Aug. 13, 1940. B. B. HOOD 2,210,924

PROCESS OF PRODUCING FLOATING TOILET SOAPS

Filed April 24, 1935

Fig. 3.



Fig. 1.

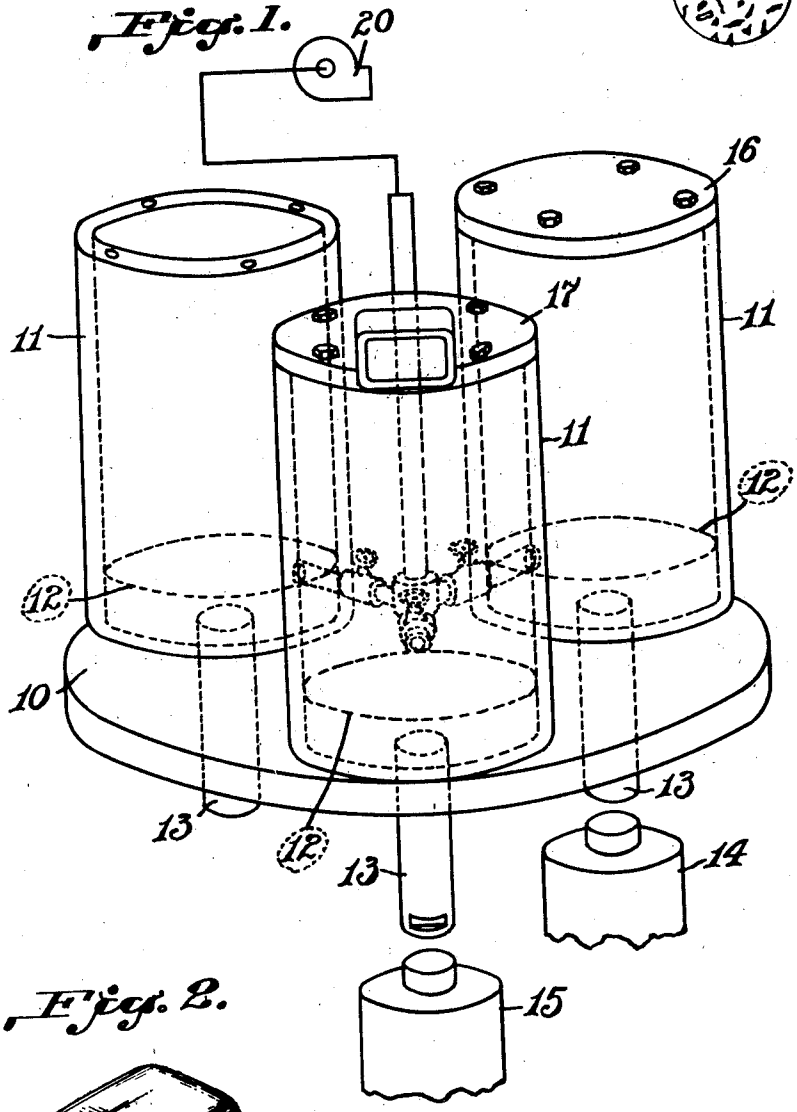
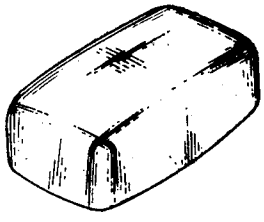


Fig. 2.



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Patented Aug. 13, 1940

2,210,924

UNITED STATES PATENT OFFICE

2,210,924

PROCESS OF PRODUCING FLOATING TOILET SOAPS

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Application April 24, 1935, Serial No. 17,950

9 Claims. (Cl. 252—134)

My invention relates to the production of water-buoyant milled soaps.

The present application is a continuation in part of my copending application Serial No. 689,196, filed September 13, 1933.

Toilet soaps, as compared with those soaps which have been produced in a bar or cake form by pouring heat-liquid soap into molds and a possible subdivision by cutting, are of finer texture and more readily soluble in water but such toilet (or milled) soaps have heretofore been produced by manipulations which result in a product having a specific gravity exceeding that of water.

