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SOAP PRODUCT AND PROCESS OF MAKING SAME

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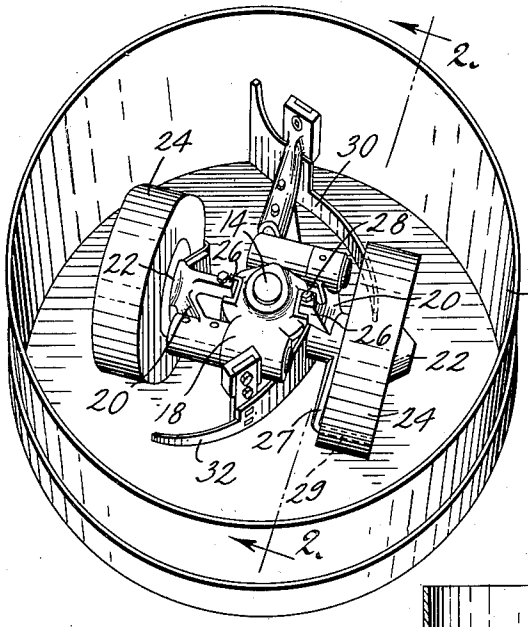


Fig. 1.

Fig. 2.

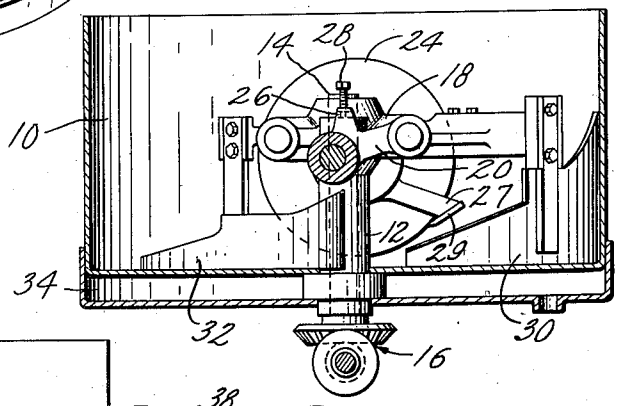
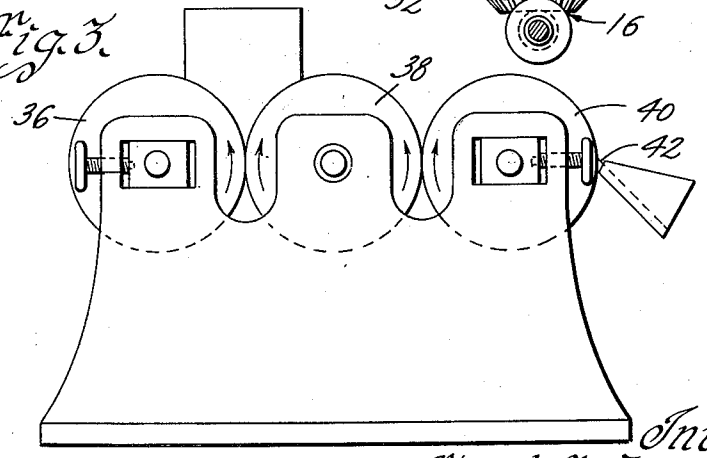


Fig. 3.



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SOAP PRODUCT AND PROCESS OF MAKING SAME

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Application January 27, 1943, Serial No. 473,688

3 Claims. (Cl. 252—367)

Our invention relates to a process or method of manufacturing a finely divided soap product, and to the product resulting from the process.

This application is a continuation-in-part of our prior application, Serial No. 384,844, filed March 24, 1941.

A number of methods of producing a finely divided product are known in the soap industry. Some of these are described, for example, in United States Patents Nos. 1,621,506 and 1,652,900; they require an extensive array of complicated equipment to produce the finely divided product, in addition to the equipment required for the ordinary initial process of manufacturing the soap. The complex character of the necessary equipment, and the space required for it, will be apparent upon reference to the patents mentioned. Some of the processes require careful and constant control of numerous rather critical physical variables, in order to give a satisfactory uniform commercial product.

