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DEDUSTING PROCESS AND THE PRODUCT THEREOF

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This invention relates to improvements in the manufacture of soaps and more particularly to powdered, granulated or comminuted soaps substantially devoid of objectionable finely divided soap dust particles; the invention relates also to methods of manufacturing such soaps.

Granulated or powdered soaps usually are formed in one of three well-known ways, namely, grinding, in which dried soap is comminuted and reduced to a powdered condition; spray-cooling, wherein a hot liquid soap that is capable of crystallizing is sprayed into a current of cooling air; and spray-drying, wherein a hot liquid or semi-liquid soap or soap mix is sprayed into a current of heated drying gas to evaporate a portion of the water and cause the soap to solidify as particles.

Soaps of these types are usually packaged in cardboard cartons and are sold to the consuming public in this convenient form. While such soaps are highly desirable from the standpoint of ease in solubility and convenience in use, when they reach the consumer they contain a quantity of finely divided soap particles. A material proportion of this dust or fines is capable of being air borne. The portion of the dust capable of being air borne is usually released upon opening the carton and pouring the soap therefrom. It is this air borne soap dust that has been found in many cases to irritate the membranes of the nose and throat, causing coughing and sneezing.

The dust particles or fines also have a tendency to lump together on the surface of the water and resist solution. This characteristic of comminuted or powdered soap products has long been recognized in the industry and attempts have been made to eliminate the dust or at least materially reduce the quantity in the product.

The attempts to overcome this difficulty have led to improvements in spray drying processes, by means of which the soap is formed into more or less rounded and discrete individual granules. Such granules are small enough to dissolve readily, but also large enough to greatly minimize the disadvantages of the so-called "dusting." The factors affecting the size and character of the soap granules produced in a spray drying process are well known. For example, fine particles can be puffed to above dust size if high temperatures and other conditions are employed. However, large puffing generally is not desirable, for in doing this to the fine particles, the total product is bulked to such a large degree that in general there is present too small an amount of soap in any given volume, and the product does not have

desirable sudsing properties. Furthermore, large puffing creates thin walled particles more susceptible to breakage, thus tending to increase the dust content of the product.

In spite of the exact control now possible, there is still generally an objectionable amount of dusty material in the product at the time the customer uses it. A proportion of "fines" unavoidably results from the commercial manufacturing processes. Dust formed during the process of manufacture could be made relatively unobjectionable in the final product by an efficient dedusting process after manufacture and prior to packaging. One of the principal causes of dust in the packaged product is the disintegration of the particles after the product is packaged. This may be because of conditions of storing and handling before or after the carton or package is opened for use.

Attempts to remove finely divided material of dust size by screening before packaging have not been successful, however, for the reason that screens of sufficient fineness to allow separation of the dust become clogged, and, at best, remove only a part of the dust. Even assuming that a screening process removes the dust formed during the production of the soap, it cannot remove the dust which is formed in the package.

The formation of dust in the package results, in part, from disintegration of the soap particles during handling and is increased by drying out of the soap. A soap product such as, for example, a spray dried soap, may consist of more or less spherical globules, each having one or more voids therein. A moisture content of between 10 percent to 20 percent is normally present in typical forms of granulated soaps at the time they are manufactured and packaged. This moisture content is sufficient to render the particles somewhat plastic and resistant to shattering. As long as this moisture content is maintained at substantially its initial amount, there is little tendency for the soap to form dust. However, if the soap dries, as is often the case, the plasticity of the particles is then reduced. Upon being subjected to shock or abrasion, the dried and friable particles will break or shatter and thus form additional quantities of dust. Low moisture content also impedes any tendency towards a reaggregation of the fines into larger agglomerates. In addition, loss of moisture permits a migration of fillers or builders in the soap, such as sodium carbonate, sodium sulfate and sodium silicate, toward the surfaces of the particles where they deposit as crust or groups of crystals. These

crystals are separable by abrasion from the larger particles as dust. In the case of the more alkaline fillers, such as sodium carbonate or sodium silicate, this form of dust is of a particularly irritating nature. There is also a tendency for the dust to remain in suspension in the air because of the presence of static charges of like sign on the particles. Such electrical dispersing charges may be created as a result of friction between the particles and the package during handling. The presence of adequate moisture content in the particles, however, largely eliminates the effects of static electricity.

The breaking up or disintegration of the soap particles also has the undesirable effect of reducing the apparent volume of the soap in the cartons. This creates an adverse psychological effect upon the user when the package of soap is opened, inasmuch as it would appear as if less than the full quantity of soap were present in the package.

