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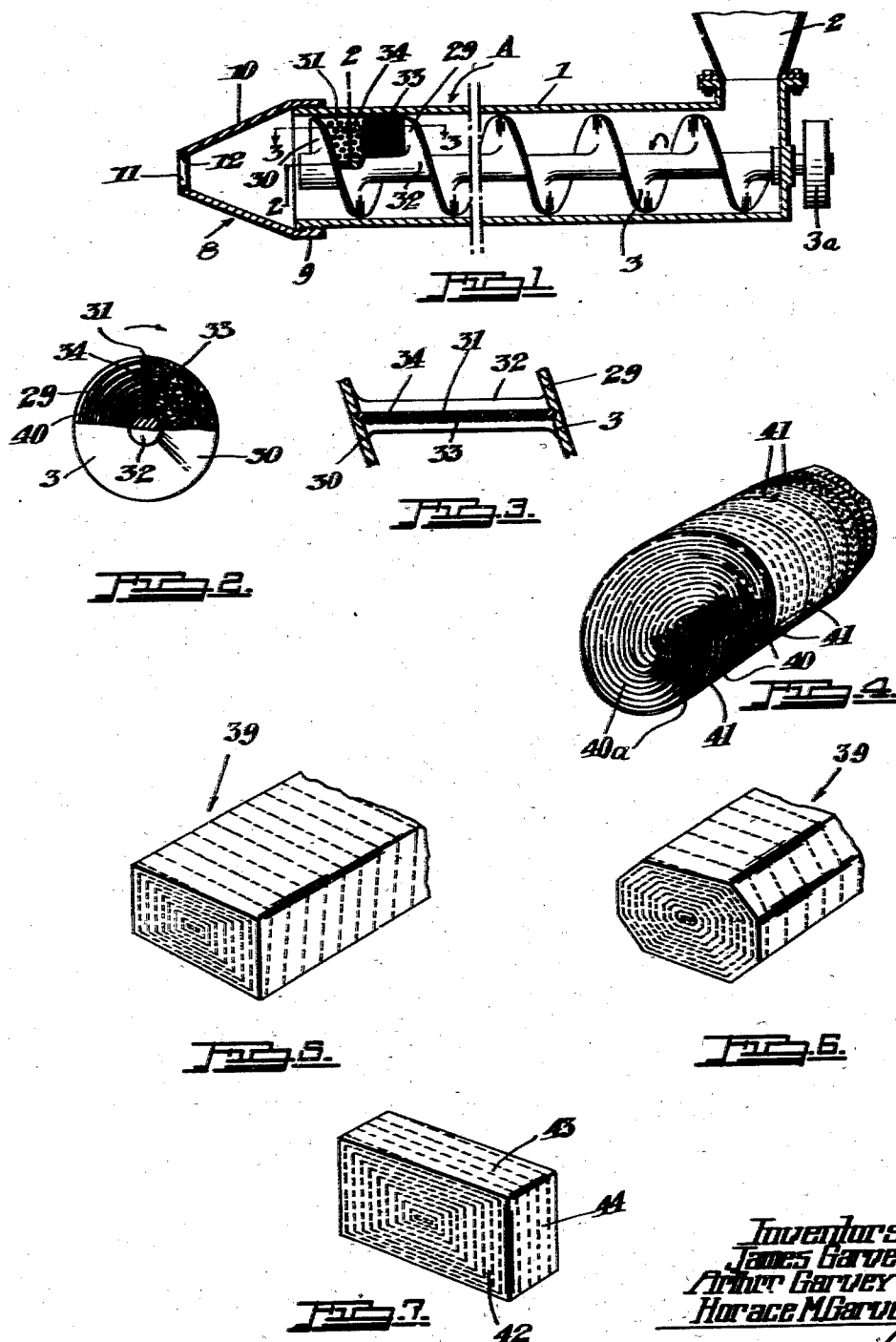
J. GARVEY ET AL