There has long been a demand for a water-buoyant soap, for toilet purposes, and for many years there have been on the market well known brands of water-buoyant soaps which have been offered in part as toilet soaps but, because of the processes to which they are subjected in fabrication, they lack the characteristic texture, permanency of form, and solubility of a true toilet soap, in that they have not been, and cannot be, subjected to the well known "drying and milling" process which imparts to soaps the desired texture, permanency and water-solubility.

My present invention or discovery is, first, a true milled soap, of accepted standard texture and water-solubility, having a specific gravity low enough to be water-buoyant and second, a commercially practical method by which such a water-buoyant soap, in cakes of desired volume and shape, may be produced.

The desired texture and water-solubility is now obtained by forming heat-liquid soap in thin sheets in a well known manner, dehydration to a necessary extent to prepare the solid for a "milling" operation, thereafter "milling" by passing the dehydrated soap between two or more closely adjacent rolls, succeeding ones of which move at higher peripheral speeds, and thereafter passing the "milled" soap through a "plodder" which thoroughly compacts the soap into a mass from which entrapped air is carefully excluded, said mass ordinarily being in the form of a column extruded from the "plodder" and thereafter cut into desired lengths which are pressed into desired final shape.

My improved method starts with the previously-known effluent of the "milling" operation reduced to ribbons or chips which are "curly" or "warped" and are preferably quite thin, say approximately 0.02" or less.

The operation of producing such ribbons or chips, either flat or curly or warped, although usually heretofore considerably thicker, is well known, the sheet effluent of the mill being subjected to curved knives and breakers.

Starting with such ribbons or chips I place a known weight thereof in a variable-volume container of known initial volume whereupon the container is hermetically sealed. Thereafter a portion of the entrapped air is withdrawn, by suitable exhausting means, and thereafter the soap and remaining interstitial air is subjected to a sufficient pressure, by reducing the effective volume of the container, to compact the soap and interstitial entrapped air until the soap particles will adhere, one to another, into a stable mass containing practically microscopic, interstitially-entrapped air under pressure. The compacting pressure is then released and the entrapped air expands the soap body to a water-buoyant volume, without rupture of the cohesive bonding of the soap particles.

The mass of air remaining in the container after a portion of the air mass has been withdrawn, as compared with the mass of soap in the container, will, of course, determine the specific gravity of the ultimate product and the interstitial mass of air retained in the container must be sufficient, when intimately incorporated with the soap, to reduce the specific gravity of the entire mass to at least slightly less than 1. This necessary remaining air mass may be readily calculated when container volume and soap weight and specific gravity of milled chips are known. On the other hand, a sufficient mass of air must be withdrawn from the container, before the soap is compacted so that the heavy pressures requisite to cause stable cohesion of the soap particles will not result in interstitial air-bubble sizes or quantities sufficient to rupture the cohesive bond when the compacting pressure is withdrawn, and, this, of course, will be a function of chip-thickness and of the co-efficient of cohesion of the soap particles resulting from the compacting pressure. This determination must depend, to some extent, on experiments which may be easily made by any experienced soap maker.

I know that the mass of interstitial air at atmospheric pressure in any given volume of uncompacted curly or warped milled soap chips is too great, by at least 50%, to permit stable pressure-produced cohesion of the soap particles and that if no more than said per cent of air be withdrawn before pressure compaction the resulting product will have a specific gravity considerably less than that required for satisfactory floating of the cake or bar, and that, if that much air

is not withdrawn, the resulting product will be too porous for a desirable texture.

For the sake of stability, therefore, I think that it is advisable to remove almost as much air as possible without passing below the limit definitely calculable for minimum buoyancy.

Sizes, volumes, weights, and pressures, of course, can be governed by various factors such as the capacity required from the manufacturing unit, the density of the milled soap which, in turn, depends somewhat upon its ingredients, and the desired density of the finished product, and other circumstances. However, a specific example of one operative method of producing floating milled soap in accordance with the present invention is as follows.

