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MANUFACTURE OF SOAP

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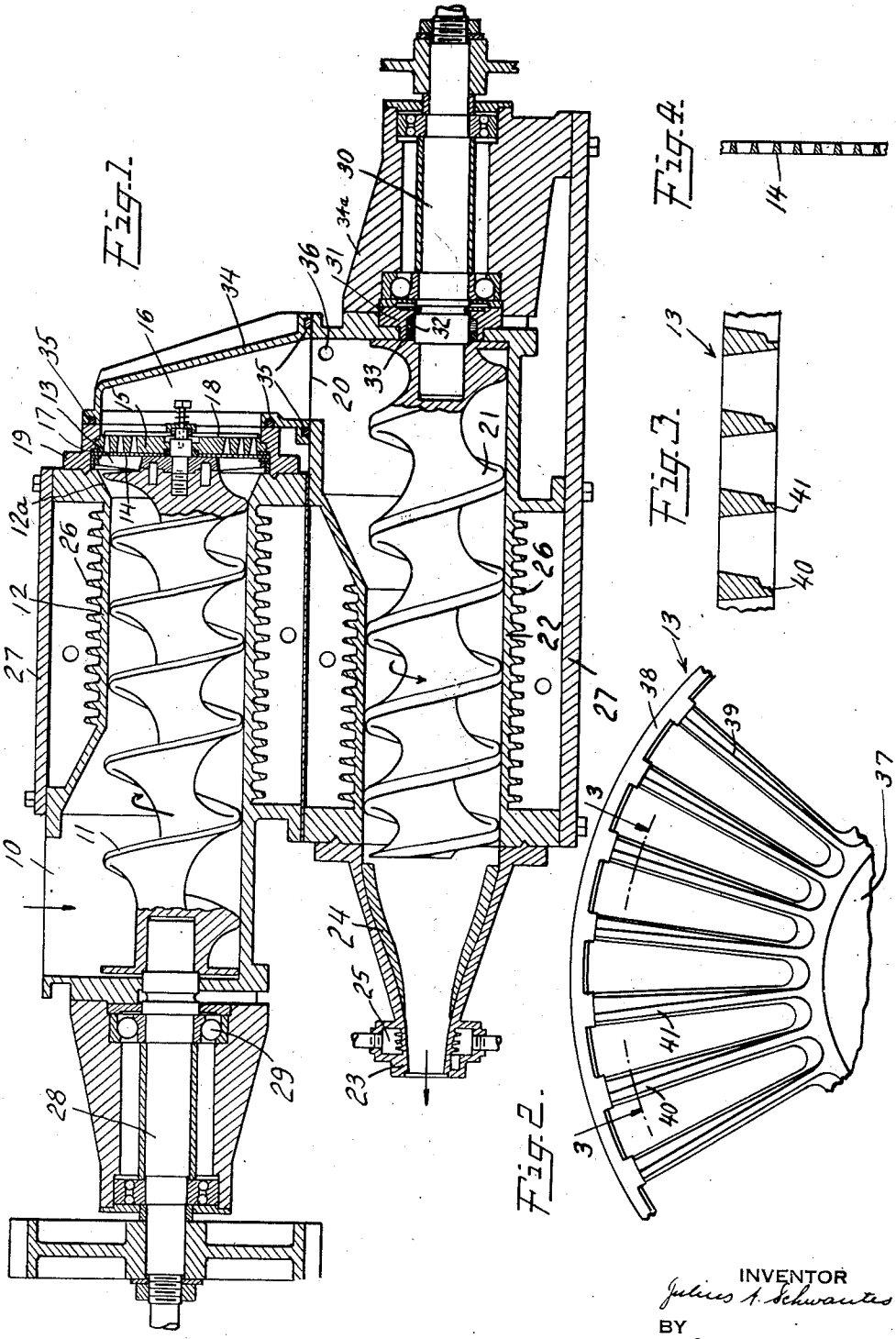


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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MANUFACTURE OF SOAP

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2 Claims. (Cl. 87—16)

This invention relates to the treatment of soap. It relates more particularly to the refining of that type of soap suitable for use as a toilet soap, i. e., a partially dried hard soap. It includes a new process and apparatus advantageously used in carrying out the new process.

Toilet soaps as heretofore produced have been characterized by striations or irregularities in texture. The primary object of the present invention is the production of a hard, partially dried soap free from striations, air pockets and irregularities in texture and the provision of a process and apparatus designed to produce such soap continuously and economically as a plastic, homogeneous, smooth bar adapted for conversion into cakes of finished soap by a simple stamping operation.