2,414,097

MANUFACTURE OF SOAP

Filed June 1, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

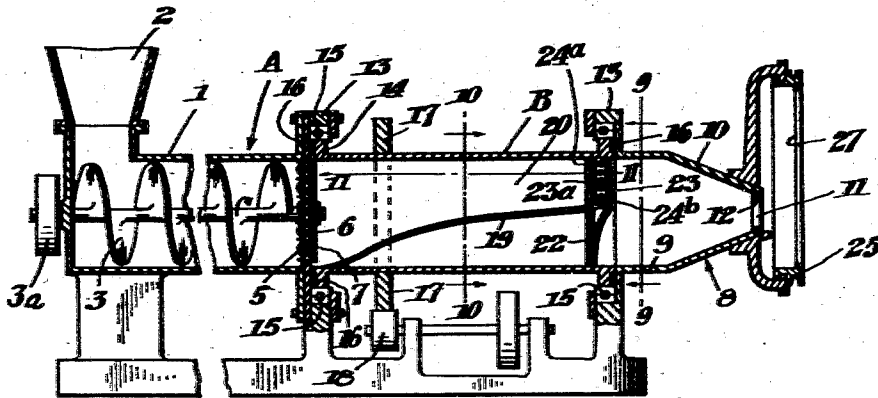


FIG. 8.

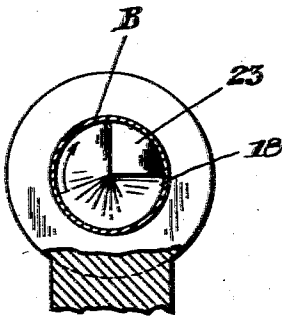


FIG. 9.

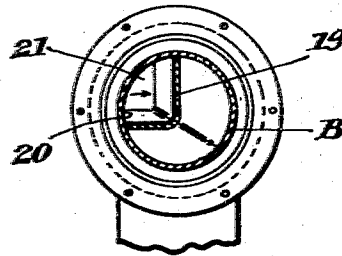


FIG. 10.

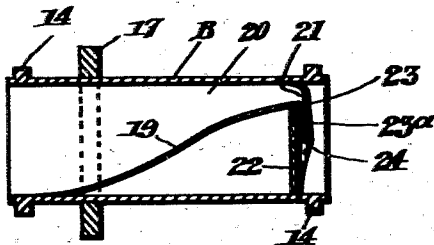


FIG. 11.

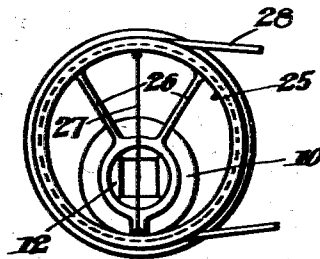


FIG. 12.

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UNITED STATES PATENT OFFICE

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MANUFACTURE OF SOAP

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9 Claims. (Cl. 25-8)

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This invention relates to the manufacture of milled soap, that is, soap which, after being initially solidified, is partially dried and milled and then compressed into bar form by means of a plodder. Such soap is known in the trade as "toilet soap."

The action of the plodder in the manufacture of such soap is first to plasticize the dried milled soap and then to force the plastic soap through a strainer and perforated backing or pressure plate mounted transversely to the axis of the plodder. After being forced through the strainer, the soap passes through the tapered nozzle of the plodder and is extruded from the latter in the form of a bar through a forming plate. These operations cause the formation in the bar of a longitudinally extending grain. Soap cakes are cut from the bar transversely to its length, the ends of the cake being the faces cut from the bar. The result is that in each cake the grain runs from end to end parallel to the upper and lower faces and to the sides.

It has been considered important in the art that the grain in soap cakes should run from end to end as described rather than from face to face. After the cakes have been cut they are usually subjected to a pressing operation to give them a finish and to impress a desired design or trade mark on the faces. The finish obtained on pressing a face which is parallel to the run of the grain is more satisfactory than one obtained on pressing a face which is transverse to the run of the grain. Moreover, a face of the first type will dissolve more slowly and evenly and will remain smoother during normal use than one of the second type, and the reduction of the soap to jelly, which takes place when a cake stands in a soap dish with water, is much less rapid if the immersed face is of the first than if it is of the second type. Since, in use, the principal action of water and rubbing takes place on the faces and sides rather than on the ends of a soap cake, it follows that the grain in the cake should run from end to end rather than in either of the other two possible directions.