The cylinders in which the operation takes place might be 12 inches in diameter, and provided with pistons having 18 inch strokes. Thus, each cylinder would have a volume of 1.18 cubic feet. Into such a cylinder might be charged 1 cubic foot of milled soap chips comprising 40 per cent voids and 60 per cent volume; the soap material weighing, for instance, 67 pounds per cubic foot, thus having a specific gravity of 1.07. The cylinder being closed at atmospheric pressure, there would be .4 cubic foot of air in the soap interstices and .18 cubic foot of air in the space above the soap mass. Thus, the total cylinder charge would comprise .6 cubic foot of soap material plus .58 cubic foot of air. Otherwise expressed, this charge comprises 60% of 67 pounds (or 40.200 pounds) of soap, and (assuming dry air at 70° F. which has a weight of 0.07495 pound per cubic foot) 0.043471 pound of air. Still otherwise expressed, the charge consists of 5548.50 parts by weight of soap and 6 parts by weight of air.

Air might then be exhausted from the cylinder to reduce the pressure within the cylinder to approximately one-sixth atmosphere leaving the equivalent of .097 cubic foot of air within the cylinder. Thus, after exhaustion, the charge comprises 40.200 pounds of soap and one-sixth of 0.043471 pound (or 0.007245 pound) of air; or 5548.50 parts by weight of soap and 1 part of air.

The piston 12 then will be moved by the lifter 14 to apply a pressure of approximately 200 pounds per square inch to the soap mass. This pressure would reduce the volume of the mass to approximately .607 cubic foot, whereupon the length of the soap mass in a 12-inch cylinder would be 9.27 inches.

Upon release of the compacting pressure, the soap column will expand to approximately .697 cubic foot, thus extending its length to 10.65 inches. The soap will thereupon be at atmospheric pressure and have a specific gravity of the finished product, i. e., 57.7 pounds per cubic foot, or .92 specific gravity.

The figure of 200 pounds per square inch mentioned above is based upon the theory that the soap itself would be non-compressible; but as a matter of fact the soap probably would be compressed to a slight extent, whereby the volume above specified would be somewhat reduced.

Various mechanisms may be devised to assist in commercially practicing my method and producing my product and I have indicated in the accompanying drawing, quite diagrammatically, such a mechanism.

In the said drawing, Fig. 1 is a diagrammatic fragmental perspective view of a machine which may be used in carrying out my method and producing my product;

Fig. 2 is a perspective view of a cake of soap produced by my method; and

Fig. 3 is a fragmental sectional view of my product, magnified approximately ten diameters.

In the drawing 10 is a rotary table carrying three cylinders 11, 11, 11, each having an open upper end. and a piston 12 in its lower end the rod 13 of which may be raised by a lifting mechanism 14, such as a hydraulic ram, and further raised and lowered by a similar mechanism 15.

The upper end of each cylinder may be closed either by the imperforate head 16, to permit necessary air exhaustion, or by the extrusion head 17 to permit bar extrusion after compaction. It will be readily understood that a single head which may be alternately made perforate to permit extrusion, and imperforate to permit air extraction, may be substituted in place of independent heads 16 and 17.

With such an apparatus each cylinder may be caused to occupy three successive stations in continuous cycles.

At the first station, piston 12 being depressed, a weighed charge of milled soap chips will be inserted and an imperforate cover 16 applied. The desired mass of air will then be extracted from the charged cylinder by exhauster 20, conveniently while the charged cylinder is moved to the second station. At the second station the lifter 14 is acuated to compress the chips and interstitial air into a coherent mass. The pressure created by 14 is then released and the interstitial air in the charge is allowed to expand, the resulting coherent soap having a specific gravity of less than 1. Thereupon cover 16 will be removed, extrusion head 17 substituted, and the cylinder carried to the third station where lifter 15 acts upon piston 12 to extrude the coherent soap-air mass into a column which may be cut into desired lengths and, if desired, further formed by suitable manipulation.

It will be readily understood that, instead of dehydrated warped chips or ribbons, soap particles in other forms capable of entrapping interstitial air may be used so long as they are of such form that a sub-normal mass of interstitial air may be entrapped in relatively small volumes in the soap mass; and also that another gas, at sub-atmospheric pressure, may be substituted for part or all of such air.

