

July 9, 1974

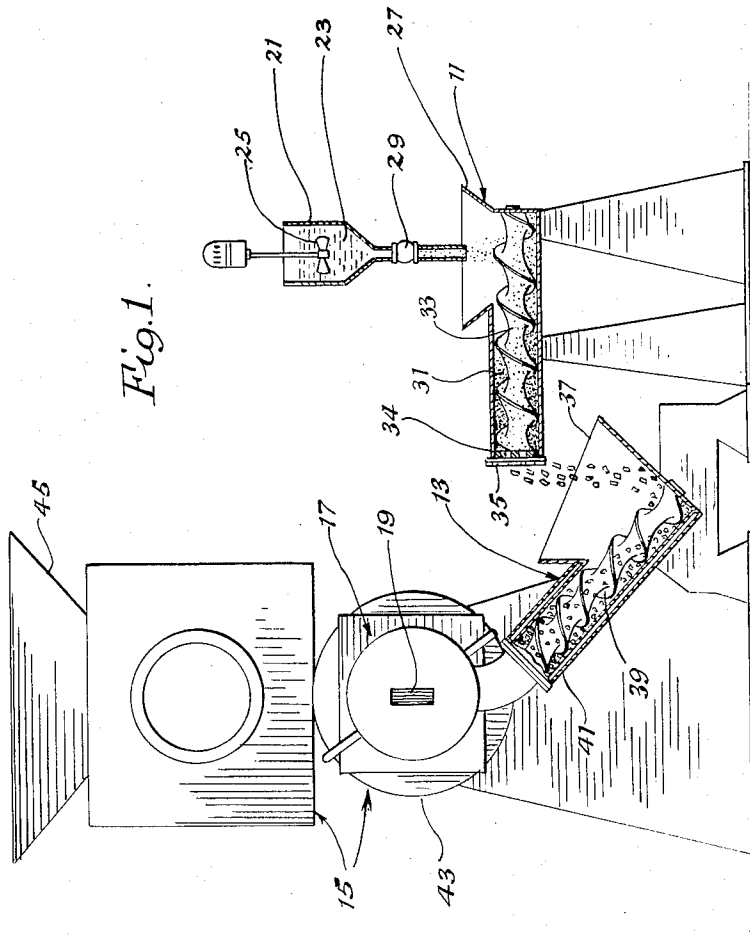
A. D'ARCANGELI

3,823,215

PROCESS FOR PRODUCING VARIEGATED DETERGENT BARS

Filed Jan. 12, 1972

3 Sheets-Sheet 1



July 9, 1974

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PROCESS FOR PRODUCING VARIEGATED DETERGENT BARS

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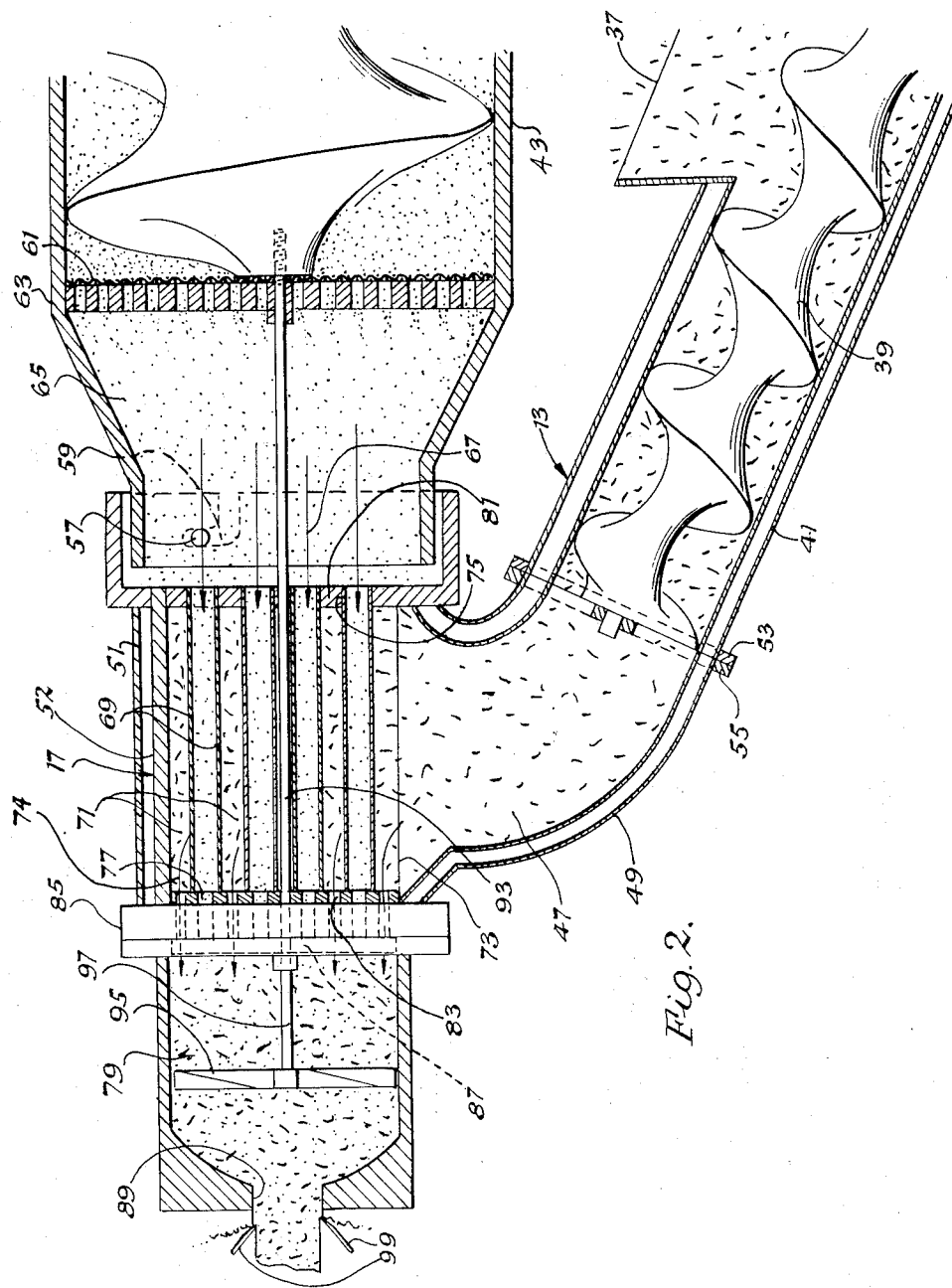


Fig. 2.

