July 19, 1955 J. GARVEY 2,713,188

APPARATUS FOR POLISHING SOAP

Filed June 15, 1950 2 Sheets-Sheet 1

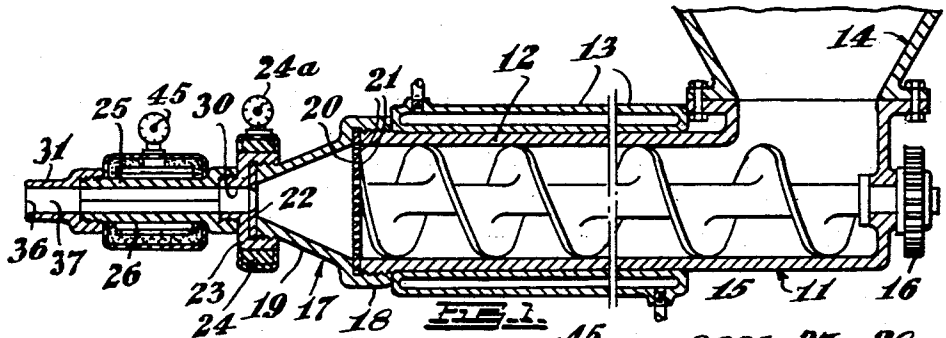


FIG. 1.

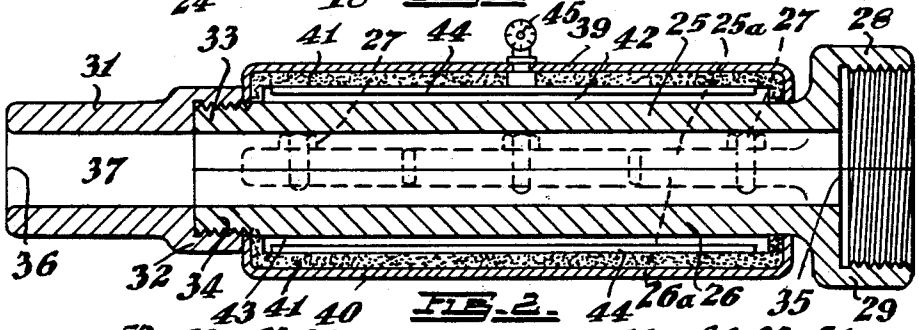


FIG. 2.

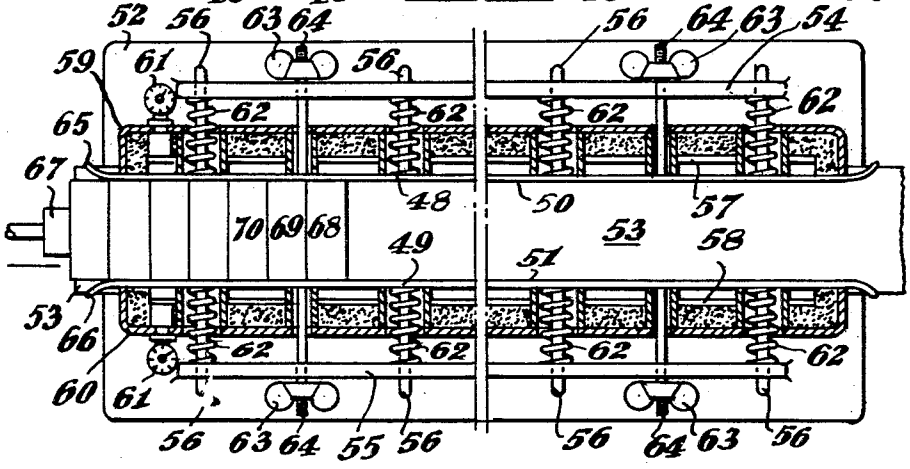


FIG. 3.

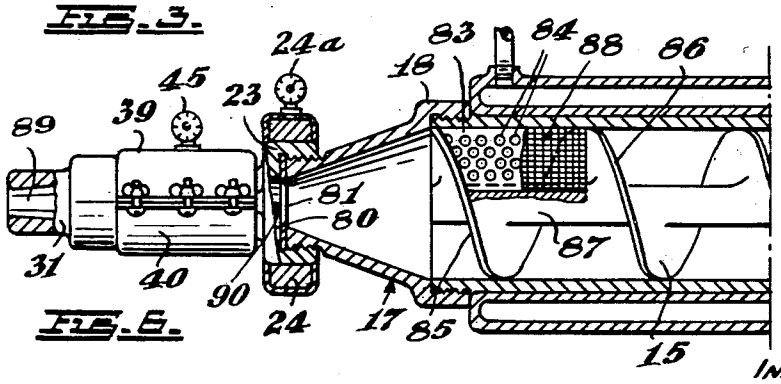


FIG. 6.

