons of tackiness are made by both visual and tactile perception. The less tacky the material, other factors being equal, the greater is its tendency to be free-flowing, and an indication of this tendency can be obtained by putting a quantity of the material into a large funnel, as in the dust test of the preceding paragraph, dropping the material through the funnel, and observing the angle of repose of the material. The more tacky a material is (other factors being equal), the greater is the angle which it makes with the horizontal. Moreover, wide differences in tackiness are readily observable by the sense of touch.

The following examples are merely illustrative of the present invention, and it will be understood that the invention is not limited thereto.

Example I

About 20 parts by weight of a synthetic detergent in the form of beads comprising 35% of the sodium salt of the sulphuric acid ester of coconut oil fatty acid monoglycerides and 65% of sodium sulphate on the dry basis and containing some 1% to 2% of moisture is put into a rotating drum and is there sprayed with 1 part of a 23% aqueous solution of said synthetic detergent. Before spraying, the beads and drum are at a temperature of approximately 75° F., and the spraying solution is at 130° F. After spraying, which operation is completed in about ten minutes, the coated beads are tumbled for an additional ten minutes and are then dried in the air for thirty minutes. The beads are considerably coarser than the original material, contain very little dust and have an apparent density of 0.38 gram per cubic centimeter, as compared with an apparent density of 0.25 gram per cubic centimeter for the untreated beads. The coated product also flows more freely, as indicated by a reduction in angle of repose to 33° from an angle of 37° for the untreated beads.

Example II

About 90 parts by weight of synthetic detergent beads such as are described in Example I are vigorously tumbled in a rotating drum at a temperature of approximately 75° F. While being tumbled, the beads are sprayed with 20 parts of a coating agent at 120° F., said coating agent comprising 5 parts of a commercial 38.4% aqueous solution of sodium silicate (1 part Na₂O:3.25 parts SiO₂) and 15 parts of a 40% aqueous solution of said synthetic detergent. After spraying is completed, vigorous tumbling is continued for ten minutes, and the coated beads are dried in air for thirty minutes. The moisture content of the coated product is approximately 5%, and, even with this increased moisture, the product is particularly free-flowing, especially as compared with the untreated material. The particles are very coarse, and very little dust is present. The apparent density of the coated beads is 0.31 gram per cubic centimeter, as contrasted with 0.25 gram per cubic centimeter for uncoated beads.

Example III

A coating agent is prepared by making up an aqueous slurry containing 30% of disodium dihydrogen pyrophosphate and 2% of a polymerized

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ethylene oxide having a molecular weight of about 4,000. The slurry is heated to 120° F., and 10 parts by weight of said slurry is sprayed upon 90 parts of beads of the synthetic detergent described in Example I, said beads being at 75° F. before the spraying and being vigorously tumbled in a rotating drum throughout the spraying operation. After an additional ten minutes' tumbling and thirty minutes' air drying, the coated product is examined. The beads thus produced are very coarse in appearance, flow freely, show no visually perceptible dust when subjected to the dust test described supra, and have an apparent density of 0.50 gram per cubic centimeter.

Example IV

A coating agent comprising sodium silicate is prepared by dissolving 1 part by weight of a commercial 38.4% aqueous solution of sodium silicate (1 part Na₂O:3.26 parts SiO₂) in 3 parts of water. The coating agent thus prepared is heated to 125° F. and is sprayed upon 40 parts by weight of synthetic detergent beads such as those described in Example I. The beads are at room temperature before spraying and are vigorously tumbled during the spraying operation. After the spraying is completed, the spraying time being about fifteen minutes, the beads are tumbled for an additional fifteen minutes and are then set out in the air to dry and to set. The coated product contains considerably less dust than the untreated material, as determined by the dust test described; the apparent density is raised to 0.36 gram per cubic centimeter from the 0.25 gram per cubic centimeter of the untreated beads; the angle of repose is 32°, as compared with 37° for the uncoated beads, indicating minimized tackiness; and a comparison of the foaming characteristics of the materials indicates that the treated beads show improved foaming in hard water over the untreated material.

