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2,328,568

PROCESS FOR DEDUSTING COMMINUTED SOAP

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Fig. 1

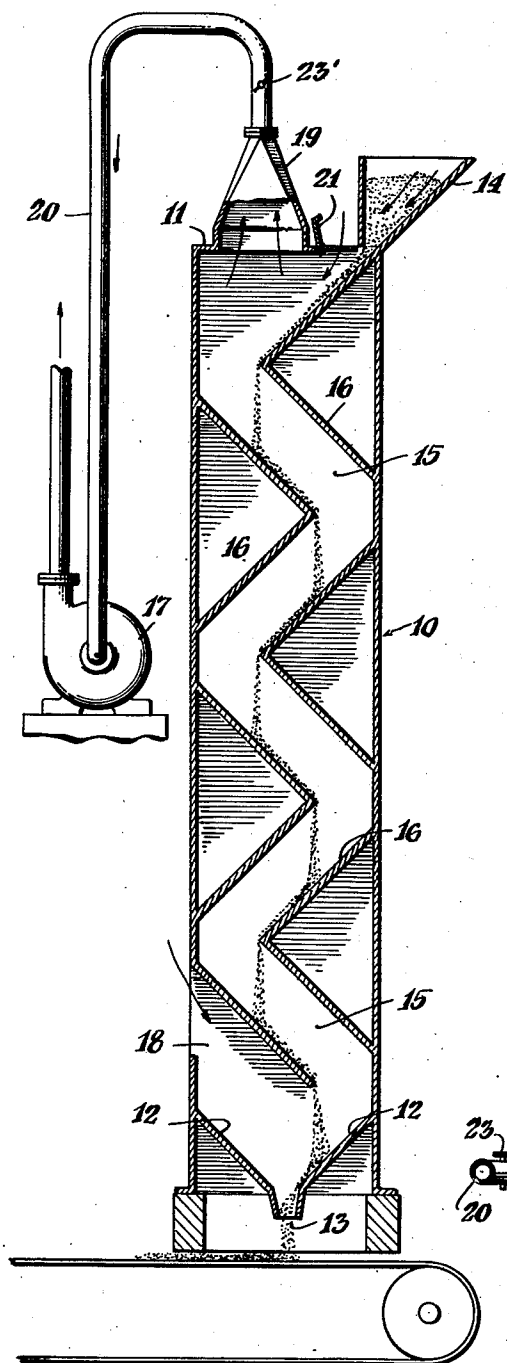
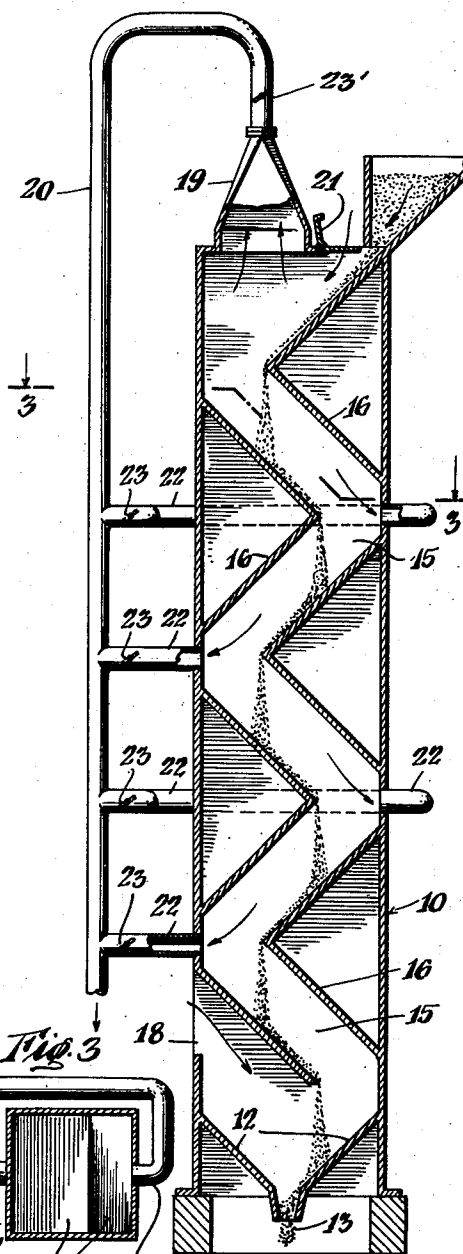
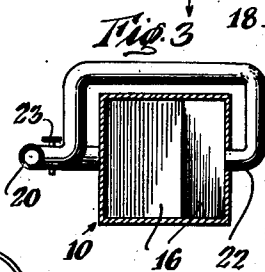


Fig. 2



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UNITED STATES PATENT OFFICE

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PROCESS FOR DEDUSTING COMMINUTED SOAP

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3 Claims. (Cl. 252—367)

This invention relates to classification of finely comminuted materials, and has particular reference to an improved method for separating excessively fine soap particles from comminuted soaps, and the improved soap product.