July 9, 1974

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3,823,215

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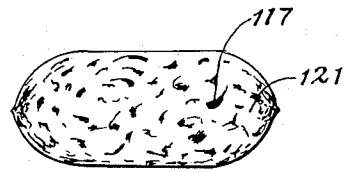
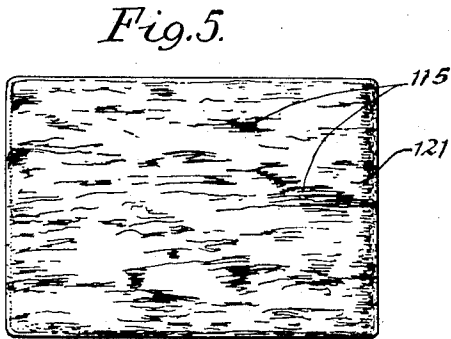
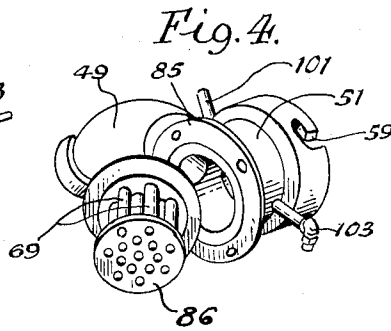
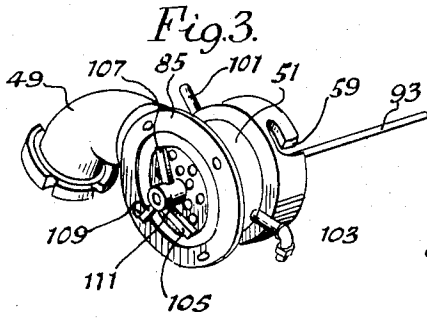


Fig. 6.

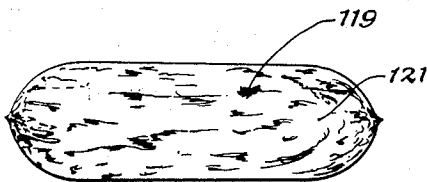


Fig. 7.

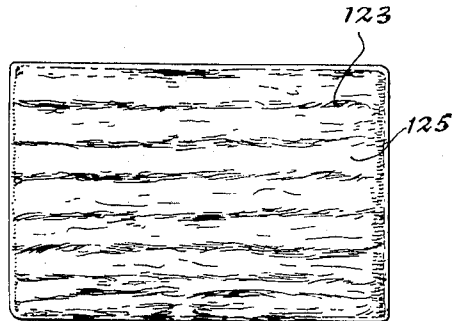


Fig. 8.

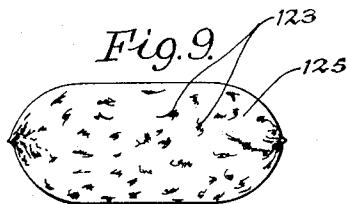


Fig. 9.

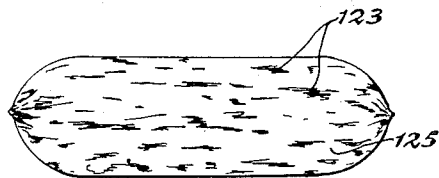


Fig. 10.

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3,823,215
PROCESS FOR PRODUCING VARIEGATED
DETERGENT BARS

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 47,924/71

Int. Cl. B29f 3/12

U.S. Cl. 264—75

6 Claims 10

ABSTRACT OF THE DISCLOSURE

A process for the manufacture of variegated detergent bars or cakes includes passing detergent compositions of similar solubilities and temperatures but of different colors, in solid plastic states along substantially parallel paths, out of physical contact with each other but preferably in thermal contact with each other, extruding the compositions, cutting the extrudates to lengths, mixing the cut extrudates together and, while they are mixed, maintaining them at an elevated temperature at which they are plastic and may be fused together tightly, and compacting and extruding them to a variegated detergent bar form, which may be subsequently pressed into variegated detergent cakes, such as soap cakes. Preferably, the base, detergent composition, e.g., a white soap, is plodded through a plurality of cylindrical tubes while a colored soap is plodded by a different plodder into the section of a variegating head around such tubes, after which both soaps are extruded at similar velocities into a mixing and contacting section of the variegating head, wherein they are cut to lengths and a whirling motion is imparted to the cut pieces by a rotating cutter. Also described is an apparatus which may be used in practicing the process, including a variegating head containing the mentioned tubes, means for fastening the inlet portions thereof to the plodders, temperature control means and cutting and whirling means for distributing one soap or detergent through the other before final plodding.

Variegated soaps and soaps containing colored indicia of various types have been manufactured for many years. Beginning with framed soaps in which Prussian Blue or other dye or pigment had been stirred during the cooling process, such soaps have enjoyed acceptances at various times. Nevertheless, for a number of reasons they have not often been commercially marketed on a large scale in recent years. In some cases, the dye solutions added in the plodder are not sufficiently sorbed by the soap and may rub off onto wrapping materials and the hands of a user, when the package is opened. The marbling or other variegated patterns, obtained by addition of a coloring liquid in the plodder often differ greatly between bars, depending on the particular movement in the plodder of the section of soap into which the dye has been incorporated. When mixtures of different colored soaps are charged to the plodder, usually as plodder bars, chips, filaments, ribbons or rods, the product obtained may be of a solid color, the resultant of the colors and proportions of the soaps charged. When attempts are made to blend the different colored soaps at a later point in a plodding operation, they may be unsatisfactorily fused together, with the result that the user can note a roughness at the interfaces between the different colored soaps.