INVENTOR
JAMES GARVEY
By—Fetherston & Laughlin
ATTORNEYS

July 19, 1955 J. GARVEY 2,713,188

APPARATUS FOR POLISHING SOAP

Filed June 15, 1950 2 Sheets-Sheet 2

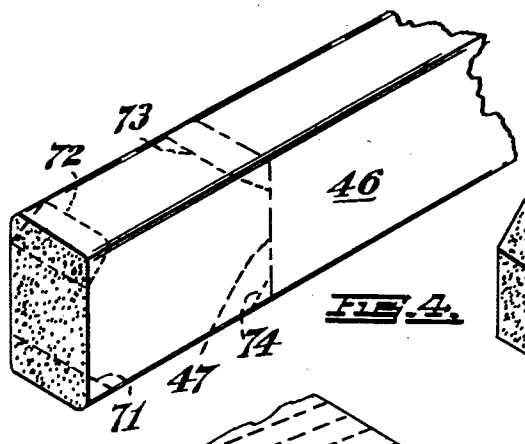


FIG. 4.

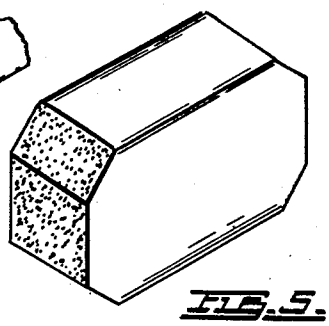


FIG. 5.

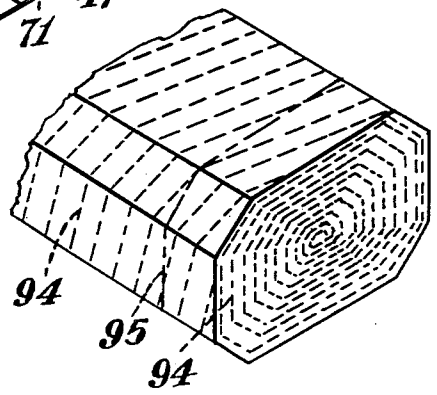


FIG. 8.

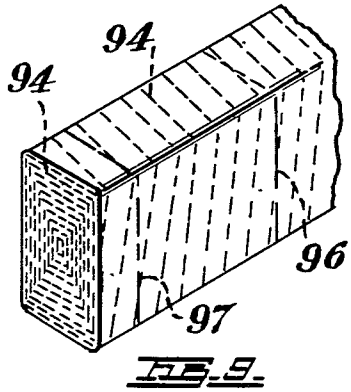


FIG. 9.

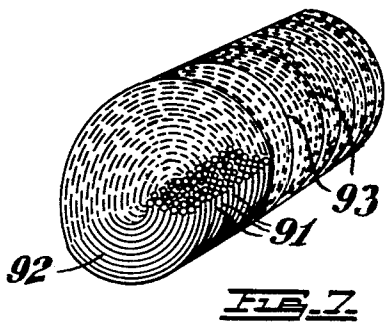


FIG. 7.

INVENTOR
JAMES GARVEY

By-Fetherstonhaugh & Co.

ATTORNEYS.

United States Patent Office 2,713,188 Patented July 19, 1955

2,713,188

APPARATUS FOR POLISHING SOAP

James Garvey, Vancouver, British Columbia, Canada

Application June 15, 1950, Serial No. 168,273

Claims priority, application Canada June 16, 1949

6 Claims. (Cl. 25—8)

This invention is for improvements in an apparatus for polishing soap.

The invention is concerned more particularly with imparting a surface polish to milled toilet soap, but the invention is applicable also to framed or laundry soaps and to toilet soaps produced from unmilled soap stock.