Toilet soaps in general are partially dried, hard soaps containing considerably less water than kettle soaps. They are generally produced from kettle soaps by removing a portion of the water content of the kettle soaps and subjecting the resulting partially dry soap to a suitable levigating treatment to plasticize and homogenize it.

In ordinary practice, hot kettle soap is cooled on revolving rolls to form a solidified film which is removed by means of doctor knives in the form of ribbons about one-half to one-eighth inch in width and from one to two-hundredths of an inch thick. These soap ribbons having a water contents of 28 to 30% are dropped onto a screen belt as they are scraped from the cooling rolls and conveyed into a drying room where they are exposed to warm circulating air to reduce their water content to the desired amount, which may vary from 10 to 15% or more, depending upon the use for which the soap is intended. Soaps intended for domestic purposes are generally dried to about 13 to 15% water and soap for export purposes to about 11 to 12%. The hardness of the final soap depends to a large extent upon its water content, soaps with a relatively large water content being softer than those with a smaller water content.

In this drying operation hard particles or specks frequently form in the partially dried soap. These hard particles or specks are minute particles of soap from which a larger proportion of water is removed than is removed from the bulk of the soap. They form partly because the edges of the soap ribbons tend to lose water more rapidly than the center portions of the ribbons and partly because in handling the ribbons it is virtually impossible to avoid a certain amount of breakage with formation of small chips which, because of their large exposed area, dry more rapidly than the main bulk of the soap. These hard specks or particles are also frequently caused by improper storage which allows exposure of a portion of the soap to dry air.

These small hard particles of over-dried soap are objectionable in a finished soap as they impart to it a harsh, gritty texture. They do not absorb water readily and they are not readily homogenized with the rest of the soap. They cannot be eliminated by mere attrition nor by levigation. It is necessary, to produce a toilet soap free from such objectionable hard particles, to crush the particles to such a small size that they are not noticeable. To accomplish this, the partially dried soap is passed through milling rolls.

In this operation the soap is admixed with perfume, coloring matter, etc., and passed through a series of rolls set with progressively decreasing clearances or bites, the last set of rolls generally being set to a clearance of some 4 to 8 or10 thousandths of an inch. The mixing and milling to which the soap is subjected in the milling rolls serve not only to crush the hard particles to a size comparable with the last clearance, but also to levigate and homogenize the soap to insure a uniform product. By setting the clearance of the last set of milling rolls to a few thousandths of an inch all of the hard particles or specks in the soap are reduced to such an extent that they do not impart an objecionable, gritty texture to the final soap even though they are not absorbed by the main body of the soap.

The milled soap with admixed perfume, etc., is then compressed and compacted and extruded into a solid continuous bar of soap suitable for stamping into cakes. In this operation, as usually carried out, the milled soap is fed into a continuous screw or worm revolving within a closed cylinder and compressed and forced through a foraminous plate which converts the soap into filaments of solid soap of much less bulk than the flakes of milled soap. The soap is then plodded, i. e., these filaments of soap are then fed to another continuous screw or worm, also rotating in a closed cylinder, which compacts the filaments and forces the compacted mass through a nozzle or orifice as a continuous bar. Generally in this extrusion operation the cylinder surrounding the worm is cooled by means of water to prevent the soap from becoming too hot and to insure its production in the form of a plastic mass of desired consistency. The nozzle, however, is generally heated so that the surface of the extruded bar has a polished, smooth finish.

The toilet soap thus produced is smooth, homogeneous, and of satisfactory quality, but frequently is characterized by striations or irregularities in texture, which are undesirable. These striations are caused by the inclusion of air in the soap. They are particularly noticeable, and hence objectionable, in colored soap, but are present, so far as I am aware, in all milled or similarly treated partially dried soap. The striations are somewhat reduced by passing the soap through a screen before extrusion but are present to some extent whether the soap is passed through a screen or not.

My invention provides a process in which the desirable features of the ordinary practice are retained and by which a soap having a smooth texture is obtained; but which in addition eliminates the objectionable striations heretofore present in all milled soaps and thus allows the production of homogeneous plastic soap having all of the desirable properties of toilet soap as heretofore produced, but free from striations or irregularities in texture.

In my process the soap is partially dried and milled in the usual manner to convert it into a plastic homogeneous product free from objectionable hard particles. It is then forced through a screen to remove all foreign material and to compact it into the form of relatively dense filaments or threads occupying relatively little space as compared with the flakes or chips resulting from the milling operation. This soap in the form of filaments or threads is then passed through an evacuated chamber which removes all of the air from the mass, and is extruded or plodded while still under the vacuum. By passing the soap, after the preliminary compacting and while in the relatively finely divided state attained when it is forced through the screen, through an evacuated chamber and maintaining the vacuum during the plodding operation, all possibility of including air pockets within the finished soap is precluded and a fissureless, striation-free soap is obtained.