Other reasons why variegated soaps have not become as popular as might be expected from their attractive appearances include processing difficulties encountered. Thus, where white soap or a particular colored soap is the main material being made on a soap production line, interruption of such production to produce a variegated soap introduces a soap of a different color into the plodder. Before resumption of normal production, the plodder will have to be cleaned thoroughly to avoid having objectionable specks of the colored soap appear in the next bars made. Also, to avoid marking of regular production soap with dye, the means for adding the dye or pigment will have to be thoroughly cleaned or completely removed from the plodder. When the colored portion of the variegated soap is made by milling the color into the soap chip, the cleaning procedure will also have to be undertaken on the amalgamator, mills rolls, bins, conveyors, elevators, chutes and other equipment with which the colored product comes into contact.

What has been needed to popularize variegated soaps and corresponding detergent composition cakes and bars is a simple, reproducible and trouble free method of satisfactorily distributing coloring material through a base soap or detergent which will result in a firm fused product in which the coloring agent is held fast, at least until use, and which does not involve difficult or costly manufacturing operations or apparatus modifications. Desirably, such method should be capable of modification to produce different types of variegations of the cleaning products. The described desirable properties are characteristic of the present process.

SUBJECT OF THE INVENTION

This invention is of a process for making variegated detergent bars and cakes. More particularly, it is of a method by which colored and uncolored soaps are blended together to produce desirably marbled, mottled or striped soaps of attractive and substantially reproducible appearances. In carrying out the process an apparatus may be employed in which a special head is provided for removable affixation to a pair of plodders, in which head the mixing of the soaps takes place and a variegated soap bar is produced.

BACKGROUND OF THE INVENTION

Soap bars and cakes are presently commercially manufactured by substantially automatic methods wherein milled chips, flakes or ribbons produced from mixtures of soaps and other components are plodded and extruded as bars, which are subsequently cut to lengths and pressed into soap cakes or tablets. Often, to obtain best cohesiveness of the bar product the plodding operation takes place under vacuum so that air and other gases which might disrupt the continuity of the soap bar are removed. Soaps of different colors have been made by the addition of dyes and pigments to the soap composition components in a mixing or amalgamating step which antecedes the milling operation. In recent years a substantial proportion of toilet soaps and bath soaps manufactured have been colored by such method.

DESCRIPTION OF THE INVENTION

In accordance with the present invention a process for the manufacture of a variegated detergent bar comprises producing a base detergent composition of one or more colors, producing a second detergent composition of one or more colors, at least one of which contrasts with or is distinguishable from at least one of the color(s) of the first composition, and is of a solubility about that of the first composition, adjusting the temperature(s) of the first and second compositions so that they are about the same and are sufficiently elevated so that both compositions are plastic solids, passing both compositions at such an elevated temperature along substantially parallel paths with the path(s) of one composition being substantially within the path(s) of the other composition but with the compositions being out of contact with each other, forcing the

compositions through separate openings, producing interspersed extrusions of different colors, cutting off the extruded materials in short lengths, mixing together such short lengths of extrudates and, while maintaining the mixed materials at an elevated temperature at which they are plastic and may be fused together tightly, compacting them and forcing the compacted mass through an opening to produce a variegated detergent bar.

With respect to the apparatus which may be employed for carrying out the process, there is provided a variegating head adapted to be fastened to a plurality of means for feeding plastic solid detergent compositions, at least one of which is colored differently from another, said variegating head including a plurality of passageways for one of the detergent compositions to be passed through but out of contact with another of said compositions in a surrounding zone, with a plurality of exit openings from the passageways and surrounding zone, through which filaments or rods of the different detergent compositions can pass, means for cutting the rods or filaments into short lengths after extrusion through said openings, means for imparting to the rods or filaments a transverse or whirling motion, a mixing and compacting zone in which the rods and or filaments are further mixed, compacted and fused together tightly, and means for extrusion of the plastic detergent composition from the mixing and compacting zone, to form a variegated detergent billet or bar.

Various objects, details, constructions, operations, uses and advantages of the present invention, in its various aspects, will be apparent from the following description taken in conjunction with the accompanying drawing of apparatuses which may be employed to effect the invented process and the various products made, in which drawing:

THE DRAWING

FIG. 1 is a partially schematic, partially sectional view of a plurality of soap plodders of a soap production line, the last of which plodders is equipped with a variegating head for the production of variegated plodder bars;

FIG. 2 is a central vertical sectional view of the variegating head of FIG. 1, affixed to and in operative relationship with two of the soap plodders of FIG. 1;

FIG. 3 is a front perspective view of a portion of the variegating head of FIGS. 1 and 2;

FIG. 4 is a disassembled view of the variegating head portion of FIG. 3, with the cutter thereof removed;

FIG. 5 is a top view of a variegated detergent tablet pressed from a bar made according to the present invention;

FIG. 6 is a transverse vertical sectional view of the tablet of FIG. 5;

FIG. 7 is a longitudinal vertical sectional view of said tablet;

FIG. 8 is a top plan view of a striped detergent tablet made with the illustrated apparatus but without imparting a whirling motion to the mixed colored rods or filaments in the variegating head;

FIG. 9 is a transverse vertical sectional view of the tablet of FIG. 8; and

FIG. 10 is a longitudinal vertical sectional view of the tablet of FIGS. 8 and 9.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1 are illustrated plodders 11, 13, and 15, which, in combination with variegating head 17, make up an apparatus for producing a variegated detergent bar 19, seen emerging from variegating head 17, from which it is moving toward the viewer. In mixing and feeding tank 21 there is a solution of a dye or a dispersion of a water dispersible pigment 23 in an aqueous medium. It is maintained uniform by stirrer 25 and is fed, continuously or intermittently, as desired, to hopper 27 through control valve 29. Other means, not shown are provided for delivery of detergent chips, rods, powders or filaments to hopper 27 and such soap or other detergent is then fed through a plodder 11 with the aqueous coloring material

23. In the illustration given only a single barrel 31 is shown in the plodder with a single worm 33 but plural barrels may be used, with plural worms, preferably with vacuum, jacketing of the plodder barrel(s), speed control of the worm(s) and remote control of the feeding of the coloring solution or dispersion. As illustrated, after the detergent is discharged through perforated pressure plate 34, which may be equipped with a screen (not shown) to remove any foreign matter and better mix the soap or detergent constituents together, the filaments or rods which exit from the plodder are cut by a revolving knife 35 and fall into hopper 37 of plodder 13. The colored detergent, in rod or filament form, is carried by worm 39 upwardly through water jacketed plodder barrel 41 in which it is kept at a desired temperature for proper plasticity, which temperature is maintained due to a combination of the working of the detergent and covering of the plodder barrel with a jacket in which there is circulated water at a desired temperature.