In the production of milled toilet soap, the soap stock after being initially solidified, is usually, but not always, passed through roller mills and then compressed into bar form by means of a soap extrusion machine, referred to in the trade as a "plodder." The action of the conventional plodder is first to plasticize the milled soap, then to force the plastic soap through a strainer and a perforated backing or pressure plate mounted transversely, to the axis of the plodder. The plastic soap, now in the form of longitudinal strands passes from the strainer and the perforated plate through a tapered nozzle of the plodder where it is consolidated or compressed after which it is extruded in the form of a bar through a forming plate mounted at the end of the nozzle transversely to the axis of the plodder. The forming plate consists essentially of an apertured die-plate, the die-aperture corresponding to the desired cross-section of the bar to be extruded and having a cutting edge which is relieved in the direction of motion of the bar. A heating device is provided at the end of the tapered nozzle around or upon the forming plate to facilitate the extrusion of the bar and to cause the forming plate to peel off, or to skin, the bar smoothly as it leaves the plodder nozzle. It is considered essential by soap manufacturers that the extruded soap bar shall normally have a temperature ranging from about 90° F. to about 115° F., according to the type of soap being extruded. At this stage in the process, while the surfaces of the bar extruded through the forming plate may be smooth (provided the forming plate is properly made), they are also dull and lustreless. The plodded bar is, thereafter, cut transversely of its length into cakes or tablets, the ends of the cakes being the cut faces of the bar. The resultant toilet soap cakes have a low moisture content from about 10 to about 14%, are dense and, to casual inspection are of uniform texture; nevertheless, they possess an internal grain structure which runs from end to end of the cake parallel to the upper and lower faces and to the sides of the cake.

Framed and laundry soaps on the other hand, are made by pouring the soap stock, when hot, into a frame or mould and allowing the soap to stand and cool for varying periods until it solidifies. The resultant solid block of soap is then removed from the frame and slabbed; that is, the faces, sides and ends are trimmed off, either mechanically or manually, and the remaining block of soap is then cut into bars which, thereafter, are again cut into cakes. The moisture content of a framed soap is usually considerably higher than that of milled toilet soap and may range as high as about 25%.

Whether the soap cake be made by plodding, with or without previous milling, or in frames followed by slabbing and cutting, the resultant cake has, hitherto, lacked any appreciable surface gloss.

It is considered important in the art of soap manufacture that soap cakes, and toilet soap cakes in particular, should possess smooth face and side surfaces with as high a gloss as possible. In the automatic continuous mass production of toilet soap, the cakes after they have been cut, are subjected to a pressing operation to impart a better finished surface appearance and simultaneously to impress a desired design or trademark on the faces. It has been considered important when pressing soap that the grain of the soap should run from end to end of the cake as described, rather than from face to face, one reason being that the finish obtained upon pressing a cake having the major surface areas running parallel to the grain, is very much superior to that which could be obtained if these surfaces were pressed transversely to the run of the grain. In fact, it has hitherto proved impossible in pressing soap of the conventional longitudinal-grain referred to above, to secure a smoothly finished appearance to any surfaces extending transversely to the run of the grain, since the effect of pressure applied upon the end structure of the grain is merely to tend to spread the ends of the cut strands and thus to increase the rough and irregular surface structure.

Notwithstanding the added appeal to the eye and consequential enhanced saleability of soap cakes having a high surface gloss, the only method of achieving this end which, to date has been recognised in the trade as satisfactory, has been a laborious and costly manual operation consisting in operators (preferably women with soft hands) slowly rotating and smoothing each individual cake of soap in the hands until a high gloss is developed. It will readily be recognised that this procedure is impracticable under conditions of mass production where machines operate more-or-less continuously at a rate of production of several thousands of cakes or tablets per hour. Manual polishing is, in fact, applicable only to the batch production of specialty soaps where the production cost is of subsidiary importance. Even so, the manual finishing operation is subject to the variability of the human element and soap cakes so finished inevitably differ in uniformity of surface gloss. Furthermore, the extensive handling which is fundamental to manual finishing is not conducive to the production of soap under controlled sterile conditions.

An object of the present invention is to improve the surface appearance of soap bars and cakes and, in particular, to provide an apparatus by means of which soap having a smooth surface of high gloss may be produced (on all surfaces of the soap, if desired) by purely mechanical means.

A further object of the invention is also to improve the surface appearance of impressions applied to the soap (for example, designs, trademarks and fancy edgings) and to enhance the sharpness of such impressions.

Broadly, the invention consists in polishing soap by ironing the surface of the soap at an elevated temperature i. e., one which is appreciably higher than normal room temperature of between about 67 to 72° F., to produce a smooth glossy finish.

Polishing may be effected by sliding the soap relatively to a platen and simultaneously exerting a shear stress from the platen upon the surface of the soap, while maintaining the soap surface at a temperature within a range adequate to produce a smooth glossy finish thereon.