Soap cakes made in the conventional way, just described, have a number of defects which result from the grain formation referred to. The most serious of these is what is known as "wet cracking." This occurs during the "wash-down" life of the soap, principally as a result of the soap drying between periods of use. Cracks, running lengthwise of the grain, often appear in the faces and sides of the soap cake in these circumstances and become more marked the more

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closely the cake approaches the end of its wash-down life. Dirt settles in these cracks during subsequent use of the soap and causes dirty marks which run lengthwise of the faces and are difficult or impossible to remove, as almost any user of soap has observed. Moreover, as the soap approaches approximately the last quarter of its wash-down life, these cracks often become so large as to cause the cake to split up into small pieces, which are substantially unusable and have to be thrown away, although, if the cake had not broken up, it would still be large enough to be useful. Another difficulty with conventionally made soap cakes arises from what is known as "checking," i. e., the formation of surface cracks in the soap cakes during storage, before use. This is believed to result largely from occasional unavoidable failure to maintain proper ingredient control, moisture content and temperature conditions during the manufacture of the soap; if the proper conditions are departed from, the resulting cakes may tend to check in storage. Considerable quantities of soap which has this defect are returned by dealers to manufacturers and are generally thereafter usable by the latter only in the manufacture of a relatively low grade product.

An additional disadvantage of the conventional longitudinal grain is that, if the cross sectional shape of the cake is to be other than rectangular, e. g., octagonal, there must be an additional cutting operation before the final pressing. In the case of an octagonal cake this operation consists of cutting off four corners. Not only does this additional cutting operation involve extra manufacturing expense but it involves waste, in that the pieces cut off the corners are of inferior quality when reprocessed and are consequently not used by most manufacturers in their high grade soaps. The cutting operation, of course, also increases the area of the cut faces on the cake.

The present invention has been designed to overcome the above mentioned disadvantages of soap cakes as made at present, and provides a method and apparatus for the production of a soap cake having a helical grain. A soap cake having such a grain has far less tendency towards wet cracking and checking than a cake with the conventional grain. It can be shaped to any desired cross section during formation of the bar without a separate cutting operation, and will retain this shape during its wash-down life better than a conventional bar shaped by such a separate cutting operation.

The method of the invention consists essen-

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tially in extruding soap from a restricted opening, the opening being stationary with respect to such soap in a plane transverse to the direction of such extrusion and thereby forming a strip of soap having a longitudinal grain, coiling this strip helically, compressing the coiled strip longitudinally of the axis of the coils to form a bar of soap, and cutting the bar into cakes transversely of the axis of the coils.

This method may be carried out in apparatus which, in its simplest form, consists of a plodder having a feed screw, and means for forcing soap travelling along said feed screw to pass through a restricted opening between two adjacent flights of the screw near the discharge end of the latter. These means may consist of two adjacent flights of the screw brought close together so as to leave only a narrow opening for passage of soap between them, or, more conveniently, of a perforated plate, preferably provided with a large number of small openings, mounted between two adjacent flights.

The invention will be described in more detail by reference to the attached drawings, which illustrate certain forms of apparatus by which the invention may be put into practice, and also illustrate soap bars and cakes produced thereby. In the drawings,

Figure 1 is a longitudinal section of one form of apparatus for putting the invention into practice,

Figure 2 is a section along the line 2—2 of Figure 1,

Figure 3 is a section on the line 3—3 of Figure 1,

Figure 4 is a view illustrating a coiled strip of soap during the initial stages of compression,

Figures 5 and 6 are views showing the grain formation in bars of soap of different cross section,

Figure 7 is a view of a completed cake of soap illustrating the grain formation,

Figure 8 is a longitudinal section of an alternative form of apparatus according to the invention,

Figure 9 is a cross section on the line 9—9 of Figure 8,

Figure 10 is a cross section on the line 10—10 of Figure 8,

Figure 11 is a partial section of the apparatus at right angles to the section shown in Figure 8 and taken on the line 11—11 of that figure, and

Figure 12 shows a means for cutting a bar of soap into cakes.