From the second plodder, the colored detergent is forced upwardly into variegating head 17, illustrated in more detail in FIG. 2. Uncolored detergent rods or filaments are fed into the variegating head 17 from the main soap line plodder 15, after having been worked in plodder barrel 43. Plodder 15 is a two-worm vacuum plodder with the vacuum being applied in the chamber between the exit from the upper worm and the entrance to the lower worm. Plodder 15 is charged with detergent composition or soap chips through hopper 45. In place of white soap, other colored soap may be employed or a partly colored soap or detergent may be used, providing that it will contrast with the other soap fed to the variegating head, so that a variegated, mottled or marbled appearance may be obtained in the finished product.

As is shown in FIG. 2, the colored soap 47 passes through jacketed introductory connecting elbow 49, which is welded to a water jacketed cylinder 51. Elbow 49 is held by bolted flanges 53 and 55 or other suitable means to plodder 13, and body portion 52 of variegating head 17 is held to main line plodder 15 by pins and grooves, such as illustrated at 57 and 59, respectively. The white soap or other contrasting soap from the main line plodder 15 may be forced through a screen 61 and a pressure plate 63 into plodder cone section 65 and thence into variegating head 17. It then pursues a plurality of paths, indicated by arrows 67, through tubes, preferably cylinders 69, which are usually made of comparatively thin heat conductive metal so as to facilitate the equalizing of temperatures of the white and colored soaps in the variegating head. The section of the head in which the parallel tubular passageways 69 are located, including the surrounding volume about the passageways, represented by numeral 71, is referred to as the "parallel paths zone," designated by numeral 73. It will be noted that although the main line white soap or detergent composition pursues a plurality of parallel paths through tubular passageways, the colored soap from plodder 13 moves transversely across the passageways but with parts thereof pursuing generally parallel paths and ultimately, before leaving such section, is moving parallel to the white soap. See arrows 74 which represent flows of such soap. Tubes 69 are welded at both ends to framework or body 75 of the variegating head and have exit openings 77 at the ends thereof which regulate the sizes of filaments or rods being extruded from the parallel paths zone of the variegating head to a cutting and mixing zone thereof 79. Similarly, the zone about the parallel tubes is blanked off at the portions 81 nearer to the main line soap plodder but is open at orifices or exit openings 83 to produce filaments or rods of the colored detergent, which are sent through plate 85, together with the extrusions from the parallel tubes, past cutting knife 87 into cutting and mixing zone 79.

During the passing of the base detergent composition and the second detergent composition through the parallel paths zone the base composition is moving substantially

5

within the paths of the second composition, although out of physical contact with it. Alternatively, it might be considered that the reverse situation is also true. Therefore, upon exiting from such zone the filaments, rods or particles of the two differently colored detergents are interspersed as they are forced through the openings in plate 85 and into the cutting and mixing portion of the variegating head. Because such head is filled with detergent composition being extruded through nozzle 89 therein, a fairly regular striped pattern would be produced if the rods or filaments being extruded through plate 85 were uncut or not given transverse, radial or whirling movements. To obtain a good degree of mottling or marblizing, a rotating cutter 87 is employed. This is moved by shaft 93 which is connected to the rotating worm of plodder 15. The knife may have from one to 12 blades (in the illustration it has three blades). The surfaces which contact the extruded material are thick, generally being from 0.5 to 2 cm. thick so that they will not just slide past the extruded rods but will push them or whirl them radially transversely through the moving mass of soap or detergent composition, thereby causing them to be spread out transversely and promoting the creation of the desired mottled or marblized appearance of the detergent in the cutting and mixing zone of the variegating head. In preferred embodiments of the invention a second impeller, propeller or other means for distributing the differently colored soaps in the mixing zones will also be present. As shown, impeller 95, attached by shaft 97 to shaft 93, also rotates and further aids in producing the desired marblized soap. Instead of being held as illustrated, this second whirling device may be mounted to rotate freely as the soap is forced past it, whereby transverse motion may be given to the soap. Alternatively, partially radially inclined passageways in a stationary whirling device may have a similar desired effect. In either case, the distance between such means and the cutting and whirling means previously mentioned will normally be from 5 to 25 cm.

The rest of the cutting and mixing section of the variegating head may be like a conventional jacketed plodder nozzle but is preferably of a somewhat different design. Thus, rather than having a tapered nose section, like most conventional plodders, it will preferably have a rather short nose and the taper will be more extreme. This design helps to prevent streaking of the product during extrusion through nozzle 89. Nozzle 89 may be equipped with a nozzle plate, which can be heated, electrified, cooled or otherwise treated to promote best extrusion of the desired detergent bar. Also, outside the nozzle of the variegating head and attached to that head will preferably be located skinning knives 99 which remove surfaces from the plodder and expose better variegated interior detergent portions which, when subsequently pressed, make a more attractive marblized bar product. After cutting the plodder bar to length, it is pressed in a conventional soap press, not illustrated. The cutting and pressing may be so effected as to create a bar having a longitudinal grain or one extending transversely through the thickness or width of the bar. Generally, however, it is preferred to have the grain longitudinal, since products so made are less apt to exhibit bad wet cracking during use.