It is preferred, however, to advance the soap through a tubular support in sliding engagement with the internal walls thereof and to exert a shear stress from the internal walls of the support upon the surface of the soap during such advance. The tubular support may itself have highly polished internal walls.

In order to impose a shear stress upon the surface of the advancing soap, the invention contemplates effecting

a progressive change in the cross-section of the soap during at least the latter part of its advance through the tubular support so to restrain the soap from free advance and to create a back-pressure which forces the surface of the soap into firm contact with the internal wall or soap lining of the support.

The invention may advantageously be applied to cut soap cakes before or after final pressing, to pre-formed soap bars, whether prepared by extrusion or by slabbing and cutting, or as a final step in the process of forming soap by extrusion.

The usual pressing operations can be performed upon soap having a high surface gloss produced in accordance with the invention without spoiling the polished surface. Thus, the soap may be polished before it is subjected to the usual final pressing operation in the soap press, which procedure, far from spoiling the surface appearance, is found to be particularly advantageous in that the smooth highly polished surface is carried down into the impressed surface indentations and the appearance of the impressed matter is thereby greatly improved. The invention furthermore enables the cut ends of the cake to be polished before or after pressing which results in a noteworthy improvement of such end surfaces when they extend transversely to a longitudinal grain.

In the application of the invention as a final step in the process of forming soap by extrusion, the invention includes the method of forming and polishing a soap bar which comprises extruding soap through a restricted opening to form an emergent bar and thereafter advancing the bar in a polishing operation as hereinabove set forth. In this connection, the invention is applicable not only in the conventional method of forming a soap bar by extruding soap through a plurality of restricted openings to form a bundle of emergent strips, the strips then being compressed transversely to their length and thereafter extruded through a restricted aperture to form an emergent bar having a longitudinal grain, but may also be applied with particular advantage in the method of forming a soap bar having a helically coiled grain extending longitudinally thereof, as described in United States Patent No. 2,414,097 in the names of James Garvey et al.

The method of the aforesaid prior patent enables a bar to be extruded with a non-rectangular cross-section (for example, an octagonal cross-section) which may, if desired, be cut by transverse severance of the bar directly into cakes with non-rectangular faces having a grain structure which does not run directly from face to face of the cake but which, owing to the helical grain formation, extends helically throughout and around the cake. Unlike cakes cut by transverse severance of a conventional longitudinal grain bar (where, it will be recalled, the ends of the cake extend substantially at right angles to the grain), the cut surfaces from a transversely severed helical grain bar extend only at a slight angle to the run of the grain. This orientation of the grain not only yields a good surface finish when pressing is effected upon the cut surfaces but gives a high surface gloss when polished by the method of the invention.

The elevated temperature at which the surface of the soap must be maintained to result in a smooth glossy finish depends upon several factors, the most important of which are the nature of the soap stock employed, the moisture content of the soap stock and the duration of the sliding contact between the soap surface and the polishing surface. An optimum temperature can therefore be given only in terms of particular operating conditions with a particular soap batch but nevertheless, an appropriate temperature can readily be determined by simple experiment since, if the temperature is too low, no appreciable gloss will be obtained or, if it is too high, the surface of the soap will adhere to the polishing surface with consequential tearing and roughening of the soap surface. However, the temperature range within which the surface of the soap should be maintained to

produce a smooth glossy finish appears to correspond very closely to the range of temperature commonly employed by soap manufacturers in extruding soap through the forming plate of the plodder which, as stated hereinabove, ranges from about 90° F. to about 115° F. The limited temperature range of from about 90° F. to about 115° F. is, therefore, believed to constitute an excellent rule-of-thumb for initial experiment with any particular soap batch under selected operating conditions and satisfactory results have, in fact, been secured at temperatures within this range. In general, the lower the temperature of the surface of the soap, the longer will be the contact time required with the polishing surface to secure the desired surface finish and vice versa.

Heat may be transmitted to the surface of the soap through the polishing face of the platen or tubular support or, alternatively, the desired temperature can be obtained by pre-heating the soap. Even though the soap be polished while it is still hot immediately after extrusion from the forming plate of a plodder, the surface of the soap tends to chill rapidly and it is advisable to provide thermostatically controlled heating means to maintain the soap surface at the desired temperature during the polishing operation.