It has been suggested that drying out of the soap particles might be avoided by packaging the granulated soap in moisture-proof containers. While this increases the cost of packaging, it will, of course, prevent drying of the soap as long as the package is unopened, but inasmuch as the entire contents of the soap package ordinarily is not used immediately after opening the package, the remainder of the soap will dry out readily upon standing in a dry place, and objectionable dust will be formed.

My invention may be utilized to overcome and avoid at least some, and preferably all, of the disadvantages and difficulties of the type indicated above, as well as others, in comminuted friable substances and for preserving and improving such substances, particularly those of the type of soap. In this connection the invention may preferably be utilized to substantially reduce the tendency of granulated or powdered soaps or other such friable substances to disintegrate or change their physical state with consequent dust formation. The invention may also be preferably utilized to maintain the moisture content of soap particles substantially constant despite variations in relative humidity so as to minimize and prevent the drying out of the soap particles with a resultant undesirable formation of dust. The invention may be utilized to minimize or eliminate dust particles present in a soap product, for example, by a cohesive or adhesive action causing them to aggregate into or adhere to larger particles and to increase the strength of soap particles, and consequently there is little or no tendency to disintegrate or change their state.

I have subsequently set forth preferred examples and illustrations of how my process may preferably be practiced to produce desirable products. It is possible, of course, to utilize the invention in such a manner as to obtain only certain of the desired characteristics or results. In general, desirable results may be obtained by applying to the soap particles a coating of a material which acts to prevent the formation or the objectionable presence of the dust. The material to be applied may be selected from a large group of suitable substances to be described hereinafter.

In accordance with the present invention the individual soap particles or granules may be coated with a material that functions primarily to strengthen the soap particles physically and which may also act as a binding agent to bond

the small dust particles together or to the larger particles to form particles larger than the so-called soap dust.

These coating compositions should be present in sufficient proportion to obtain the desired results and yet not in such proportion that they will cause lumping and formation of aggregates of such size that the characteristic of rapid dissolving, which is desirable in granulated soaps, is materially reduced. Preferably, these coating compositions should not be particularly soluble in the soap itself for the reason that such soluble compounds would tend to diffuse into the soap particles, thereby reducing their effect and requiring a larger and more costly quantity of the coating composition to be used. Any material tending to be absorbed by the soap particle decreases its desirability for my purpose. Preferably these substances should be either water-soluble or water-dispersible.

Typical coating compositions of this type are the wax-like polyhydroxide condensation products which may be water-soluble. Also, the product known as "Carbowax" which comprises polymerized ethylene glycol is very satisfactory.

If the coating compositions are water-insoluble, the soap particles should not be completely covered thereby because otherwise they would not dissolve in water. Accordingly, coating compositions of this type should be applied so that the soap particles are more or less spotted or discontinuously coated with bands, spots or lines, thus leaving fairly extensive uncoated areas, while at the same time imparting the necessary strength to the particles.

A typical coating composition of this type is methyl cellulose, which may be sprayed on the individual soap particles to form the desired type of coating. Higher ethers of cellulose are much less water-dispersible and are, therefore, less suitable for use with granulated soap. Another example of a suitable agent is polyvinyl alcohol. Depending upon the degree of polymerization of the polyvinyl alcohols, the coatings made thereof are more or less soluble. However, coatings formed of these partially polymerized alcohols may, as a rule, be fairly easily dispersed in water. They are quite adhesive and hence may be used in a very small proportion while at the same time serving as effective binding agents without being present in sufficient quantity to cause filming on the particles.

Other film-forming agents which are suitable for strengthening the particles and binding the dust or fines together or to the larger particles are various starch compositions. These range from the natural corn and potato and similar starches which are readily dispersible in water to treated starches such as the soluble starches and dextrans. Certain of these compositions possess the property of binding water. As a consequence, they not only add strength to the granules of soap, but also assist in maintaining their plasticity.

The various materials mentioned may be used alone or in any admixture.

It is desirable to prevent excess quantities of the coating material from impinging upon the soap particles in order to prevent them from sticking or lumping together and interfering with their normally free-flowing properties. Since the coating material is applied only to the surface of the particles, very small quantities are required. This makes the process particularly economical and achieves results that would be

prohibitive from the standpoint of cost if the material were incorporated within the soap before it was placed in granular form. For example, one or two pounds of "Carbowax," which is a water-soluble wax-like plastic solid, may be sufficient to treat 100 pounds of a soap of the following composition:

	Per cent
Anhydrous soap-----	64.25
Soda ash -----	4.75
Sodium silicate -----	16.25
Salt, glycerine, etc-----	1.25
Water -----	13.50

"Carbowax" has an elementary composition approximately as follows:

	Per cent
Carbon -----	51.63
Hydrogen -----	9.19
Oxygen -----	39.18

"Carbowax" is sometimes identified by the numbers "1500" and "4000" which refers to the approximate molecular weight of the particular blends. The "1500" "Carbowax" is said to be a mixture of approximately equal proportions of nonaethylene glycol and a polymer of ethylene glycol having a molecular weight of 1540. The "4000" "Carbowax" is a polymer of ethylene glycol and has a molecular weight of 3600. These products melt at 96° F. and 126° F., respectively, and have specific gravities of approximately 1.15 and 1.20.