In general, the forming of comminuted soaps is accomplished by spray drying the liquid soap stock to obtain particles in characteristic granule form. The dried soap particles are classified within designated limits of particle size by a screening operation, and packaged. Commercial grades of comminuted soap ordinarily range in particle size between those particles passing a 20 mesh screen and retained by an 80 mesh screen, the oversized particles and fines being returned to the manufacturing system for reprocessing. However, with screening methods presently in use, soap fines and dust occur in the packaged product in amounts varying between 5% and 30% of the total pack.

The presence of soap fines and dust in the comminuted product is objectionable for several reasons. The fine particles have an irritating effect on the nasal passages. Such a dust irritating effect may become apparent in several ways. For example, the user of a comminuted soap of undesirably high dust content may sneeze and cough on opening a package of such soap or in pouring it out for use. This undesirable effect is also particularly apparent in the comminuted soap manufacturing process. Objectionably large amounts of dust are formed during the manufacture of comminuted soap and the problem is difficult to overcome in view of the pulverulent properties of the soap particles.

Soap dust extracting methods heretofore employed in comminuted soap manufacture have been, in most cases, entirely inadequate, and in many cases the use of dust masks by workmen associated with the screening and packaging rooms is necessary.

Moreover, the wastage of soap between the spray drying and screening operations by excessive sifting or filtration from apparatus and entrainment of fine particles in the air, is considerable. It has been found that the presence of large amounts of fines in bulk comminuted soaps causes undesirable variance in bulk-weight proportions of the packaged granules.

The forming of small amounts of fines in comminuted soaps during screening and packaging is unavoidable, due to agitation of the particles inherent in these operations. However, the accumulation of large amounts of fines in bulk comminuted soaps during manufacture and prior to

screening leads directly to air pollution through excessive dusting, and enhances the inefficiency of the screening operation as an accurate method of particle classification, due to clogging of the screen mesh.

It has been discovered that a comminuted soap containing in the bulk only those particles retained by a 140 mesh screen is not objectionable from the point of view of causing the nasal irritation often indicated by excessive coughing or sneezing. Removal and collection of soap dust of such fineness is not satisfactorily accomplished during the screening operation due to the tendency of the bulk soap to retain a portion of the dust, and the tendency of microscopic particles to entrain in air upon agitation, the effect of gravity thereon being negligible. Similarly, apparatus presently available for classification and dedusting of relatively hard materials such as case hardened soap drops and the like, are not adaptable to the refining of bulk comminuted soaps, due to the fragile nature of the soap particle and the tendency to crumble with excessive agitation, reducing the percentage of packageable dedusted product.

It is an object of the present invention to provide an improved method of separating excessively fine soap particles from bulk comminuted soaps, without undue loss of packageable soap by powdering, under excessive agitation.

A further object is to provide a method of controlling dust accumulation and filtration in comminuted soaps to produce a comminuted product having a very low dust content.

A still further object is to provide a bulk comminuted soap product having a low content, preferable less than 1%, of objectionable fines and soap dust, upon packaging.

Other objects and advantages will appear from the following description and drawing, wherein:

Figure 1 is a view in vertical section of the soap particles classifying and dedusting apparatus of the invention;

Figure 2 is a similar view of a modified form of apparatus of the present invention; and

Figure 3 is a view in top section along the line 3—3 of Figure 2 and looking in the direction of the arrows.

Referring to Figure 1 of the drawing, the numeral 10 indicates a tower preferably rectangular in cross-section, having a top wall 11 and bottom plates 12 converging to a particle discharge outlet 13. A hopper 14 discharges into a tortuous chamber 15 enclosed by a series of ramps 16 positioned to form inclined falls throughout the

tower. The chamber 15 at its lower portion connects with the outlet 13, which discharges to a conveyor 24 or other device suitable to divert the soap particles into containers. A suction pump 17 adapted to draw a flow of gaseous medium such as air through an air inlet 18 into the chamber 15 at its lower portion exhausts spent gaseous medium through an aperture in the upper wall 11 by means of a hood 19 and a conduit 20. A damper 21 at the upper portion of the chamber 15 provides a means of controlling the velocity of the airflow up through the chamber 15 as it permits air to be bled in at the top.