If heat is transmitted to the surface of the soap from a heated plate or tubular support, it has been found that a platen or support temperature such that its heat can just be tolerated for a few seconds by the palm of the hand is about the upper working limit of temperature. A good surface gloss has been achieved at this temperature but in general it is preferred that the temperature of the platen or tubular support should be somewhat less than that corresponding to the above approximate test and preferably should be automatically controlled by thermostatic means presettable in the range from about 90° F. to about 115° F.

The invention includes apparatus for carrying out the polishing operation described and, in one form comprises a platen, means for sliding soap to be polished relatively thereto and means for exerting a shear stress between the platen and the surface of the soap.

In a preferred form of the invention, polishing is effected by a device (which is conveniently constituted as an attachment for a soap extruding machine), comprising a tubular member having an axial passage through which soap may be fed from an inlet to an outlet end and wherein the cross-section of the passage is progressively modified towards at least the outlet end to impose a shear stress upon the surface of soap fed therethrough. The axial passage of the tubular member may have a highly polished internal wall surface.

The progressive modification of the cross-section of the passage may conveniently be obtained by having the passage slightly convergent from its inlet to its outlet or the tubular member may consist, for example, of a tubular element having a substantially parallel-walled axial passage and a tubular extension detachably secured at one end to one end of the element, the extension having an axial passage in axial alignment with and forming a smooth continuation of the parallel-walled passage and changing progressively in cross-section (for example, shrinking in cross-sectional area or merging from a circular to an octagonal or rectangular cross-section) axially thereof towards its other end.

The invention will now be described in more detail with reference to the attached drawings, which illustrate by way of example, several forms of apparatus by which the invention may be carried into effect and which also illustrate certain soap bars and cakes to which a surface gloss may be imparted in accordance with the method and by the apparatus of the invention.

In the drawings:

Figure 1 is a longitudinal section of a conventional soap plodder having attached thereto, a soap polishing device according to the invention,

Figure 2 is a longitudinal section on an enlarged scale of the soap polishing device shown in Figure 1,

Figure 3 is a plan view of an alternative soap polishing device,

Figure 4 is a view showing the grain formation in a longitudinal grain bar of soap,

Figure 5 is a view of a cake cut from a bar as shown in Figure 4, and subsequently cut to octagonal shape,

Figure 6 is a longitudinal section of part of a helical grain soap plodder of the kind described in the United States Patent No. 2,414,097, fitted with the polishing device of Figure 2,

Figure 7 is a view illustrating a coiled strip of soap during the initial stages of compression,

Figures 8 and 9 are views showing the grain formation in helical grain soap bars of different cross-section.

Figure 1 shows a conventional plodder indicated by the general reference **11**, having the usual cylindrical casing **12** surrounded by a water jacket **13**, a filling hopper **14** and a feed screw **15** rotated from any desired prime mover through the usual driving gear **16**. Attached to the left hand end of the cylindrical casing **12** beyond the discharge end of the feed screw **15** is a forming nozzle **17** having a cylindrical portion **18** and a conical portion **19**. A plate **20**, provided with a plurality of perforations **21**, is mounted transversely to the feed screw **15**, fitting on the one hand within a recess at the left hand end of the portion **18** and abutting on the other hand against the end of the cylindrical casing **12**. The apex of the conical portion **19** terminates in a transverse flat annular wall providing a seating for an annular forming plate **22** which is held in position by a collar **23** having internal threaded engagement with the outer rim of the portion **19**. The forming plate **22** has a central die aperture corresponding to the desired cross-sectional area of the soap bar to be extruded therethrough, the aperture having an edge which is relieved downstream of the soap. A shroud electric heater **24** surrounds the periphery of the collar **23** and maintains the soap at the correct temperature for extrusion through the forming plate, the temperature of the forming plate and collar **23** being controlled through a conventional pre-settable thermostat means shown diagrammatically at **24***a*.

The structure so far described is well known in the art, the action of the plodder being as follows:

Upon rotation of the feed screw **15**, soap introduced through the hopper **14** is fed to the left within the container **12** where it is compressed and forced to pass through the openings **21** in the perforated plate **20**. The soap emerges from the openings **21** in the form of longitudinal strips which are at first separate and distinct from one another. However, under the continued action of the feed screw **15**, the forming nozzle becomes filled with soap strips, and further operation of the screw causes the strips to be compressed longitudinally and transversely by the conical portion **19** of the forming nozzle **17** until they are consolidated into a compact mass in the region of the forming plate **22**, through the die aperture of which they then extrude as a bar having a longitudinal grain. High compressive forces are exerted upon the soap in the plodder and upon extrusion of the soap through the die aperture of the forming plate **22**, these forces are released so that the soap bar expands slightly in cross-section immediately after leaving the forming plate. The relieved, downstream, edge of the forming plate is provided for the purpose of smoothly accommodating this expansion without disrupting the surface of the soap.