Example V

About 98 parts by weight of beads of the synthetic detergent described in Example I are vigorously tumbled in a rotating drum at room temperature and are there sprayed with 10 parts of a coating agent at 120° F. The coating agent contains 2 parts by weight of a polymerized ethylene oxide having a molecular weight of about 4,000, dissolved in 8 parts of water. After the beads have been sprayed, the tumbling is continued for approximately seven minutes, and the beads are then spread out in the air to dry. The coated beads thus produced are practically free of dust, are free-flowing and have an apparent density of 0.30 gram per cubic centimeter.

Example VI

Tetrasodium pyrophosphate is acidified with sulphuric acid to a pH below 7.0, and an aqueous coating agent is prepared by mixing 18% of the acidified phosphate and 10% of glycerine with water. The coating agent is heated to 100° F., and 1 part by weight thereof is sprayed upon 10 parts of beads of the synthetic detergent described in Example I. The beads are tumbled in a rotating drum at room temperature during the spraying, which takes about fifteen minutes, and the tumbling is continued for an additional ten minutes. The treated beads are then air-dried. The resulting product comprises well-formed beads and practically no dust, and the apparent density is 0.38 gram per cubic centimeter.

Example VII

About 47 parts by weight of beads of a synthetic detergent comprising 36% of a sodium alkyl aryl sulphonate and about 60% of inorganic salt are put in a drum, and 15 parts of a 20% aqueous solution of said detergent is sprayed upon the beads in the drum. The drum is rotated and the beads are vigorously tumbled therein during the spraying and for some ten minutes thereafter. The product is air-dried for a half hour and is examined. The coated beads are coarser in appearance and contain appreciably less dust than the untreated material, and the apparent density of the product is raised to 0.14 gram per cubic centimeter, as compared with an apparent density of 0.11 gram per cubic centimeter for the unsprayed beads.

Example VIII

A slurry containing 25% of disodium dihydrogen pyrophosphate and 1% of a water soluble polymerized ethylene oxide having a molecular weight of 4,000 in water is heated to 120° F., and 10 parts by weight of said slurry is sprayed upon 48 parts of the synthetic detergent described in Example VII. The synthetic detergent beads are at room temperature before spraying and are vigorously tumbled during the spraying operation, the tumbling being continued for ten minutes after the spraying has been completed. The coated beads are examined after being dried for some thirty minutes, and no visually perceptible dust is observed upon subjecting them to the dust test described supra. The angle of repose of the product is 30°, as compared with 33° for the untreated beads, indicating that the coated beads flow more freely.

Example IX

Grains of a synthetic detergent, comprising about one-third an organic sulphonate produced by neutralization of an organic sulphonyl chloride resulting from the reaction of sulphur dioxide and chlorine in the presence of light on a paraffin base mineral oil fraction having an average molecular weight of about 235 and two-thirds inorganic salts, are passed through a 10-mesh screen. About 95 parts by weight of said grains are placed in a rotating drum at room temperature, and 10 parts of a 19.2% aqueous solution of sodium silicate (1 part Na_2O :3.26 parts SiO_2) at 120° F. are sprayed upon the grains. The grains are vigorously tumbled in the drum while being sprayed and for about ten minutes thereafter, and they are then air-dried for about thirty minutes. The coated product is then compared with the untreated material. The unsprayed grains are very tacky with considerable tendency to cake and contain considerable dust, as indicated by the dust test described above. The coated product is free-flowing with greatly reduced tackiness, and there is almost no dust present. The coated grains have an apparent density of 0.47 gram per cubic centimeter, as compared with an apparent density of 0.57 gram per cubic centimeter for the untreated material.

Example X

A 50% aqueous slurry of disodium dihydrogen pyrophosphate is prepared, and 10 parts by weight of said slurry is sprayed upon 90 parts of the synthetic detergent grains described in Example IX, said grains being vigorously tumbled during the spraying. The tumbling is continued for ten minutes after completion of the spray-

ing operation, and the sprayed grains are then air-dried. The coated product obtained is lighter in color than the untreated material, is dust-free, and has an apparent density of 0.51 gram per cubic centimeter.