In the modified form of the invention shown in Figure 2 of the drawing, conduit 20 leading from suction pump 17, branches into a series of auxiliary conduits 22 opening into the chamber 15 at points adjacent the sequences of the ramps 16. The conduits 22 permit the carrier air to be drawn off at intermediate zones in the tower. Dampers 23 in each of the conduits 22 permit of control of the rate of exhaustion of gaseous medium through each. There is also a control damper 23' in the draw-off conduit 20.

In operation, the pump 17 is operated to provide an airflow in chamber 15. This airflow has preferably a fixed velocity determined in accordance with the degree of particle separatory action desired. The comminuted soap product is continuously introduced into the chamber 15 through the hopper 14, falling by gravity over the inclined ramps 16 to ultimate discharge through the outlet 13. The slope of the ramps 16 is selected to permit of free gravitational fall of the particles of soap which are subjected to a series of winnowing actions as they pass over the ends of the ramp sequences and fall by gravity through the upflowing air to the surface of the ramp next below. It is essential that the rate of feed and the slope of the ramps 16 be correlated to obtain a particle flow characterized by minimum agitation, in order to preserve the particle form of the packable soap and avoid pulverization. The air, traveling counter to the particle fall, entrains and carries the excessively fine particles of soap dust through the hood 19 and conduit 20 to suitable particle recovery means, not shown, such as a cyclone separator, or a dust bag for example. The degree of particle separation effected will depend upon the velocity of the flow of air in the tortuous chamber 15, which velocity may be varied as desired by proper manipulation of the damper 21. For example, if it is desired to separate only those dust particles passing through a 140 mesh screen from the bulk soap, a moderate counter-flow velocity may be provided by opening the damper 21. If it is desired to effect removal of all soap fines and dust passing through, for instance, an 80 mesh screen, the velocity of the counterflow may be duly increased by closing the damper 21 to exert the full effect of the suction generated by the pump 17 on the counterflow in the chamber 15.

In the modification shown in Figure 2 of the drawing, comminuted soap is introduced into the chamber 15 and a suitable gaseous counterflow generated therein, as described. By means of the auxiliary exhaust conduits 22, portions of the counterflow are exhausted from the chamber 15 at zones immediately subsequent to the winnowing operations. In this manner the dust carried by the air is immediately separated and the possibility of its return to the downflowing mass of soap particles is minimized. Any danger of overloading of counterflow with soap dust prior to

ultimate exhaustion through the hood 19 is avoided. By proper adjustment of the dampers 23 and 23', the rate of withdrawal of portions of the airflow in the chamber 15 may be controlled in accordance with previously determined conditions of dust concentration in the soap bulk, and the airflow velocity desired at designated points along the length of the chamber 15. If desired, additional air may be bled into the chamber at points intermediate the ends thereof to replace the dust-laden air withdrawn through conduits 22, thus avoiding operating at decreasing linear velocities from the bottom to the top of the chamber. For instance, as the maximum concentration of dust in the comminuted soap bulk will occur upon initial introduction of the soap particles into the chamber 15, it may be desirable to introduce additional air and to operate the top auxiliary conduit 22 with the damper 23 in position to restrict the flow therein and thus maintain a maximum velocity of the counterflow at the first ramp sequence. The number of auxiliary conduits 22 may be varied as desired.

The angle of incline of the ramps 16 may be determined in accordance with the relationship of the ramp slope to the desired rate of travel of the particles thereover. The rate of travel is also dependent upon the size and density of the soap particles and the velocity of the upward flow of air. By reducing the area between the ramps at points along the length of the tower 10, the velocity of the airflow will be proportionately increased at those points. It has been noted, for example, in a test unit having a capacity of 200 ounces per minute of a standard spray dried soap screen through 20 mesh and with 6 ramps or falls at an angle of 45 degrees that a spacing of eleven inches was desirable between the inclined ramps. The air volume was about 450 cubic feet per minute and the velocity of flow about 500 feet per minute. A screen analysis of the soap originally and after treatment gives the following data:

Screen analysis	Originally	After treatment
Held on 20-mesh	0.1	0.1
Held on 30-mesh	11.6	13.1
Held on 60-mesh	63.5	71.1
Held on 80-mesh	10.8	9.1
Held on 140-mesh	8.5	5.3
Held on 200-mesh	3.0	0.6
Through 200-mesh	2.4	0.4
Through 80-mesh	13.9	6.3
Through 140-mesh	5.4	1.0
Packable soap recovered		87.50

By simple experimentation with ramp positioning, airflow velocity and volume and positioning of the damper 21, in accordance with the principles indicated and taking the aforementioned factors of particle size, density and rate of feed into consideration, operation of the novel particle separating and dedusting apparatus of the invention may be maintained at peak efficiency to obtain a dedusted bulk comminuted soap product having a percentage content of objectionable fines and soap dust considerably under 1.0% of the total bulk. For a given rate of feed of soap particles, which rate has an optimum value for any given size of the apparatus there will be a critical volume of airflow determined by the setting of the damper 21, and a critical velocity of airflow, determined by the spacing between the ramps 16 and the setting of damper 21, at which adjustment a maximum efficiency of dust separation both from the mass

of soap particles as they pass from the surface of the ramps and from the particle screen as the particles pass across the upflowing air. This, furthermore, as a result of our invention, may be amplified without undue loss of packable soap granules as a result of the separation.

Desirable results, we have found, may be obtained commercially by utilizing an air volume of about 6000 cubic feet per minute and an air velocity of about 600 feet per minute. When operating under these conditions of air velocity and volume, the width of the unit preferably is about 10 feet and the spacing between the inclined ramps preferably is about twelve inches. Obviously, for commercial purposes, a greater capacity may be obtained by utilizing multiple towers. For example, a battery of three towers operating under the above conditions of air volume and velocity will have a capacity of about 40,000 lbs. of soap per hour. With this rate of feed, a material containing 3 to 4% of fines through 140 mesh is reduced in fines content to less than 1%.

While it is preferred to carry out the method of the invention in a comminuted soap manufacturing system prior to screening or otherwise classifying the soap particles for packaging, in order to expedite classification, the dedusting operation may be carried out with equally successful results subsequent to screening, or at any other point in the manufacturing process subsequent to spray drying of the soap particles. By incorporating the method of the present invention into presently used processes for manufacturing comminuted soap, operating inefficiencies incurred through air pollution and waste of product through dust filtration are eliminated. The method of the invention provides a bulk comminuted soap product with an effectively standardized bulk-weight proportion, and having a soap dust content of less than 1% prior to packaging.

While the invention has been described herein with reference to specific structure, these references are made by way of illustration. It is intended to include all equivalents within the scope of the invention, which is to be limited only as defined in the appended claims.

We claim:

1. A method of dedusting bulk comminuted

soaps comprising particles of varying sizes and including substantially in excess of 1% of particles passing through a 140 mesh sieve, comprising conducting the bulk soap in a continuously flowing thinly dispersed particle layer over a tortuous path with minimum disintegration of the particles, providing successive intervals of free gravitational fall of the said particle layer at each successive change in direction of the tortuous path to form successive curtains of falling particles, passing a gaseous carrier medium counter to the flow of the curtains of falling particles and at an angle thereto, and at a velocity to provide a series of successive winnowing actions on the soap particles at each of said successive changes in direction of the tortuous path to entrain the soap dust content of the particle layer to an extent that the particles so treated will have less than 1% passing through a 140 mesh sieve, and separating the gaseous carrier medium with the entrained dust from the soap particles.

2. A method of treating a pre-formed comminuted soap product having particles of varying sizes and containing substantially in excess of 1% of fine particles passing through a 140 mesh sieve, which comprises forming a plurality of vertically falling curtains of said particles, passing a gaseous medium through said curtains of particles at an angle to the vertically falling particles and at a velocity such as to entrain a major portion of the fine particles in the gaseous medium so that the particles falling through said gaseous medium will contain less than 1% of particles passing through a 140 mesh sieve.

3. A method of treating a pre-formed comminuted soap product having particles of various sizes and including substantially in excess of 1% of particles passing a 140 mesh sieve, which comprises forming a plurality of falling curtains of said particles and passing a gaseous carrier medium through said curtains of particles at an angle to the vertically falling particles and at a velocity of not less than 500 feet per minute, whereby objectionable fine particles are entrained in the moving gaseous medium and separated from the remaining falling soap particles.

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