Figure 1 shows a plodder A having the usual cylindrical casing 1, filling hopper 2 and feed screw 3 rotated from any desired prime mover through the usual driving wheel 3a. Attached to the cylindrical casing 1 beyond the left hand or discharge end of the feed screw 3 is the plodder nozzle 8 having a substantially cylindrical portion 9 and a conical portion 10. At the outer end of the latter portion is an opening 11 in which may be mounted a die or forming plate 12. Attached to the nozzle 8 may be a suitable mechanism for cutting a bar of soap into cakes, for instance a mechanism such as is illustrated in Figures 8 and 12.

Mounted between the last two flights 29 and 30 of the feed screw 3 is a perforated plate 31 provided with a large number of small openings 34. As shown in Figures 2 and 3, it extends from the shaft 32 to the periphery of the feed screw and is let into slots in the shaft 32 (Fig. 2) and the adjacent flights 29 and 30 (Fig. 3). There

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may, if desired, be arranged on the leading side of the plate 31 a strainer screen 33 for removal of any impurities present in the soap.

It will be appreciated that rotation of the feed screw 3 in the direction shown by the arrows in Figs. 1 and 2 will force soap fed by the feed screw to pass through the openings 34 in the plate 31. The soap emerges from these openings in the form of strips 40 having a longitudinally extending grain, which, upon continued rotation of the plate 31, are left coiled helically about an axis substantially coinciding with the axis of rotation of the feed screw. As operation of the feed screw continues, the plodder nozzle 8 becomes filled with soap strips coiled about an axis which extends out through the opening 11. Continued movement of these coiled strips towards the opening, which is caused by continued operation of the feed screw, causes the coiled strips to be compressed both longitudinally and transversely of their axis by the conical portion 10 of the plodder nozzle until they are extruded from the opening 11 and die 12 in the form of a bar. This bar is cut at appropriate intervals transversely to its axis by any desired form of cutting mechanism, for example that described below in connection with Figures 8 and 12.

Figure 4 shows a portion of the coiled mass of soap as it would be found in the nozzle 8 of the plodder looking from the point at which the strips 40 of soap are first extruded from the openings 34 of the plate 31. Owing to the separation of these openings the strips will at first be separate and distinct from one another but, as they are forced along the plodder nozzle, they will merge to a greater and greater extent. This is more or less diagrammatically illustrated in Figure 4 by showing the individual strips as entirely separate at first and then in contact, with their boundaries defined by lines 40a which are first continuous and then become more and more broken. This figure also illustrates diagrammatically the longitudinal compression of the coils which takes place as they advance through the plodder nozzle, the lines 41 indicating the boundaries between successive coils of the group of strips extruded from the plate, becoming, as can be seen, closer and closer together as the end of the nozzle is approached. These lines are, for purposes of clarity, shown as unbroken throughout, although there is of course a merging between adjacent strips of different coils just as there is between adjacent strips of the same coil.

Figs. 5 and 6 show sections of bars of soap formed by dies of different shapes. In these bars the individual strips or groups of strips cannot be detected by ordinary observation or as a result of ordinary use. However, dotted lines are used in these figures to show the general run of the grain. It will be noted that the grain runs generally in the form of coaxial helices of increasing diameter from the axis to the surface of the bar, the cross sectional contour of these helices following generally the contour of the die from which the bar was extruded.

Fig. 7 shows a cake cut from the bar illustrated in Fig. 5. It will be noted that the cake is cut with its faces 42 transverse to the axis of the bar, its sides 43 and ends 44 being the sides of the bar. Since the pitch of the helices referred to above can be made quite low, as indicated by dotted lines on the sides 43 and ends 44, it follows that not only the sides and ends but also the faces of the cake run substantially parallel to the grain.

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So far as the strength and coherence of the soap cake is concerned, it is not essential that the cake be cut with its faces transverse to the bar. It might be cut in such a way that the coils ran helically from side to side or from end to end, but the way of cutting it illustrated in Fig. 7 is the most satisfactory, because it permits the cake to be shaped upon extrusion from the plodder rather than by a separate operation such as is required in present practice.