It will be understood that a greater or less amount of the coating composition referred to may be used, depending on the character and physical characteristics of the granulated soap treated. Greater amounts of these coating compositions may be used although this increases the cost of treating the soap and, when some coating compositions are used, such as methyl cellulose, may decrease the solubility of the soap.

The coating materials may be applied to soap particles in various ways, and at any convenient time between the formation of the soap particles and the packaging step. The coating materials are preferably atomized and the soap particles allowed to fall through the atomized coating material. It is desirable to maintain the finest possible mist or fog of the material to be applied so that the most effective application can be made and even the finest of the dust particles forced into contact with the treating material. It has been found that a series of repeating treatments is effective in obtaining a desirable dust free product. Also, the coating composition may be applied by spraying in a rotary drum through which the soap particles are tumbled.

It will be understood that suitable aerating or drying devices may be provided in order to facilitate setting of the applied materials if desirable, for example, methyl cellulose or starches.

The major portion of the soap particles treated will, for the most part, vary in particle size from about 20 to 80 mesh. They may be coated completely or partially with a single coating composition or a blend, simultaneously or in separate stages, as already described. Any fine, objectionable, dust-like material will be coated and will tend to bond with the larger particles or with other fine material to form aggregates of a size larger than the average size of the dust particles. This will be the case not only with disintegrated or fine soap particles but also with any dust formed as a result of the migration or separation

of the ingredients ordinarily present in the soap composition, such as the hydrating salts.

It has been found that in general, dust particles of a mesh of 140 or smaller are undesirable in the final product and are considered as dust. It has been found that dust particles of about 400 mesh or smaller, as calculated on the bases of formulas for standard screens, will be air borne under conditions of relatively low air movement. These air borne particles might average 50 microns in size and smaller. They are, therefore, particularly undesirable as they can readily move into contact with the membrane of the nasal passages to cause irritation. Larger particles than 400 mesh may be air borne under conditions of increased air movement and for the same reason should be rendered innocuous.

From the foregoing it will be apparent that the present invention has resulted in the production of a novel dustless type of granular or comminuted soap product and that a simple process has been provided for obtaining such dustless soap granules. It will be understood that the present process can be applied to any of the usual types of granulated or powdered soaps in order to overcome their objectionable dusting characteristics and that by means of the process shrinkage in packaging or in weight may be largely avoided.

It will be understood that coating compositions similar to but other than those mentioned specifically above may be used without departing from the invention. Therefore, the forms of the invention described above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. A process for treating granulated soap to reduce the amount of soap dust therein comprising applying to at least a portion of the surfaces, only, of soap particles a normally solid water-dispersible coating agent adapted to cause cohesion of said soap dust to said finely divided particles, to strengthen said particles physically and render them resistant to disintegration by abrasion and impact.

2. A process of treating granulated soap to prevent the formation of soap dust therein comprising applying to a portion of the surfaces, only, of finely divided soap particles a liquid containing a normally substantially solid water-dispersible, soap-insoluble coating agent, and solidifying said agent to reinforce said particles and render them more resistant to disintegration by abrasion and impact.

3. A soap product comprising finely divided soap particles having on at least a portion of their surfaces a superficial coating, only, of a water-soluble, wax-like agent comprising polymerized ethylene glycol.

4. A soap product comprising finely divided spray dried soap particles having on at least a portion of their surfaces a superficial coating, only, of a water-soluble wax-like mixture of nona-ethylene glycol and polymerized ethylene glycol in the proportions of about 1 to 2 pounds thereof to about 100 pounds of said soap.

5. A process of treating soap to prevent the formation of soap dust which comprises spraying a substantially soap-insoluble, water-soluble normally substantially solid agent on finely divided soap particles to render said particles slightly cohesive and to stabilize their moisture content, whereby disintegration of said soap particles into soap dust is substantially prevented,

6. A method of treating spray-dried soap particles having a puffed rounded form to prevent the formation of soap dust, which comprises applying to said soap particles a superficial surface coating of a water-soluble, wax-like agent comprising polymerized ethylene glycol.

7. A soap product comprising spray-dried free-

5 flowing soap particles having at least a partial surface coating only of a normally substantially solid, water-dispersible, soap-insoluble coating agent reenforcing said particles and rendering them more resistant to disintegration by abrasion and impact.

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