There have been some processes known whereby finely divided products of relatively low soap content, those ordinarily known as "soap powders," could be manufactured, but none of these processes, so far as we are aware, utilize apparatus and procedures which work equally well for the production of a product of high soap content.

In such mechanical processes of making soap powders as are known to us, it has been necessary to add a liquid medium to the soap in order to take up the salts which are added to the mixture. This usually requires a crutching operation, involving extra time and expense, and special machinery.

According to other methods, finely divided soap products are made by mechanical fragmentation of hardened or solid soap. Processes of this type involve expensive steps for reducing the moisture content of the soap to the point where it can be shredded or ground without clogging up the machine used for the purpose.

It is an object of our invention to provide a process for producing finely divided soap which can be carried out with a minimum of equipment in addition to that needed in a soap works for making soap by any of the commercial methods.

Another object is the provision of a type of process which can be carried out equally well, using the same apparatus, whether the product is a low soap content material (soap powder), a high soap content material (powdered soap), or even a substantially pure granulated soap.

Another object is the provision of a process wherein the step of granulating the soap can be carried out in the same apparatus used for mixing alkaline salts with the soap, where the product is one in which such mixture is required.

A further object is the provision of a method whereby very large amounts of suitable alkaline salts may be thoroughly mixed with hot kettle, semi-boiled, cold process or rapid saponification soaps, without the addition of a liquid medium such as water or water-glass (aqueous solution of sodium silicate) to dilute the soap composition or break down solid gels. In previous methods, the necessity of adding such liquid mediums to get proper mixing has been attended with the consequent time and expense required after mixing for reducing the moisture content to the point where the soap would harden enough for handling or further processing.

Another object is the provision of a process in which tetrasodium pyrophosphate or other similar complex phosphates may be incorporated into a soap without the presence of water at high temperatures, so that breakdown to orthophosphate is minimized.

Still another object is to provide a process in which all ingredients added to the soap can be mixed simultaneously instead of one at a time, as is now common.

Another object is to provide a process in which essential oils or perfumes can be added during the granulating stage, so that thorough mixing is obtained without subjecting the oils or perfumes to high temperatures, which have an injurious effect on delicate odors.

Another object is the production of a granulated filled soap which can be rolled to produce a thin chip or flake product having low density in bulk, and quickly and completely soluble in water.

According to our invention, hot fluid or semi-fluid soap direct from the soap kettle, undiluted and uncrutched, is subjected to the action of a machine in which an intensive mixing is carried on as the soap cools. When the product is one in which alkaline salts or other filler materials are to be incorporated, they are subjected to the action of the machine simultaneously with the soap.

In the drawing we have illustrated certain apparatus with which our process may be carried out. It will be understood, of course, that performance of the process is possible with other apparatus, having an action similar to that of the particular kind shown. It is shown and described, however, in order that there may be a

full and complete teaching of means by which our process may be successfully practiced.

In the drawing,

Figure 1 is a perspective view, looking from above, showing an intensive mixer which may be used for carrying out our process.

Figure 2 is an elevational view, partly in vertical section taken on the line 2—2 of Figure 1;

Figure 3 is a diagrammatic representation of the rolls used when it is desired to convert the granular product resulting from the first stage of our process into a flake or chip product.

In Figures 1 and 2, the reference numeral 10 indicates generally a containing vessel in the nature of a circular stationary pan or tub. In the center is a post 12 within which a shaft 14 is rotated by suitable gearing 16 located below the pan. To the top end of the shaft a crosshead 18 is attached, so that it rotates with the shaft. Links 20 are pivoted to the crosshead so that they can swing about axes in a horizontal plane. On shafts 22 offset from the axes on which they are pivoted to the crosshead, the links 20 carry heavy revolving muller wheels 24. These wheels can roll on the bottom of the pan, or when there is material in the pan the link mounting allows the wheels to ride on the irregular surface of the material.

The shafts 22 are arranged so that the axes are offset, i. e., do not pass through the axis of the vertical shaft 14, as may be seen in Figure 2. Hence the muller wheels have a sideward sliding component as they rotate.