The improvement in soap treated by this process is particularly apparent when colored soaps are so produced, as striations or fissures are particularly apparent in such soaps. The striation-free soap so produced is thoroughly levigated and homogenized by the milling operation and is free from objectionable hard particles. It is uniform in texture and, if during the plodding operation the soap is maintained at a proper temperature, has a desirable plasticity. It differs from prior milled soaps only in the fact that it is free from striations and therefore has a more even texture than such soaps have previously had.

The screening operation to which I subject the milled soap serves the dual purpose of removing all foreign materials from the soap and of reducing the bulk of the soap so that the removal of entrapped air is greatly simplified. It also serves to levigate the soap to a certain extent and to compact it and thereby simplify the final plodding or extruding operation. The size of the orifices in the screen is of no particular importance as long as they contribute the desired screening effect. I prefer, however, to use orifices of a relatively small diameter, e. g., about 12 to 15 thousandths of an inch so that the filaments of soap so produced are relatively small and do not contain entrapped air which might not be removed in the vacuum chamber. Also, by the use of holes or orifices of such a small diameter, effective screening of the soap is insured.

In one embodiment of my invention, I force partially dried milled soap with admixed perfume, coloring matter, etc., thoroughly levigated and with all hard particles crushed to such a size as to be unobjectionable, through a foraminous screen directly into an evacuated chamber whence it drops by gravity into the hopper of a plodder or extrusion machine which is included in the evacuated chamber and is compacted and extruded as a continuous bar of striation-free soap.

The evacuated chamber is conveniently provided by placing a metal hood over the exit end of the screen and over the hopper of the plodder or extrusion machine and connecting the included space to a suitable vacuum device such as a steam injector or a vacuum pump. The screen and the nozzle of the plodder are kept continuously full of soap and thus prevent the entrance of air at these points. It is desirable to maintain a relatively high vacuum, e. g., 27 inches of mercury below atmospheric pressure, more or less, in the evacuated chamber.

The invention will be described in greater detail in connection with the accompanying drawing, but it is not limited thereto. In the drawing:

Fig. 1 is a sectional view in elevation of a machine for plodding milled soap;

Fig. 2 is a view of part of a grinding head adapted to rotate in contact with the screen of the apparatus;

Fig. 3 is a sectional view of the grinding head along the section 3—3 of Fig. 2 showing the construction of the knives; and

Fig. 4 is a sectional view of part of the foraminous plate which is used as a screen.

The machine illustrated in Fig. 1 is adapted for the production of a continuous bar of homogenous, striation-free, plastic soap from partially dried milled soap in accordance with the present invention. In this machine, milled soap is fed into opening 10 from a hopper or a chute (not shown) onto worm 11 which rotates within cylinder 12. The worm carries the soap forward and at the same time compacts or compresses it and subjects it to a certain amount of levigation. The soap is thus forced through grinding head 13 and foraminous plate 14 and through the holes of the backing plate 15 into evacuated chamber 16. The grinding head 13 is directly attached to worm 11 and rotate with it. It is shown in greater detail in Figs. 2 and 3. The screen 14 consists of a sheet metal disc having a myriad of small conical holes flaring away from the worm as shown in Fig. 4. The holes are advantageously conical and flare as shown, to reduce friction and lessen the power required to force the soap through the screen. It is supported at its periphery by rings 17 and is backed by heavy plate 15 which has a large number of relatively large holes which taper as shown. Behind this backing plate is set a four-bladed knife 18 also directly fastened to worm 11 and rotating with it, which serves to cut the filaments of soap into convenient lengths for feeding to the plodder or extrusion device. This knife is fastened to the worm in a detachable manner so that it may be readily removed when it is desirable to remove the screen for cleaning.

Screen 14 is larger in diameter than cylinder 12, as the cylinder diverges at the screen end, as shown at 12a. This enlargement of the screen serves to increase the capacity of the screen, and allow the use of somewhat lower pressures in the

cylinder for forcing a given amount of soap through the screen.

The screen and backing plate are carried by ring 19 which is fastened to the cylinder 12 by a hinge so that when it is desirable to clean the screen, access to it may be had readily.

