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METHOD AND APPARATUS FOR PRODUCING LIGHT BULKY SOAP PARTICLES

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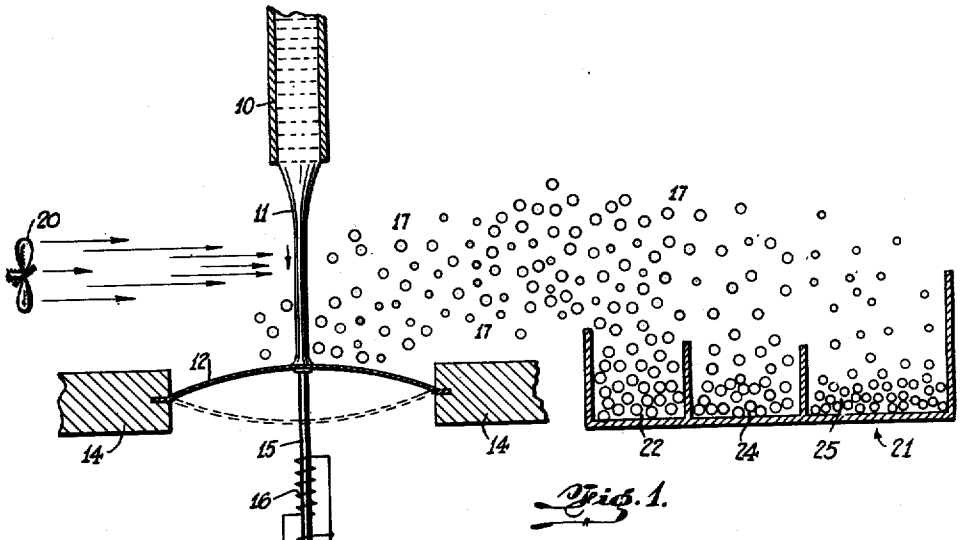


Fig. 1.

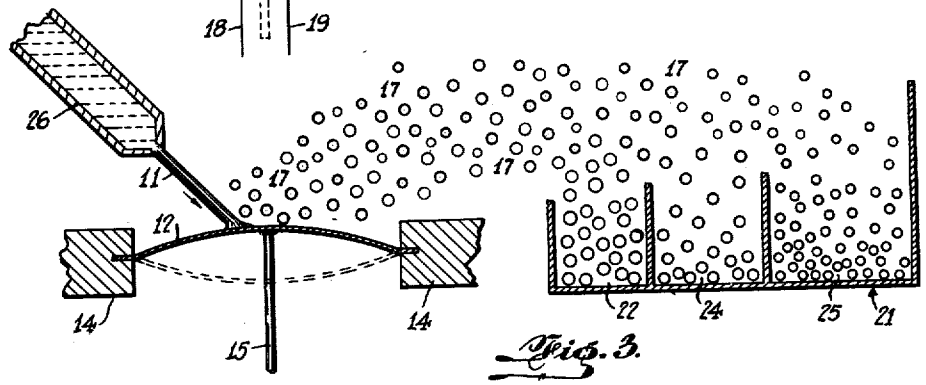


Fig. 3.

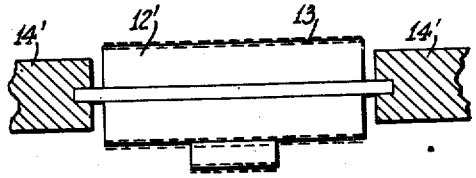


Fig. 2.

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METHOD AND APPARATUS FOR PRODUCING LIGHT BULKY SOAP PARTICLES

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6 Claims. (Cl. 83—91)

This invention relates to new and useful means and methods for the comminution of fusible solids and more particularly to methods for the production of light bulky soap particles containing entrapped air.

One object of the invention is to provide an improved soap particle which quickly dissolves and simultaneously produces heavy and voluminous suds.

Other objects of the invention are to provide an improved device which utilizes a vibrator for breaking up particles and which may avoid the use of nozzles having fine apertures susceptible to clogging.

Additional objects of the invention are to effect simplicity and efficiency in such methods and apparatus and to provide an extremely simple device or apparatus of this kind which is economical, durable, and reliable in operation, and economical to manufacture and use.

Still other objects of the invention will appear as the description proceeds; and while herein details of the invention are described in the specification and some of the claims, the invention as described in the broader claims is not limited to these, and many and various changes may be made without departing from the scope of the invention as claimed in said broader claims.