The links 20 have projections 26 extending above the crosshead, and carrying screws 28 which can be brought to bear against the crosshead, thus raising the muller wheels 24 off the bottom of the pan to any desired clearance distance. This adjustment makes it possible to eliminate excessive grinding of the materials.

Arms 27 on the links 20 carry scraper blades 29 which clean the surfaces of the wheels as they rotate.

Plows 30 and 32 are carried on the crosshead, the plow 30 being arranged to scrape material from the side and bottom of the pan 10 and direct it into the path of the muller wheels, and the ploy 32 being arranged to scrape material from the sides the the post 12 and the bottom of the pan 10, also direct it into the track of the wheels.

The result of the combined action of the plows and mullers is an intensive mixing, characterized by a very thorough, rapid and uniform distribution of the materials in the mixture.

To shorten the time required for processing a batch of soap by our method, the pan 10 is preferably provided with a water jacket 34 through which cold water may be circulated to cool the contents of the pan.

In the practice of our method, hot fluid soap is drawn from the soap kettle in fluid or semi-fluid condition, and without dilution or crutching is dropped directly into a mixing machine of the kind shown and described. If an unfilled product is desired, the soap is simply subjected to the intensive mixing action of the machine as it cools.

If a filled soap product is desired, the alkaline salts or other filler materials are placed in the mixing machine along with the fluid soap. As the machine is operated, the combined action of the plows and mullers effects a very thorough, rapid and uniform distribution of the materials in the mixture. No crutching operation is required. There is no necessity for adding water or any other liquid medium to take up the filler materials.

Whether filler materials are used or not, the mass becomes increasingly stiff as it crystallizes and cools. In the machine illustrated, this stiffened mixture is crushed and broken up by the weight and the squeezing, rubbing, sliding action of the mullers, and gradually the mass disintegrates into granules.

The muller wheels should be supported above the bottom by the screws 28, because it is only desired to reduce the soap mass to a granular or fragmentary character, but not to pulverize or powder it. The action differs from that of the ordinary edge-runner mill in that the function of the latter consists essentially in crushing, since the wheel runs or rests on the track or race. For the best exercise of applicants' method, it has been found advisable to support the muller wheels 24 above the bottom of the pan by the adjusting screws 28 a distance which may be on the order of $\frac{1}{8}$ to $\frac{3}{16}$ inch. This avoids a grinding action which would produce a powdered product having some very fine components, difficult to handle during the manufacturing process, Soap in too finely powdered form often tends to lump and agglomerate in water and thus remain for a long time undissolved. Furthermore, the dusty fines float into the air when the soap is used, causing eye and nose irritation and sneezing.

Rotation of the crosshead at 25 R. P. M. gives good results, and, in general, speeds in the range of approximately 5–50 R. P. M. are satisfactory. Because of the slow speed of operation there is no problem of overheating, such as may be present in the use of high speed centrifugal mills. By our method, soaps having a temperature when drawn from the kettle of 150° to 260° F. can be readily handled. The temperature of the soap as it is run into the mixer is the highest temperature encountered. Throughout the process thereafter, the temperature is gradually lowered.

After the mixture has cooled somewhat, during the stage of granulation, essential oils or perfumes may be added. Our process has the advantage that these perfumes will be thoroughly and uniformly distributed throughout the mass, but need not be subjected to the high temperatures which must prevail in ordinary present-day mixing operations or in subsequent drying operations.

Operation of the mixer is continued until the granules are brought to the desired uniformity of size and have cooled to an extent permitting satisfactory handling. The product is then discharged from the mixer and passed through a screen to remove any occasional lumps of soap. If a granular soap is desired, it is ready for packaging and use in this state, without any further processing.

The foregoing description applies to the first stage of our process. The hot fluid soap used may be full boiled, semi-boiled, cold process, or so-called rapid saponification sodium soap, in moisture contents ranging from 6% to 30%. The process may be carried out without the addition of filler materials, or very large amounts of dry inorganic alkaline salts or other materials may be incorporated into the hot soap, giving a uniform, homogeneous product. Hot finished soap can be granulated in less than thirty minutes, and the quantity which can be handled in each batch is limited only by the size of the mixer, which may be made in any practical size.