The filaments of soap, cut into convenient lengths, then fall by gravity through opening 20 onto worm 21 while still under a vacuum. Worm 21 rotates in cylinder 22 and compacts and forces the soap forward through nozzle 23. This nozzle is constructed in the usual fashion and has guide-bars 24 and annular conduit 25 through which hot water or steam may be circulated to heat the surface of the extruded bar of soap by heating the inner surface of the nozzle, preferably to about 110° to 118° F.

Both cylinder 12 and cylinder 22 are provided with fins 26 and jacket 27 so that cooling water may be circulated around the cylinders to maintain the temperature of the soap being forced through the cylinders by the worms sufficiently low to insure the production of a bar of soap of proper consistency and plasticity in accordance with ordinary practice. The soap is preferably maintained at about 80° F.

Worm 11 is directly keyed to shaft 28 and is driven by it. This shaft rotates in bearings 29 which are constructed in the usual manner. Worm 21 is keyed to shaft 30 and is driven by it. This shaft rotates in a bearing made in the usual fashion except that it is provided with stuffing box 31, packing 32, and gland 33 to prevent the ingress of air past shaft 30 into vacuum chamber 16. Also the joints between bearing support 34a, cylinder 22 and stuffing box 31 are provided with thin rubber gaskets to insure against the ingress of air at these points. The shafts are driven in any convenient manner.

Vacuum chamber 16 is formed by placing a metal hood 34 over opening 20 into the lower cylinder and over the screen 14. Chamber 16 is made vacuum-tight by inserting rubber packing 35 between the metal hood and the parts of the cylinders with which it comes in contact. Opening 36 is provided either in the lower cylinder or in the metal hood for a connection to a suitable vacuum device (not shown).

The grinding head 13 is shown in greater detail in Figs. 2 and 3. This head consists of 32 knives which rotate with the worm 11 and which scrape against screen 14 and prevent it from being clogged up by foreign matter. The grinding head consists of a central portion 37, a supporting ring at the periphery 38, and knives 39. These knives scrape across the foraminous screen and are of such character that alternate knives force the soap against the screen because of inclined edges as shown at 40, while the other knives are provided with right edges which scrape the surface of the screen clean and prevent the accumulation of foreign particles which might clog up the screen. The grinding head also serves to protect the screen, inasmuch as it prevents large pieces of metal such as nails, wires, or bolts, from impinging against the screen and damaging it. This grinding head is unnecessary for successful operation of the machine, but is advantageously used, as it considerably lengthens the period during which operation may be continued without cleaning the screen. For example, using the grinding head, the machine may be operated for a week or more without cleaning, whereas without that grinding head, it may require daily cleaning.

Thus in carrying out my process, milled soap in flake or chip form is fed onto a rotating worm or screw and compacted and compressed and forced through a foraminous plate directly into an evacuated chamber in the form of filaments or strings of soap cut into convenient lengths. In the evacuated chamber, all air or permanent gas is removed from the soap which then passes to another screw or worm which again compresses and compacts the soap and forces it out through a nozzle in the form of a continuous bar of soap which is free from striations or irregularities in texture and which is homogeneous and plastic.

In the operation, all foreign matter which might be objectionable in the finished soap is removed by the foraminous plate. The consistency of the final soap and of the soap during the operation are controlled by providing cooling water around the cylinders in which the worms operate, in the usual manner. While it is not necessary to maintain any particular temperature of the soap mass during the operation, it is desirable to prevent an undue rise in the temperature of the soap which might adversely affect its texture or other properties, and hence is desirable to maintain the soap at or below about 80° F.

My process differs from other known processes for the production of toilet soap or partially dried milled soap, in that it provides means for eliminating all striations or fissures in the soap by eliminating the air which causes such striations or fissures before the soap is finally compacted and compressed into a bar. This process retains all of the advantages of the prior processes inasmuch as it provides for the elimination of hard particles or for their reduction in size to such an extent that the particles which remain are unobjectionable, for the admixture of perfume, coloring matter, etc. which may be desirable, and for the levigation and homogenizing which is essential for the production of a soap of proper texture.

The apparatus which I provide is an improvement over apparatus previously known in that it is provided with a chamber which may be evacuated and through which the soap may be passed while in a finely divided condition to insure the absence of air pockets or fissures in the final soap product, and hence to insure the production of soap free from striations.

I claim:

1. The improvement in the manufacture of soap which comprises forcing milled soap through a foraminous plate into an evacuated chamber to remove air and other gases, and plodding the soap, while maintaining it under the vacuum, to produce soap free from striations.

2. The process which comprises partially drying soap, milling such partially dried soap, forcing it through a screen, then subjecting it to a vacuum to remove air and other gases, and plodding the soap while maintaining it under the vacuum to produce soap free from striations.

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