In the plodder just described, cold water is usually circulated through the jacket **13** to chill the outer layer of the soap so as to provide a resistant outer skin to the soap upon which the feed screw **15** can act. The forming plate **22** is, however, heated by means of the device **24** preferably controlled by the thermostatic means **24***a* to maintain an even temperature in the region of from about 90° F. to about 115° F.

According to a first form of the invention, the plodder shown in Figure 1 is provided with a tubular polishing member which is detachably secured to the mouth of the forming nozzle **17**, beyond the forming plate **22**.

The polishing member is shown in greater detail in Figure 2 and comprises a main tubular element divided in a longitudinal central plane into upper and lower sections **25** and **26** respectively secured together at opposite sides of the division plane by bolts **27** extending through longitudinal flanges **25***a*, **26***a*. At the right-hand end, the tubular element terminates in semi-circular socket portions **28**, **29** which are internally threaded for screwed attachment to an externally threaded spigot extension **30** of the collar **23**. To the left-hand end of the tubular member is detachably secured an integral tubular extension **31** having an internally threaded socket portion **32** in screwed engagement with externally threaded semi-circular spigot portions **33**, **34** of the tubular elements **25**, **26** respectively. The end faces of the pairs of spigot portions **28**, **29**, and **33**, **34** fit accurately against the bottom of the sockets **27** and **30** respectively.

The tubular member constituted by the parts **25**, **26** and the extension **31** encloses an axial passage having an inlet opening **35** and an outlet opening **36**, the openings being joined by smooth, highly polished internal walls **37** which are preferably covered with a hard chromium plating to minimize corrosion. The passage extends axially in line with the central axis of the forming nozzle **17**, the passage through the extension **31** forming a smooth continuation of the passage between the elements **25**, **26**.

In the present embodiment of the invention the entire axial passage between inlet **35** and outlet **36** is assumed to have an internal configuration corresponding in cross-sectional shape to that of the bar emergent from the forming plate **22**, and the passage through the collar **23** is assumed to be similarly shaped. However, the internal walls **37** of the passage are axially convergent to a slight extent from the inlet **35** to the outlet **36** so that the cross-section of the passage is progressively modified towards the outlet. The axial convergence of the walls **37** should however, be very slight if the production capacity of the plodder is to be maintained and it has been found that an axial convergence amounting to only about four one-thousandths of an inch over a total axial length of thirty-four inches from inlet to outlet produces a most satisfactory polish without any substantial reduction in production capacity. The inlet opening **35** should be very slightly larger in area than the die aperture in the forming plate **22** to accommodate expansion of the bar upon its extrusion through the forming plate.

In order to maintain the surface of the soap at a temperature adequate to produce a smooth glossy finish, the tubular member may be provided with a thermostatically controlled electric shroud heater comprising upper and lower boxes **39** and **40** which fit around the upper and lower halves **25**, **26** of the tubular element and are joined by a longitudinal hinge (not shown) at one side and secured together at the other side by pivoted bolts and wing nuts. The boxes **39** and **40** are each linked with a layer of suitable heat insulating material **41**, such as asbestos, which is suitably held in position so as to provide air cavities **42**, **43** between the insulating linings and the outer surface of the elements **25**, **26** respectively. Electric strip-heating elements **44** are mounted upon the inner surfaces of the heat-insulating linings **41** within the air cavities **42**, **43** free of direct contact with the elements **25**, **26** and extend longitudinally thereof being supported, for example, from the boxes **39**, **40**. Preferably, at least two such strip-heating elements are disposed within each box **39**, **40** and are connected to an electric connector through conventional adjustable thermostat means, shown diagrammatically at **45**, which is variable at least over the temperature range from 90° F. to 115° F. The temperature of the tubular elements **25**, **26**

may thereby be predetermined and accurately controlled during the polishing operation and the surface of soap passing in contact with the walls **37** of the tubular member accordingly maintained at a required temperature.