FIGS. 3 and 4 illustrate the parallel paths zone or feeding portion of the variegating head with the inlet elbow from the colored soap plodder attached. The head has been rotated about 90° from the position of FIG. 2. The various parts designated have the same meanings as previously described in conjunction with FIG. 2. The inlet and outlet lines to the water jacket are indicated by numerals 101 and 103, respectively. Cutting blades 105, 107 and 109 are shown with greater clarity, as is the hub 111 to which they are joined, forming cutter 91. As illustrated, the cutting and mixing section of the variegating head is joined to the parallel paths zone portion at flange 85, by conventional means, and is separable from it.

6

In FIGS. 5-7 are shown various views of a marblized soap bar made by the method of the present invention. In this case, however, the second impeller or mixing device in the cutting and mixing head of the variegating means is omitted, since sufficient transverse or whirling motion of the colored soap particles is obtained with the first mixing device. As illustrated, the colored soap is satisfactorily dispersed throughout the soap bar, on the face thereof, at 115 and throughout the bar, as at 117 and 119. The white soap base or matrix 121 surrounds the colored soap and, as it wears down during use, exposes new surfaces of the colored detergent, so that the marblized appearance is substantially constant during use. In FIGS. 8-10, corresponding views are given of a bar made from substantially the same charges of white and colored soaps but the cutting knife and mixer utilized in the cutting and mixing head to make the products of FIGS. 5-7 were removed before processing. Thus, the product resulting is striped, with the colored soap extending substantially longitudinally through the bar. In FIGS. 8-10, numeral 123 represents the colored striping detergent and numeral 125 is the base soap.

The detergent composition employed is preferably a white or a light colored soap but may be any other suitable detergent, either anionic, cationic, nonionic or amphoteric or blend thereof, providing that it is normally solid at room temperature, and is capable of being plasticized during manufacture so that a cohesive bar product may be obtained. Of course, the colored or contrasting detergent or soap should possess similar properties and be sufficiently compatible with the base so as not to result in degradation of either portion of the final bar due to objectionable oxidation or other reactions. Although it is preferred to utilize a white base and a contrasting marblizing or variegating charge, mixtures of differently colored soaps or detergents may be used for each and more than two different colored materials may be employed. In fact, the base may be of several colors, as may be the dispersed detergent composition.

Although the synthetic organic detergents and soaps are very well known, and are set forth in detail in the text, *Synthetic detergents*, Vol. II, by Schwartz, Perry and Berch, published in 1958 by Interscience Publishers, Inc., the most preferred of these are the alkali metal salts of straight chain higher fatty alcohol sulfuric acids; the alkali metal salts, particularly the sodium salts, of higher linear alkyl benzene sulfonic acids; the sodium, potassium and ammonium salts of higher fatty acid monoglyceride sulfuric acids, e.g., those of 14 to 18 carbon atoms in the fatty acid groups; the solid Plurionics®, condensation polymers of ethylene oxide with the condensate of propylene glycol and propylene oxide; and the alkali metal sulfates of ethoxylated higher fatty alcohols. The soaps employed are those which are standard in commercial production today, blends of alkali metal soaps, preferably sodium soaps, of tallow and coconut oily fatty acids, or equivalent materials. Normally these will comprise from 50 to 90% of tallow and from 10 to 50% of coconut oil fatty acid soaps. Preferred are those of 10 to 40% coconut oil soap and 60 to 90% tallow soap.

To make desired products which will be capable of being satisfactorily used as toilet soaps or other washing aids, the physical characteristics of both the "uncolored" and "colored" soaps should be essentially the same. Thus, they should be plastic within the same temperature ranges, usually somewhat elevated, and should have essentially the same water solubilities, etc., so that they may hold together tightly and not preferentially dissolve in use, leaving ridges and inequalities in the product. Accordingly, it will be usual for most of the base and dispersed material to be the same, with only slight differences therein due to coloring materials, possibly due to perfumes, plasticizers, or minor proportions of adjuvants. Essentially, the compositions of the continuous and dispersed phases will be from 90 to 95% the same. Of course, in addition to color

contrasts, there may be other distinctively different adjunct properties given to the continuous and dispersed phases. For example, different perfumes may be employed, one to complement the other, and different minor adjuncts may be present.

The equipment utilized in the practice of the invention, with the exception of the variegating head, may be prior art equipment, either in general use or described in the literature and patents. It may sometimes be employed unchanged and at other times will be adapted for use with the other parts of the present invention. For example, laboratory, small scale and large scale production plodders may be employed. These may have speed controls, torque regulators, heating or cooling jackets, thermal controls, automatic high pressure or high temperature alarms, etc., such as are known and presently utilized. They may be permanent installations or may be portable, especially in the case of the smaller plodders adapted to feed colored soap to the variegating head. A number of such plodders is illustrated in U.S. Pats. 2,296,842; 2,495,005; 2,640,033; 2,649,417; 3,268,970; 3,294,692; and 3,485,905. Some of the mentioned patents relate to the production of variegated or mixed-color soaps but the apparatuses and methods used are different from those of the present invention.

In addition to the plodders employed, other conventional soap line equipment will be used, including amalgamators, mills, elevators, other feeding devices and various measuring devices and automatic controls to help coordinate and synchronize the operations of the different machines. Such apparatuses, although important for the obtaining of the desired chip, ribbon, rod, powder or other material to feed to the plodder, are well known and do not relate closely to the present invention. Therefore, they are not described in detail here.

At the heart of the present process is the variegating head, equipped, in accordance with this invention, with structural elements for carrying out the process by which the desirably marblized or variegated detergent bar is produced. Thus, the head has a plurality of passageways, preferably tubular, and most preferably cylindrical, which are of internal diameters of from 0.4 or 0.5 to 2 centimeters and will usually be from 10 to 50 centimeters long. These tubes will form a number of parallel passageways, generally from 3 to 100 and preferably from 5 to 50 through the "parallel passageway zone" of the variegating head. The passageways may be terminated by orifices that are smaller than the tubes and such exit openings may be from 0.5 to 10 millimeters, with one or more openings per tube. Similarly, the exit openings from the zone about the tubes may be in the same size range and of approximately the same number, although this is variable, depending on the degree of marblizing desired. The effective area of the total number of orifices for the tube section will be from 50 to 95%, preferably from 80 to 90% of the total orifice area, including the exit orifices from the surrounding zone. Of course, if so desired, the variegating head may be arranged so that the colored soap is directed through the tubes and the base about it. The tubes, while preferably straight and parallel to one another, may pursue different paths so long as the essential path of the soaps passing through them is one which, at least toward the end of the journey, parallels the paths surrounding material being extruded.