I claim as my invention:

1. A process of producing water-buoyant milled soap which comprises the steps of enclosing a quantity of relatively thin, warped, milled soap particles, in a sealed container, thereafter establishing an interstitial gaseous content at sub-atmospheric pressure, the weight of gas, relative to the weight of soap, being such that subsequent compression of the mixture may compact the soap into a coherent whole, with interstitial gas which, when released and expanded to atmospheric condition, will result in the coherent whole having a specific gravity less than 1, and so compressing the mass.

2. A process of producing water-buoyant milled soap cakes which comprises the steps of assembling, in a sealed container, a predetermined weight of individualized pieces of milled soap and a predetermined weight of interstitial gas at sub-atmospheric pressure, the weight of gas present being less than that of the gas required, under atmospheric conditions, to fill the voids between such individualized pieces, thereafter compacting the soap and gas to a coherent stable mass

having a specific gravity less than 1, and thereafter extruding said mass in columnar form.

3. A process of producing water-buoyant milled soap cakes which comprises the steps of assembling, in a sealed container, a predetermined weight of individualized pieces of milled soap and a predetermined weight of interstitial gas at a sub-atmospheric pressure, the weight of gas present being less than that of the gas required, under atmospheric conditions, to fill the voids between such individualized pieces, thereafter compressing the soap and gas into a coherent stable mass having a specific gravity less than 1.

4. A process of producing water-buoyant milled soap which comprises the steps of assembling, in a container a predetermined mass of individualized pieces of milled soap and a quantity of interstitial gas, the mass of which is less than the mass of an equivalent volume at atmospheric temperatures and pressures, and thereafter cohesively bonding the soap particles and interstitially entrapped gas by external pressure, the mass of entrapped gas being so proportioned relative to the mass of soap that the specific gravity of the finished product will be less than 1.

5. A process of producing water-buoyant milled soap which comprises enclosing approximately 5548.50 parts by weight of relatively thin, warped, milled soap particles, in a sealed container, together with approximately 6.00 parts by weight of air, thereafter reducing the weight of air in said container to approximately 1 part by weight, and compressing the entire mass to compact the soap into a coherent whole with interstitial gas which when released and expanded to atmospheric condition will result in the coherent whole having a specific gravity less than 1.

6. A process of producing water-buoyant milled soap which comprises the steps of assembling, in a container, approximately 5548.50 parts by weight of individualized pieces of r illed soap and approximately 1 part by weight of interstitial gas, the density of which is subnormal, and thereafter cohesively bonding the soap particles and interstitially entrapped gas by external pressure, and releasing the pressure, whereby the specific gravity of the finished product will be less than 1.

7. A process of producing water-buoyant milled soap which comprises the steps of charging into a container approximately 40.200 pounds of milled soap particles and approximately 0.0435 pound of air at atmospheric temperature and pressure, sealing said container and reducing the air content thereof to approximately 0.007 pound, applying external pressure to the mass of soap and air while preventing access of air thereto, to compact the mass of soap and air into a coherent body which, when the external pressure is released, will expand to a normal volume under atmospheric pressure and will then have a specific gravity less than 1.

8. The process of producing water-buoyant milled soap which comprises the steps of charging into a container having a volume of approximately 1.180 cubic feet, 0.600 cubic foot of soap particles having a specific gravity of 1.07 sealing said container, exhausting therefrom approximately 5/6 of the volume of entrapped air therein, compressing the contained mass of soap and air by reducing the volume of said container to approximately 0.607 cubic foot, and then opening said container and removing therefrom the compacted mass of soap and entrapped interstitial air so produced.

9. As an article of manufacture, a cake of milled soap possessing the texture and solubility characteristics of a true milled soap and containing minute voids entrapping interstitial gas at pressures insufficient to rupture the coherent bond of the soap particles comprising the cake, and of an aggregate volume sufficient to reduce the specific gravity of the composite mass to a value less than 1.

BEN B. HOOD.