The action of the polishing member is as follows:

Continued operation of the feed screw **15** feeds the extruded soap bar into the entrance-opening **35** where the expanded bar comes into contact with the internal walls **37** of the axial passage. The soap bar is thereupon fed under the continued action of the plodder, through the tubular passage in sliding engagement with the convergent walls thereof and is therein subjected to a surface shear stress from the walls deriving from the close contact between the soap and the surrounding walls consequent upon the convergence of the passage towards the outlet **36**. In this connection it should be noted that the aforementioned volumetric expansion of a soap bar immediately after extrusion, is evidenced not only by an initial increase in cross-sectional area of the bar but also in a tendency for the bar to undergo slight longitudinal extension or to "creep" with resulting slight reduction in cross-sectional area. The convergent walls of the polishing member serve nevertheless to maintain close sliding contact with the soap bar and the surface of the soap bar is thus subjected in the polishing member to a surface acting dynamic shear stress and is worked upon mechanically by the wall surfaces **37** which function, so far as can be ascertained, similarly to the platen of a flat iron. The surface of the soap bar, emerging through the heated aperture of the forming plate **22** is at a temperature in the region of 90° to 115° F. (according to the particular soap stock employed) and it has been found in practice with a variety of different commercial soap stocks that a smooth glossy finish can be obtained on the soap bar emergent through the outlet **36** with the soap surface maintained in this temperature range while passing through the tubular polishing member. However, notwithstanding the presence of the heater **24** close to the polishing member, it is advisable also to employ the strip-heaters **44** and more particularly so if one or more nozzles (not illustrated) are inserted between the tubular polishing member and the spigot **30** for the purpose, for example, of reducing the cross-section of the bar extruded from the forming plate and/or for converting its shape (as from a circular section to a square, oval or octagonal section) before passing into the polishing member.

No matter how skillfully the upper and lower sections **25, 26** of the tubular element may be fitted together, it is found that unless an integral tubular extension such as **31** is employed having a continuous internal wall surface, the emergent bar while polished will also have a fine longitudinal seam at its opposite sides corresponding to the partition lines of the upper and lower sections. The tubular extension **31** effectively removes these longitudinal seams and the soap bar emerging through the outlet **36** possesses smooth glossy surfaces on all its longitudinal faces. The emergent bar is thereafter cut at appropriate intervals transversely to its length by any desired form of cutting mechanism.

Figure 4 is an isometric view of soap bar **46** of rectangular cross-section having a longitudinal grain, such as might be extruded in the plodder of Figure 1 using a forming plate with a rectangular die-aperture. In such soap bars, the individual consolidated soap strips cannot be detected by ordinary observation or as a result of ordinary use but the cut ends of the grain are indicated by dotted shading in Figure 4 on the forward transverse end-face of the bar. The longitudinal surfaces of the bar **46** having been in contact with the walls **37** of the tubular polishing member exhibit a smooth glossy surface and to complete the polishing of cakes cut from such a bar it is now only necessary to polish the transverse cut end faces of the cakes.

The bar **46** may, for example, be cut into cakes in a transverse plane as indicated in chain-line at **47** in Figure 4, and the apparatus shown in Figure 3 may then be used to impart a smooth glossy finish to the cut end faces of the cakes.

Referring to Figure 3, a pair of platens **48, 49** having opposite smooth, highly polished longitudinal faces **50, 51** respectively, are supported in vertical spaced parallel relationship above a horizontal fixed table **52** about which is disposed a horizontal conveyor belt **53**. Vertical frame members **54, 55** formed integrally with or secured to the table **52** extend along its opposite sides in spaced parallel relationship. The frame members **54, 55** are provided with transverse holes to receive in close but free sliding engagement a plurality of dowels **56** which are fixed perpendicularly to the platens **48, 49**. Strip electric heater elements **57, 58** are attached to the outside surfaces of the platens and extend longitudinally thereof.

Strip electric heater elements **57, 58** are located within air cavities between the platens **48, 49** and thermally insulated boxes **59, 60** secured to the outer sides of the platens similarly to the arrangement described in detail with reference to Figures 1 and 2. The temperature of each platen is also controlled by conventional adjustable thermostat **61** variable at least over the temperature range of from 90° F. to 115° F. Compression springs **62** are disposed around each dowel **56** between the frame members and the platens and serve to urge the polished faces **50, 51** towards each other. The inward transverse movement of the platens under the action of the springs **62** is limited by adjustable wing nuts **63** in threaded engagement with bolts **64** attached perpendicularly to the plates and passing through holes in the frame members **54, 55**. The platens **48, 49** are provided with out-turned vertical portions at their ends, as indicated at **65, 66** to facilitate admission of the soap cakes between their opposed faces.