For best operation of the variegating head to produce a most desirable design, it is normally preferred to have from 50 to 95% of one soap or detergent composition and the balance of another. However, plural components may be employed with adjustments of such proportions correspondingly made. With soaps, the sodium soaps of higher fatty acid are preferred and these are desirably plastic when they contain from 5 to 25% moisture, on a total basis. Nevertheless, soaps of moistures up to about 30%, e.g., floating soaps, may also be used. The soaps will usually be from 80 to 90% of sodium soaps of such higher fatty acids. To make such materials properly plas-

tic, the temperatures of the water or oil jackets employed about the plodders and the variegating head will usually be in the range of from 30 to 60° C. This range will be from 30 to 50° C. for the plodding operations and from 40 to 60° C. for the mixing, compacting and extrusion operations effected in the variegating head. Generally it will be desirable to utilize water jackets over plodder parts and at the parallel paths zone portion of the variegating head, with an oil jacket being used over the cutting and mixing section of such head. In either case, the temperature of the soap, for best plodding and fusion will be from about 35° C. to 55° C., most preferably from 38° C. to 45° C.

At the above conditions, with the described plodding and variegating equipment, it will usually be a simple matter to produce a variegated, marbled or mottled soap product of desired appearance and the soap made, if at the right plasticity and temperature will bond well, so that boundary lines between parts thereof are not objectionable in use. However, when the hard milled soap bars are of moisture content less than 10% and when floating soaps are less than 20% moisture, bondings may be weakened unless there is a plasticizer present. In such cases, up to about 10% of a plasticizer, such as water, glycerol, polyoxyethylene glycol, sorbitol, other di- or polyhydric alcohol of 2 to 10 carbon atoms and 2 to 6 hydroxyls, petrolatum, paraffin, stearic acid, other higher fatty acid of 10 to 18 carbon atoms, or a hydro-tropic compound, such as sodium xylene sulfonate, potassium cumene sulfonate, sodium benzene sulfonate or other lower alkyl-substituted benzene sulfonate may be added to the detergent composition to improve the bonding strength thereof. In some preferred formulas water, glycerine, potassium soap and sodium toluene sulfonate, will be used together or in various subcombinations.

With soaps of usual plasticity for the manufacture of milled toilet bars, pressures reached in the plodders and in the extrusion heads may be from 50 to 500 lbs./sq. in. although it will usually be preferred to operate in the lower part of this range. Vacuum in the plodder may be any subatmospheric pressure but will preferably be from 1 mm. to 300 mm. of Hg absolute, with the lower portions of this range being preferred to deaerate the soaps. Such vacuum will be employed, preferably, in all of the plodders being used. Motor speeds, worm pitches, diameters and root diameters may vary but usually will not depart much from those which are conventional in the usual soapmaking operations. Thus, worm speeds of 2 to 50 r.p.m., preferably 5 to 35 r.p.m., are generally employed. The worm may be of a diameter from two inches to 16 inches or even more, in some cases, but preferably will be between four and ten inches in diameter. The length of the worm and the barrel will usually be from three feet to ten feet. Throughputs of soap may be from as little as one pound per minute to fifty or one hundred pounds per minute, depending on equipment sizes.

Although the illustrated embodiments of apparatuses for practicing the invention are considered to be most preferred, variations therein can be made, some of which have already been mentioned. Instead of feeding the colored soap to the variegating head from underneath, this may be effected from the top or side and sometimes, different and attractive patterns result from such variation. Instead of utilizing single barrel plodders for the auxiliary equipment, double barrel plodders may be employed. In replacement of the second impeller or propeller in the variegating head fixed vanes may be used for giving additional transverse movements to the differently colored detergent compositions. Materials of construction may be varied, depending on the composition of the detergent being processed. In most cases, stainless steel, polytetrafluoroethylene, nylon or other inert materials will be preferred although often a good grade of steel may be employed, providing that the equipment is kept well

cleaned and free from rust. An important structural feature of the present invention is to provide means of joiner of the various pieces of equipment so that they may be readily removed and the soap line may be quickly returned to production of ordinary soap. Thus, the auxiliary plodders may be mounted on rollers, which may be locked when they are being used to feed the main plodder. Quick disconnect fittings may be used between the various plodders. The variegating head is preferably very easily removable so that it may be inspected and conditions therein altered to change the variegating pattern, when desired. Other modifications which are desirable to utilize in certain situations will be apparent to those of skill in the art.