In the alternative form of apparatus shown in Fig. 8 the main casing 1 of the plodder terminates in a conventional fine mesh strainer screen 5 supported by a perforated backing or pressure plate 6 and revolving cutter 7, and is separated from the nozzle 8 by a drum B which revolves with respect to both the casing and the nozzle and has a fluidtight joint with both of them. Such a joint may be formed as illustrated by means of a bearing raceway housing 13 mounted on the end of the casing 1, and a flange 14 on the drum, also containing a raceway, with ball or roller bearings 15 operating between the raceways. In order to ensure that the joint is fluidtight, a washer 16 may be provided between the flange 14 and the pressure plate 6. The joint between the drum B and nozzle 8 may be of a similar type as shown.

Fixed to the drum B is a ring gear 17 driven through a pinion 18 from a suitable source of power not shown. Within the drum is a plate 19 forming with the drum a soap container 20, the cross section of which gradually decreases from the left hand (inlet) to the right-hand (discharge) end of the drum. At the latter end the container has a restricted opening 21 formed in the end plate 22 of the drum eccentric to the axis of rotation of the drum. Mounted on the outer side of the end plate and communicating with the opening 21 is a spout 23 bent substantially at right angles to the axis of the drum and terminating in a plate 23a which lies in the plane of a chord of the drum and preferably, as shown in Fig. 9, extends over substantially the full length of a radius of the drum. This plate is provided with a series of small outlet openings 24 which, it will be noted lie in a plane extending longitudinally of the axis of the drum. They are seen in elevation in Fig. 8, which is a section taken along that axis. As will be clear from a consideration of Fig. 9, the right hand end wall of the drum and container, as seen from the right, is in the form of the end of a helix the last two convolutions of which are joined by the plate 23a.

Mounted on the end of the tapered portion 10 of the nozzle 8 of the plodder is a cutter which may be of any suitable conventional type as illustrated. It consists of a rim 25 rotatably carried by arms 26 mounted on the nozzle 8 and having one or more cutting wires 27 extending along its diameter. The rim is rotated by any suitable means such as a belt 28 driven from a suitable source of power not shown.

The operation of the device just described is as follows:

The soap is fed in the usual way into the hopper 2 from which it discharges into the casing 1 and is forced by the feed screw through the strainer screen 5 and backing plate 6, the chamber 20 thus being filled with a mass of plastic soap. The action of the feed screw 3 continuously forcing more soap into the inlet end of the chamber through the strainer causes this mass to travel along the chamber towards the dis-

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charge end and to be extruded through the opening 21. The strip thus formed is forced through a spout 23 and passes out of the spout through the small holes 24 in a series of smaller strips which, as shown, will be round, although it is not important that they should be of any particular cross section.

It will be noted from the arrow in Fig. 10 that the drum is revolving in a direction such that the strips extruded from the openings 24 are left behind the spout. In this way a series of concentric coils of soap are formed within the discharge nozzle 8 of the plodder in a plane transverse to the axis of the nozzle, that is, in the plane of Fig. 9. The continued revolution of the drum and the extrusion of more soap forces the soap already in the nozzle 8 to pass along that member towards the discharge opening 11 and to be compressed longitudinally of the axis of the coils in this process. Instead of having a number of small outlet openings 24, the spout 23 might have a single outlet slot, in which case a single coil of a width substantially equal to the radius of the drum would be formed. In this case the spout should be somewhat tapered towards the opening or be provided with a forming plate at the opening for satisfactory grain formation. The small holes illustrated appear, however, to give the best results. It will be appreciated that the coils formed in the plodder nozzle, whatever their type, will extend helically along its length. With the holes 24 as illustrated there will be a number of helical coils of decreasing diameter one within the other, the coil formed from the hole 24a being of largest diameter and that from hole 24b being of smallest diameter.