Example XI

Beads of a synthetic detergent comprising about 40% of sodium lauryl sulphate and 60% of inorganic salts are examined and are observed to be extremely dusty when subjected to the dust test described supra, to exhibit an angle of repose of 36° from the horizontal, and to have an apparent density of less than 0.21 gram per cubic centimeter. About 95 parts by weight of this detergent is put in a rotating drum at approximately 75° F., and 20 parts of a 25% aqueous slurry of disodium dihydrogen pyrophosphate containing 1% of a water soluble polymerized ethylene oxide having a molecular weight of 4,000 is sprayed upon the beads in the drum. The slurry is at 120° F., and the beads are vigorously tumbled during the spraying and for about ten minutes thereafter. They are then air-dried for about a half hour, and the coated product is observed. The coated beads are coarser and less dusty than the untreated detergent, the angle of repose is reduced to 33°, and the apparent density is increased to 0.26 gram per cubic centimeter.

Example XII

About 98 parts by weight of beads of the synthetic detergent described in Example XI are vigorously tumbled in a rotating drum at approximately 75° F. and are there sprayed with 10 parts of a moistening agent at 120° F. The moistening agent contains 2 parts by weight of a water soluble polymerized ethylene oxide having a molecular weight of 4,000 dissolved in 8 parts of water. After being sprayed, the beads are tumbled for an additional ten minutes and are then dried. The coated beads thus produced are practically free of dust, assume an angle of repose of 34° when subjected to the test for free-flowing characteristics hereinbefore described, and have an apparent density of 0.27 gram per cubic centimeter.

Coating agents suitable for use in the present process may be modified by the addition of pigments and/or organic dyes. Thus, a small proportion of titanium dioxide (e. g., about 0.5% on the dry basis) may be incorporated in the coating to give a considerably whiter product. The addition to the coating agent of a material adapted to provide a slippery feel to the particles, such as gum tragacanth, gum arabic, quince seed, etc., may also be employed.

The present invention has been described with illustrative examples and proportions, but it will be appreciated by those skilled in the art that variations and modifications of the invention can be employed, and equivalents substituted therefor, without departing from the principles of the invention.

The term "particle" used in the present specification and in the appended claims is intended to include sizes and shapes of material having at least one dimension of relatively low order, such as grains, beads, chips, flakes and other forms having proportionately large surface area. Particles having solid centers are usually referred to as "grains," while hollow particles are generally known as "beads." Grains and beads frequently occur together and are distinguishable

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from chips and flakes in that all of their dimensions are of relatively low order.

The term "organic sulphonate" as used in the appended claims is intended also to include organic sulphate salts, which are frequently known as "sulphonates" in common usage.

The words "coat" or "coating" are not to be understood as limiting. Whether the detergent particle is completely enclosed in a film of the moistening agent and/or of the material deposited thereon, when sprayed and/or dried, is not known. What is known is that, by applying the moistening agent to the detergent particles, as is disclosed and described herein, the objects and advantages desired are attained.

The term "moistening" as used herein comprises the application to detergent particles of a liquid body, including water and aqueous solutions or suspensions, and other liquids, whether or not containing solid materials dissolved or suspended therein and/or mixtures of these.

The term "drying" as used herein includes the removal of moisture, whether water or other relatively volatile liquid, in excess of that desired in the final product.

I claim:

1. The process which comprises spraying the surfaces of particles of non-soap synthetic organic sulphonate detergent with an aqueous solution of a water-soluble alkali metal silicate in sufficient amount to render said particles plastic, tumbling said particles, and drying said particles.

2. The process which comprises spraying the surfaces of particles of non-soap synthetic organic sulphonate detergent with an aqueous solu-

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tion of a water-soluble alkali metal phosphate in sufficient amount to render said particles plastic, tumbling said particles, and drying said particles.

3. Detergent particles which comprise a core of water-soluble organic sulphonate detergent and a surface coating comprising alkali metal silicate.

4. Detergent particles which comprise a core of water-soluble organic sulphonate detergent and a surface coating comprising alkali metal phosphate.

5. Detergent particles which comprise a core of water-soluble organic sulphonate detergent and a surface coating comprising alkali metal phosphate and a normally solid water-soluble polymerized ethylene oxide.

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