In operation, the various plodders are connected together, as illustrated in FIG. 1, with the variegating head in position, as shown in FIGS. 1 and 2. Sufficient dye or pigment dispersion is fed to produce a colored soap and this is passed through an auxiliary plodder to the variegating head. Speeds of the worms in the auxiliary and principal plodders are regulated so that both colored and uncolored soaps are fed in correct proportion desired, for example, about 10% colored soap and 90% uncolored. Temperatures in the various heating jackets, preferably heating all the equipment, are regulated and heating fluids are flowed through them at sufficient rates to maintain the soaps at the desired temperature throughout. Thus, with the correct ratios of the soaps being maintained by the feed mechanisms and the desired speeds of rotation of the worms, the colored and uncolored soaps enter the parallel path portion of the variegating head. The openings in the plate and in the screen adjacent to the end of the parallel paths portion are so chosen as to allow the proper feeding of the colored and uncolored soaps through them at the same linear speed. If it should be apparent that the rates of feeds are disproportionate and result in the moving of one soap past the other, thereby causing streaking and preventing good compacting, modifications of the screen sizes or the feed rates may be made. The soaps are then cut by the revolving knife-pusher and are given a transverse or radial motion outward from the hub of the knife. This action produces a desired marblizing effect. If the colored soap bodies in the uncolored soap are too concentrated and a more diffus distribution is desired, the number of knives may be increased or their width decreased. On the contrary, if the pattern is not distinct enough, fewer knife blades of greater thickness may be desired. Usually the length of the short rod or filament cut will be approximately the same as the thickness of the knife blade. Different patterns of soap colors also result from raising or lowering soap temperatures. The degree of diffusion of color may also be controlled by utilizing a water- or soap-soluble dye or a dispersible but insoluble pigment as coloring agents. The former gives a greater diffusion and less contrast, whereas the latter tends to maintain a separate contrasting color more readily. To vary the pattern of the plodder bar mechanically is a simple matter and is soon learned by the worker utilizing the equipment. By varying feed rates, plate and screen openings, knife design, presence or absence of an auxiliary distributor, proportions of colored and uncolored soaps, etc., a wide variety of variegated or marbling patterns may be obtained. Sometimes a different variegating head will be used, wherein the compacting and extruding portions of the noses may be more or less tapered, which also will modify the appearance of the final product. Once the pattern is chosen, by means of the present invention it is possible to continue to reproduce similar patterns, although no two will be identical.

Although in preferred embodiments of the invention the plodder bars or billets made will be "skinned" after plodding to reveal most attractive surfaces, this is not always necessary and sometimes may not be desirable. However, if surface shaving is effected the shavings may be re-

turned to the first plodder in which soap is being colored, thus avoiding any waste.

The advantages of the present invention are many. It is simple to operate and results in variegated soaps of reproducible designs. Because the soaps are given the same speed when being brought through the variegating head into the cutting and mixing portions thereof (also referred to as the mixing and compacting section), flow is more uniform and the soaps are fused together better. Yet, especially if the auxiliary plodding equipment is portable, the line may quickly be returned to ordinary use. It is easy to adjust the design produced. For example, by changing of the knife-pusher or removal of it, different marbilized or granite effects may be obtained and by removing it a striped soap product may be produced. By using a floating soap charge and not using vacuum (sometimes, air under pressure may be blown into the plodders), a variegated floating soap may be made. Cleanouts are easily performed and it is usually unnecessary to give the main plodder more than an ordinary cleanout. All of these simplified operations help have downtime on the soap line and contribute to its greatly increased efficiency of operation.

The following examples illustrate the various embodiments of the invention. Of course, the invention is not limited thereto. Unless otherwise indicated, all temperatures are in ° C. and all parts are by weight.

EXAMPLE 1

A marbled soap of the type illustrated in FIGS. 5-7 is made by utilizing the equipment of FIGS. 1-4. The soap base comprises 95.7% sodium soap of a fat charge of 62% beef tallow and 38% coconut oil; 4% distilled palm oil fatty acids; and 0.3% of antioxidants, sequestrants (EDTA) and stabilizers. The soap, initially of a moisture content of about 33% (kettle soap), is dried to a moisture content of about 10.6%. It is then ready to be used as a soap base for a marblized product.

95.8 parts of the described soap base, 0.2 parts titanium dioxide Anatase, 1 part perfume, 2 parts water and 1 part glycerine are mixed together to produce a chip which, after moisture loss, has about 10% moisture content. Another soap, this one of a dark green color, is made by milling 94.3 parts of the base chips, 0.3 parts titanium dioxide, Anatase, 1 part perfume, 1 part water and 1 part glycerine. To this milled soap, in the first plodder, there is added an aqueous "solution" of a water dispersible green pigment, 0.03 part Viscofil Green (Sandoz) in 2 parts water and 0.5 part glycerol. Then, the colored soap so produced is fed into the variegating head through the second auxiliary plodder and the base soap is fed through the main plodder, in proportion of 7:93. The production rate employed, while it may be varied, is about 30 lbs./min. and the feed rates are adjusted accordingly.

The various pieces of equipment are jacketed, with the worms of the plodders being water jacketed and with the water therein being held at a temperature of 25-35° C. The jacket on the variegating head is filled with oil at 45-60° C.

The main plodder worm revolves at about 10 r.p.m., as does the three-bladed cutting knife employed. The openings through which the soaps pass into the variegating head are within the range of 2 to 5 mm., proportional in cross-sectional area to the 93:7 ratio of the soaps employed. The cutting knife is 1 cm. thick. The second circulating impeller is not employed. During the plodding operations the soap temperature is maintained at about 40° C. and in the variegating head this is raised to about 45° C. Trimmings from the shaving device at the nozzle plate are recycled back to the coloring plodder.

As illustrated in the drawing, the base soap passes through the tubular passageways, which number approximately 50, each of which is of a diameter of about 1 cm. From the pipes and surrounding area outlets of 2 to 5 mm. diameter lead to the cutting and mixing zone of the

variegating head. These number about 130, with approximately half being outlets from the tubes.

Operating at a pressure of about 100 lbs./sq. in., a bar like that of FIGS. 5-7 is produced and is pressed by conventional pressing equipment.

Using substantially the same formulation but with the addition of 6% of sodium toluene sulfonate to the colored soap, slightly greater penetration of the colored soap into the white soap is noted. Similarly, when the knife thickness is halved, so that smaller rods or filaments are cut off, the marblizing obtained is more diffuse. This is also noted when the jacket temperatures are raised so that plodding is at 45° C., with the variegating zone temperature maintained at 50° C. In such cases, it is desirable to employ cooling means before pressing the soap.

When the mixer-cutter is removed from the variegating head, the product obtained is striped soap, resembling that of FIGS. 8-10. When the secondary impeller is added to the primary mixer, a more extensive marbling is noted.