In its broader aspects our invention contem-

plates the preparation of soap powders such as those containing from about 5% to about 25% of soap, or somewhat more or less; however, it is especially important and useful in connection with the preparation of powdered soaps or soap products containing at least 50% by weight of anhydrous soap, or of the order of 60% to 80% of anhydrous soap or more. Accordingly, we make particular claims to the preparation of powdered soaps, the term being here employed to refer to soap products containing at least 50% by weight of anhydrous soap.

We have found that the granulated soap resulting from the first stage of our process is peculiarly adapted for further processing if a chip or flake product of quick solubility and low density in bulk be desired.

By ordinary methods of mixing, it is not possible to produce a filled soap which is suitable for rolling or ironing without an intermediate drying operation. Soap mixed by ordinary methods contains too much moisture, is not intensively mixed, and tends to form an incoherent, brittle product when ironed or rolled. Where drying is necessary, it requires time and involves the use of expensive equipment, occupying considerable space.

Granulated soap made by our process, however, is ready at once, and can be easily ironed or rolled into thin sheets by use of a system of water cooled steel rollers. We have employed a series of three rolls arranged in a horizontal plane, each of the rolls being sixteen inches in diameter, forty inches long, and having a shell thickness of three and one-half inches. These rolls and their respective directions of rotation are diagrammatically represented in Figure 3. The roll sizes and speeds are not critical, but are indicated simply to show values which can be successfully employed.

The first roll, indicated in the drawing as **36**, is operated at 6 R. P. M., the second one, **38**, at 18 R. P. M., and the third, **40**, at 54 R. P. M. Provision is made for adjustment of the spaces between rolls. Soap granulated by our process is fed between rolls **36** and **38**. In passing between these rolls, the particles are flattened and ironed out somewhat. They adhere to the roll **38**, and are then carried between the rolls **38** and **40**, being rolled still thinner. They adhere to the roll **40**, and are scraped off of it by a knife **42** extending along the roll. We thus obtain a thin, easily soluble flake product which in bulk weighs about one-third as much, for a given volume, as the granulated product.

The sheets or flakes of soap produced by rolling may be broken up by screening to produce a fine, light weight, silky granulated soap.

As illustrations of various applications of our method, we give several examples.

A pure soap or high soap content product may be made as follows:

600 pounds of rapid saponification soap, at a temperature of 260° F., moisture content 6%, is dropped direct from the soap kettle, undiluted and uncrutched, into the mulling type intensive mixer. The mixer is set in motion, water is turned into the cooling compartment, and mulling is carried on while the mass of soap cools, solidifies and disintegrates into small granules under the action of the mixer. This may take about twenty minutes. Perfume is then added and the mulling is continued until the perfume is thoroughly mixed, requiring about five more minutes. The product is then dumped from the mixer and passed through a screen. The soap may be packaged in the resulting form, as a relatively dense product, or it may be rolled as previously described to give a quicker dissolving product of less density in bulk. After rolling, the soap is forced through a screen to make the particles more uniform in size. It is then ready for packaging as a flake or chip product.

A typical filled soap product is made in the following manner:

500 pounds of semi-boiled soap, temperature 240° F., moisture content 10%, is fed direct from the soap kettle into the mulling type mixer in which water softening chemicals have been placed in the following amounts:

	Pounds
Soda ash	25
Tetrasodium pyrophosphate	60
Sodium metasilicate	5
Trisodium phosphate	15

The mixer is set in motion, and water is turned on in the cooling jacket. The mass being worked upon congeals in about five minutes. After about ten minutes of mulling, it disintegrates to small particles. After it has cooled, perfume is added and the mixing is continued for five minutes. The result, as in the first example, is a granulated product which may be packed for use as such, or may at once be rolled and screened to make a chip or flake type of product.

The following procedure is representative of the making of a soap powder, or product high in inorganic salts and low in actual soap content, and illustrates the flexibility of our process:

200 pounds of finished full boiled kettle soap is dropped into the mulling type mixer. This soap may have a temperature of approximately 175° F. and moisture content of 29%. Water may be worked into the soap by the mixer if desired before the chemicals are added, but it has certain disadvantages, as hereinafter pointed out, and satisfactory mixing is achieved without the addition of water. The following chemicals are added:

	Pounds
Soda ash	300
Tetrasodium pyrophosphate	50
Sodium metasilicate	10
Trisodium phosphate	25

Mulling is continued until all the ingredients bind together in a homogeneous mass, and then disintegrate into small particles. The resulting granulated product is ready for packaging and use.