As the helically coiled soap is forced along the plodder nozzle 8, it is compressed transversely as well as longitudinally of the coils, owing to the conical portion 10 of the nozzle. This serves to compress the soap thoroughly and produce a final product which is firm and coherent in all directions. The soap is extruded from the nozzle discharge opening 11 in the form of a bar 39 of a cross sectional shape determined by the shape of the die 12, and the bar is cut into cakes of the desired thickness by the cutter wire 27 in the usual way.

This application is a continuation in part of our prior application Serial No. 389,978, filed April 23, 1941.

What we claim as our invention is:

1. The method of forming cakes of soap, which comprises extruding soap from a restricted opening, maintaining said opening substantially stationary with respect to such soap in a plane transverse to the direction of such extrusion, and thereby forming a strip of soap having a longitudinal grain, coiling said strip helically, compressing the coiled strip longitudinally of the axis of the coils to form a bar of soap, and cutting the bar into cakes transversely of the axis of the coils.

2. Apparatus for forming cakes of soap, which comprises a plodder having a feed screw, a restricted opening between two adjacent flights of said screw near the discharge end thereof, and means for forcing all the soap travelling along said screw to pass through said restricted opening.

3. Apparatus for forming cakes of soap, which comprises a plodder having a feed screw, and a perforated plate mounted between two adjacent flights of said screw near the discharge end thereof, said plate extending from one of said flights to the other and extending from the axis of said

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screw to substantially the periphery of said flights, whereby all soap fed by said screw is forced to pass through said plate.

4. Apparatus for forming cakes of soap, which comprises a container for soap, means for rotating said container about an axis passing through the ends thereof, a restricted opening at one end of said container eccentric to said axis of rotation, means for extruding soap from said opening, whereby a helically coiled strip of soap having a longitudinal grain is formed, means for compressing said coiled strip longitudinally of the axis of the coils to form a bar of soap, and means for cutting the bar into cakes transversely of the axis of the coils.

5. Apparatus for forming cakes of soap, which comprises a container for soap, means for rotating said container about an axis passing through the ends thereof, a restricted opening at one end of said container eccentric to said axis of rotation and lying in a plane extending approximately longitudinally of said axis of rotation, means for extruding soap from said opening, whereby a helically coiled strip of soap having a longitudinal grain is formed, means for compressing said coiled strip longitudinally of the axis of the coils to form a bar of soap, and means for cutting the bar into cakes transversely of the axis of the coils.

6. Apparatus for forming cakes of soap, which comprises a substantially cylindrical container for soap, one end wall of said container being substantially in the form of an end of a helix with a portion joining the last two convolutions of said helix and extending substantially longitudinally of the axis of said helix, a series of openings in said portion from the end thereof nearest the centre of said end wall to the end thereof at the periphery of said wall, means for rotating said container about an axis passing through the end walls thereof and corresponding

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with the axis of the helix formed by said end wall, means for extruding soap from said openings, whereby a series of concentric helically coiled strips of soap having a longitudinal grain are formed, a stationary chamber of circular cross section into which said strips are discharged, said chamber being bounded at one end by said end wall and having at the opposite end a restricted outlet, whereby continued extrusion of soap from said openings and rotation of said container and helically formed end wall compresses the strips in said chamber longitudinally of the axis of the coils and extrudes a bar from said outlet, and means for cutting the bar into cakes transversely of the axis of the coils.

7. Apparatus for forming cakes of soap, which comprises a feed screw for feeding plastic soap, a member having at least one restricted opening therethrough and mounted to extend substantially in the direction of the longitudinal axis of said feed screw, means for causing all soap fed by said feed screw to be forced against a face of said member and extruded from said opening, whereby a strip of soap having a longitudinal grain is formed, means for causing said member to rotate in a plane transverse to the axis of said screw to coil said strip helically, means for compressing the coiled strip longitudinally of the axis of the coils to form a bar of soap, and means for cutting the bar into cakes transversely of the axis of the coils.

8. Apparatus according to claim 7, in which the means for compressing the coiled strip longitudinally of the axis of the coils also compresses said coiled strip transversely of said axis.

9. Apparatus according to claim 7, in which the member is a plate having a plurality of small holes therethrough.

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