EXAMPLE 2

A wide variety of soaps of mixed colors is produced by utilizing other coloring materials than the described water dispersible pigment. For example, pigments and dye such as Blue Iragon L/UD (Geigy); 1390 Pink GT Vat Red No. 1 (D. F. Anstead, Ltd.); C. I. Pigment Green 7 (Geigy, Sandoz); C. I. Pigment Red 6 (Geigy) are employed. Soap- or water-soluble dyes are also used to obtain a more diffused variegated product and in some cases, a mixture of the pigments and dyes are employed. In these formulas, the soap composition is varied to 85% tallow soap and 15% coconut oil soap, with no addition of fatty acids. The moisture content of the soap is 14% and the proportions of colored and uncolored or differently colored soaps are varied over the range from 50:50 to 5:95, preferably 25:75 to 5:95. The products obtained are all variegated, marblized soaps of attractive appearances. In each case, by removal of the cutter-mixer, striped soaps are made.

It is noted that whether or not the colored shavings are returned and recycled, the appearance of the soap is substantially the same.

EXAMPLE 3

The procedures of Examples 1 and 2 are repeated but with the base soap also being colored and of a contrasting color with that of the "colored" soap fed by the auxiliary pladders. Coloring of the base soap is effected with water-soluble and soap-soluble dyes which are added to the kettle soap before removal of the moisture therefrom, so that the colors are uniformly distributed, preferably making pastel shades. The products made are attractive marblized soaps in which the contrasts are usually subdued than those of Examples 1 and 2, when the dyes or pigments employed for both charged are of similar or compatible colors.

The products made are tested by practical washing tests and found to be satisfactorily bonded together. They do not wash away unevenly and are not rough or pebbly after use. By incorporation of 3 to 10% of plasticizing agents, such as water, hydrotrope salt, oil or glycerol, or mixture thereof, the bond is further improved and the surface of the bar after washing is even smoother. Also, penetration of the "colored" soap into the other soap is improved.

EXAMPLE 4

The experiments of Examples 1-3 are repeated with 30% of the soap replaced by sodium lauryl sulfate or with 70% of the soap replaced by a mixture of magnesium stearate and linear higher alkyl benzene sulfonate, sodium salt. Such synthetic detergent-soap combination bars are also produced in marblized form and have the desirable cohesiveness and washing properties previously mentioned.

The invention has been described with respect to various embodiments thereof but it will be appreciated that it is not limited to these, since it will be obvious to one of skill in the art to substitute equivalents for various elements of the invented processes and apparatuses.

What is claimed is:

1. A process for the manufacture of a variegated detergent bar which comprises producing a base detergent composition of one or more colors, producing a second detergent composition of one or more colors, at least one of which contrasts with or is distinguishable from at least one of the color(s) of the first composition and is of a solubility about that of the first composition, adjusting the temperature(s) of the first and second compositions so that they are about the same and are sufficiently elevated so that both compositions are plastic solids, passing both compositions at such an elevated temperature along substantially parallel paths with the path(s) of one composition being substantially within the path(s) of the other composition but with the compositions being separated from each other so as to be out of physical contact but with heat being able to pass from one to the other while they are out of physical contact with each other, forming the compositions into filaments or rods and bringing them into physical moving contact while maintaining their paths substantially parallel, cutting off the filaments or rods in equal short lengths and simultaneously giving them transverse motions and mixing them together and, while maintaining the mixed material at an elevated temperature at which it is plastic and may be fused together tightly, compacting the particles thereof and extruding the compacted mass to produce a variegated detergent bar.

2. A process according to claim 1 wherein the first and second compositions are separately plodded, with temperature control, into a zone in which they pursue substantially parallel paths, with the paths of one composition being of circular cross-section and straight, the filaments or rods produced, after and during cutting are moved transversely while being mixed with other short lengths of such filaments and rods of different color and being fused together with them, the compacted mass is extruded to produce a marblized detergent bar, and said bar is cut to length and is pressed into final detergent cake form.

3. A process according to claim 2 wherein the first detergent composition is a soap base of one color, the second detergent composition is a soap of another color, both compositions are extruded as rods into a mixing and compacting zone and are cut and moved transversely therein, the flow of materials through the parallel path zone being controlled so that they move at about the same speed through such zone and during extrusion, to diminish streaking, the "skin" of the extruded bar is removed and the bar is cut to a length greater than its maximum width and is pressed into final soap cake form.

4. A process according to claim 3 wherein the soap base is of a lighter color than the second soap, a softening or plasticizing compound is present in the soap base and/or the second soap to aid in subsequent fusion of the soaps together and to prevent any rough or pebbly feeling at the interface of the soaps during use thereof, the temperatures at which the soaps are plodded, passed through substantially parallel paths out of contact with each other, extruded as filaments or rods, cut, mixed, compacted and extruded in bar form are from 30 to 60° C., walls of tubular passageways separate the detergent compositions before extrusion to filaments or rods and are heat conductive and aid in equalizing the temperatures of the soaps in the parallel paths zone, and the rods or filaments extruded into the mixing and compacting zone have diameters from 0.5 to 5 millimeters.

5. A process according to claim 4 wherein the soap base comprises from about 80 to 95% of the final marblized soap cake, the second soap comprises the

13

balance thereof, the soaps each comprise from about 80 to 99% of sodium soaps of higher fatty acids, on an anhydrous basis, and from 5 to 25% moisture, on a total product basis, at least one of the soaps is plasticized with a material from the group selected from the group consisting of dihydric or polyhydric alcohols of 2 to 10 carbon atoms and 2 to 6 hydroxyls, higher fatty acids of 10 to 18 carbon atoms, polyoxyethylene glycols and hydro-tropic compounds and the cutting of the rods and mixing of them by transverse movement thereof is effected by a rotating knife.

6. A process according to claim 5 wherein plodding operations are effected at a temperature in the range of 30 to 50° C., mixing, compacting and extrusion operations are effected at a temperature in the range of 40 to 60° C., and mixing effected in the mixing and compacting zone is at two sections thereof from 5 to 25 centimeters apart, both of which include rotating means for imparting transverse motions to the differently colored soaps.

14

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15 JEFFERY R. THURLOW, Primary Examiner

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