A striking advantage of our method of making soap or soap products is in connection with the use of tetrasodium pyrophosphate or other similar complex phosphates as a filler material. Complex phosphates of this and related character are used in most of the commercial granulated soaps. They aid the action of soap by sequestering the calcium and magnesium salts in hard water. In order to incorporate tetrasodium pyrophosphate into soap by ordinary methods, a liquid medium, such as water, must be employed. But when tetrasodium pyrophosphate is in intimate contact with the water at elevated temperatures—i. e., under conditions existing in the ordinary crutching operation—it breaks down to orthophosphate to a considerable extent, thus losing much of its advantageous effect on hard water.

In our process, we can mix the pyrophosphate directly and thoroughly with the soap because of the intensive mechanical action, so that no liquid

medium is required, and consequently there is substantially no breakdown of the pyrophosphate. The second example given above is representative. This method of introducing pyrophosphate into soap gives a product that is superior in water softening and suds building properties to one in which a corresponding amount has been added by the ordinary crutching method.

In an illustrative case, a typical soap to which 11.5% of tetrasodium pyrophosphate was added by our process without added water or other liquid medium, was found upon analysis to show 11.33% of tetrasodium pyrophosphate in the finished product, showing that hydrolysis to the orthophosphate was negligible.

In some cases, particularly where the soap as drawn from the kettle is in the higher temperature ranges, it may be preferable to add the pyrophosphate in the mulling device after the soap has cooled down somewhat, but while it is still plastic.

It will be seen from the foregoing description that by our invention we have provided a rapid and economical way of processing soap to give a finished product of either high or low density, with the use of a minimum amount of equipment.

We get a dry granular product in which we can incorporate filler materials without crutching, without the necessity of adding soda ash to take up water, and without any other drying operation. Our process can be employed for the making of a product with any proportion of soap from 100% down to very low values. We can do everything necessary for the processing of the soap in one machine, without changing its mode of operation. The granular product obtained in the machine is suitable for rolling at once without drying or other intermediate processing.

When tetrasodium pyrophosphate is incorporated as a water softening agent, we get a product which differs from any similar product known to us, in that the complex phosphate has not been subjected to breakdown by the presence of water at high temperature.

Some changes may be made in the details of procedure involved in the practice of our method, in the construction and arrangement of the parts of the devices which we have described for carrying it out, and in the components of the product made by our process, without departing from the real spirit and purpose of our invention. It is our intention to cover by our claims any variant modes of procedure, the use of any modified forms of structure or mechanical equivalents, and various forms of product which may reasonably be included within their scope.

We claim:

1. A soap-making process comprising the steps of providing an uncrutched and undiluted fluid to semi-fluid hot soap, having a moisture content between about 6% and 30% and a temperature between not substantially below 150° F. and up to about 260° F., introducing said soap into a vessel having mulling rotors carried on a revolving crosshead therein, said rotors being supported so that they run slightly above the bottom of said vessel, and slowly revolving said crosshead together with said rotors, while allowing the soap to cool, until the mass stiffens and is broken down into granules due to the action of said mulling rotors.

2. The process of manufacturing a finely divided powdered soap comprising providing a hot, uncrutched fluid to semi-fluid soap having a moisture content between about 6% and about 30% and a temperature between not substantially below 150° F. and up to about 260° F., introducing said soap into a vessel, and rolling heavy rollers around on the material in the vessel while it cools, until the soap hardens and is broken up into particles.

3. A soap product made by introducing uncrutched and undiluted fluid soap having a moisture content between 6% and 30% and a temperature between 150° F. and 260° F. into a vessel having mulling rotors carried on a revolving crosshead therein, and slowly revolving the crosshead together with said rotors while allowing the soap to cool, until the mass stiffens and is broken down into granules by the action of said rotors.

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