The inventive features for the accomplishment of these and other objects are shown herein in connection with an apparatus for the comminution of materials which briefly stated, includes means for passing a stream of material against the surface of a vibrating body whereby the stream is broken up into small particles, while the vibration agitates the particles so that air is occluded in the material. The fine particles are then removed from the zone of the vibrating body and classified.

Such an apparatus is especially suited to the production of soap particles having great bulk, but may be used for the comminution or granulation of almost any fusible material which may be solidified by a gaseous coolant.

In the accompanying drawing showing, by way of example, three of many possible embodiments of the invention, and in which similar characters of reference indicate corresponding parts:

Figure 1 is a partially diagrammatic representation of one form of the invention;

Figure 2 is a fragmentary sectional view showing another form of the vibrating body, and

Figure 3 is a partially diagrammatic representation of another form of the invention.

Using the production of soap particles to illustrate the use of the invention, molten soap from a suitable source, such as a pipe 10 is allowed to fall in a molten stream 11 onto the upper face of a vibrating member, such as a diaphragm 12, mounted, for instance, as shown at 14. The vibration should be of a high frequency, depending on the characteristics of the soap and the nature of the desired products. The vibrating member 12 may be set in motion by any suitable means, such as a rod 15 fastened to the latter and actuated by an electromagnetic coil 16 having lead wires 18, 19 operatively connected to a source of power, not shown.

As the stream 11 strikes the face of the diaphragm or vibrating member 12, the liquid is broken up into a number of relatively large particles or drops of molten soap, first by ordinary impact, and then by the vibratory action of the diaphragm. Initially a relatively large globule of liquid may lie on the vibrator, but immediately it is subjected to repeated impact by the diaphragm or vibrator, so as to comminute it thoroughly, and finally disperse it substantially as a fog 17 in the air above.

An outstanding advantage of such comminution is that as long as the globule is large it is heavy enough to substantially remain in contact with the vibrator and will remain molten because of its small cooling surface per unit of weight. As the globule is broken up, the effect of gravity becomes less and the effect of air vibrations tends to hold the minute particles in suspension so that they have a proportionately larger surface exposed for cooling. Thus each portion of liquid remains subjected to division until small particles are obtained. Since the vibration may be very rapid as compared to other methods of comminution, all of the described action may be accomplished in a matter of seconds, or a small fraction of a second. The frequency of vibration may be within the audible range or in either of the inaudible regions.

A further outstanding advantage is that a highly desirable form of hollow soap particle is formed during the described operation. As the molten soap is comminuted and repeatedly "bounced" on the vibrator, a large number of spheres are apparently flattened out into disks and are thrown from the vibrator against the air, thereby causing a doubling back of the peripheral portions of the disks to form a deeply dished or "parachute shaped" effect. The peripheral portions then converge to form a substantially hollow sphere.

The particles are extremely light and bulky and

because of such a state dissolve almost instantly when placed in water. A large quantity of air is, of course, associated with each particle whether it is completely enclosed in a sphere of soap or not; consequently solution of the soap is accompanied by the formation of heavy suds, a feature most desirable to the trade.

My method is easily adapted to the classification of the product which may be accomplished by a flow or stream of air that, may also serve to cool the product in the vicinity of the vibrator surface to blow the product away as it is formed; such a flow may be effected by any known means as, for instance, a fan 20. The flow of air may be so regulated that the dense molten liquid is substantially undisturbed by the air stream, but that the bulky or hollow product is blown into a classifier bin 21, subdivided into troughs or sections 22, 24, 25. The lightest product is thus caught in section 25, the most remote from the vibrator.

While in Figure 1 there is shown a conventional diaphragm as the vibrator, a metallic vibrator 12' (Figure 2) of the known free-free bar type may likewise be used. The vibrator 12' mounted by suitable means, as shown at 14' is especially advantageous when the grade of product must be held to narrower limits, since its period of vibration may be closely controlled and the amplitude of vibration of the surface 13 is equal throughout its entire area. Such vibrators are known to have frequencies as high as 17 kilocycles per second.

Instead of merely allowing the molten soap to pour onto the diaphragm 12 or 12' so that the stream 11 strikes the diaphragm substantially perpendicularly, the soap stream may be directed at an angle, as shown in Figure 3 by means of a nozzle 26 connected to a source of molten soap under pressure, not shown.

In this manner a lateral force is constantly applied to the soap in contact with the diaphragm. This lateral force is a result of two actions. One being substantially a constant impact of the nozzle stream against the soap lying on the diaphragm surface, and the other being a dragging action of the air in natural motion near the stream. The aforesaid lateral force causes the final product to drift away from the diaphragm in a substantially definite direction, as the stream is being reflected from the surface of the diaphragm and toward the classifying bin 21, which is located in suitable relation to the resulting stream of fluffed product; and the different grades of the latter are then caught in the respective compartments 22, 24, and 25.

It is obvious that slight changes may be made in the form, construction and arrangement of the several parts, as shown, within the scope of the appended claims, without departing from the spirit of my invention, and I do not, therefore, wish to limit myself to the exact construction and arrangement shown and described herein.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. A method for making soap particles, said method comprising vibrating a hard surface at high frequency, passing a stream of molten soap obliquely against said surface to impinge thereon, whereby portions of molten soap are repeatedly subjected to rapid impact by said surface and become finely divided into minute particles, and the lateral force of the stream sweeping the particles laterally away from the surface; their distance of travel being dependent on air resistance, and classifying the particles according to distance travelled, as a result of said force.

2. A method for making soap particles, said method comprising vertically vibrating a substantially horizontal hard surface at high frequency, passing a stream of molten soap downwardly against said surface to impinge thereon to substantially form a fog above the surface, and passing a horizontal substantially unconfined stream of cooling air through the fog to solidify the minute particles and transport the resulting solids, the velocity of the air stream diminishing as it leaves the vicinity of the surface, so that heavier solid particles settle from the air stream nearer the vibrating surface than do the lighter solid particles.

3. A method for the production and sorting of light bulky soap particles, said method comprising passing a stream of molten soap downwardly against a substantially horizontal surface to impinge against said surface; vibrating said surface at high frequency, whereby portions of molten soap are repeatedly subjected to rapid impact until they are finely divided into minute particles and substantially form a fog above the surface, and passing a horizontal stream of cooling air through the fog to solidify the minute particles and transport the resulting solids, the velocity of the air stream diminishing as it leaves the vicinity of the surface, so that heavier solid particles settle from the air stream nearer the vibrating surface than do the lighter solid particles.

4. An apparatus for the making of light bulky soap particles having air occluded therein, said apparatus comprising a diaphragm provided with an upper substantially horizontal flat surface; means for passing a stream of molten soap downwardly to impinge against said surface; means for vibrating said surface at high frequency whereby portions of molten soap are repeatedly subjected to rapid impact until they are finely divided into minute particles and substantially form a fog above the surface, the air sound waves distorting the minute particles, so that air becomes entrapped therein, and means for passing a horizontal stream of cooling air through the fog to solidify the minute particles and transport the resulting solids, the velocity of the air stream diminishing as it leaves the vicinity of the surface, so that heavier solid particles settle from the air stream nearer the vibrating surface than do the lighter solid particles.

5. A device for making soap particles, comprising means for vertically vibrating a substantially horizontal hard surface at high frequency, means for passing a stream of molten soap downwardly against said surface to impinge thereon, whereby portions of molten soap on said surface are repeatedly subjected to rapid impact by said surface, until they are finely divided into minute particles and substantially form a fog above the surface, the air sound waves distorting the minute particles so that air becomes entrapped therein, and means for passing a horizontal substantially unconfined stream of cooling air through the fog to solidify the minute particles and transport the resulting solids, the velocity of the air stream diminishing as it leaves the vicinity of the surface, so that heavier solid particles settle from the air stream nearer the vibrating surface than do the lighter solid particles.

6. A method for making soap particles, com-

prising vertically vibrating a substantially horizontal hard surface at high frequency, passing a stream of molten soap downwardly against said surface to impinge thereon, whereby portions of molten soap on said surface are repeatedly subjected to rapid impact by said surface until they are finely divided into minute particles and substantially form a fog above the surface, the air sound waves distorting the minute particles so that air becomes entrapped therein, and passing a horizontal substantially unconfined stream of cooling air through the fog to solidify the minute particles and transport the resulting solids, the velocity of the air stream diminishing as it leaves the vicinity of the surface, so that heavier solid particles settle from the air stream nearer the vibrating surface than do the lighter solid particles.

ALFRED VANG.