The operation of the device shown in Figure 3 is as follows:

Soap cakes which may, for example, have end-faces cut transversely to a longitudinal grain as indicated at **47** in Figure 4, are placed or fed one-by-one onto the conveyor belt **53**, for example, by a padded reciprocating plunger **67** which urges them to the right between the highly polished faces **50, 51** of the platens. If it is required to polish the cut end faces of cakes cut from a pre-polished bar like that shown in Figure 4, the cakes are positioned with their end faces in contact with the faces of the platens parallel to their direction of movement therealong. A series of cakes **68, 69, 70** so positioned between the platens is shown in Figure 3.

The individual soap cakes are fed by pressure exerted on their rear faces from the front face of the immediately following cake, the conveyor **53** idling over the table **52** and merely serving to provide a smooth support for the bottoms of the cakes which are stationary with respect thereto. The feeding action may be intermittent so that each cake is advanced by an amount equal to its own width each time a fresh cake is placed or fed onto the conveyor.

The surface of the soap in contact with the platens **48, 49** must be maintained at a temperature such that the required surface polish is achieved by the sliding engagement with the platen faces **50, 51**. As pointed out above in connection with Figures 1 and 2, the soap may be preheated to a temperature from about 90° to about 115° F. or, alternatively or in addition, heat may be transmitted to the soap surface from the platens using the strip-heaters **57, 58**. As indicated previously, the upper working limit of temperature is best determined by simple experiment according to the nature of the soap employed, but as an approximate guide the platens **48, 49** should not exceed a temperature which can be borne by the palm of the hand over a duration of a few seconds and maintaining the surface temperature of the soap at from about 90° F. to about 115° F. should enable a satisfactory result to be secured.

During their passage between and along the platen

faces 48, 49, the end faces of the soap cakes are subject to a slight transverse pressure from the platens, due to the loading of the springs 62 and consequently are subjected upon movement to a dynamic shear stress resulting from their sliding engagement with the platen faces. The surfaces of the soap cakes in contact with the platen faces are accordingly mechanically worked upon by the faces of the platens. Whatever may be the true explanation of the processes involved, a smooth glossy finish is obtained upon those surfaces of soap cakes which have been subjected to polishing in the apparatus of Figure 3, notwithstanding that the surfaces in question may have been cut transversely to a soap bar of longitudinal grain, as shown in Figure 4.

While the polishing device of Figure 3 is particularly convenient for imparting a smooth surface of high gloss to the end faces of soap cakes formed by cuts made transversely to a soap bar pre-polished by the action of polishing nozzle as described with reference to Figures 1 and 2 (which cakes are, therefore, already polished on their faces and sides), it is to be noted that the apparatus of Figure 3 may also be employed to polish soap cakes cut from an extruded or a framed bar which has not been subjected to previous polishing and, furthermore, may be employed in polishing an unpolished extruder or framed bar.

In using the apparatus of Figure 3 to polish soap cakes having no previous polish, the cakes before being pressed, are placed or fed onto the conveyor 53 and are moved between the platen faces 48, 49 as previously described, the cakes all being oriented to bring similar opposite surfaces (for example, their ends) in contact with the platens. These opposite faces having been polished, the soap cakes are then turned through a right angle to bring a further pair of opposite surfaces (for example, the sides) in parallel relationship with the platen faces and are again passed through the apparatus. Alternatively, the second polishing operation may be made performed in a second polishing device similar to that of Figure 3 and arranged in series with the first, the platens of the second device being disposed at right angles to those of the first but in line therewith so as to avoid an intermediate turning operation upon the soap cake. The polishing of the remaining opposite surfaces (for example, the faces) may then be performed by a further pass through the polishing device of Figure 3 or may be effected in yet a third polishing device similar to that of Figure 3 disposed in series with the first and second such devices. In such a multiple series arrangement, the third polishing apparatus is preferably disposed at right angles to the plane of the first two devices with its polishing platens vertical so that the remaining surfaces of the soap may be polished by feeding the cakes as they emerge from platens of the second device, at right angles into engagement with the platens of the third polisher.

It should be noted, moreover, that the tubular polishing member of Figure 2 can be used otherwise than as an attachment to a soap extrusion machine. Thus, the tubular member may be mounted upon a fixed support at a loading station where pre-formed, but so far unpolished, bars can be brought into axial alignment with the passage through the polishing member and then fed through the inlet opening 35 in an axial direction, for example, by a mechanical plunger mechanism or manually. Such preformed bars may consist of bars extruded from a conventional extruding machine as previously described, or may consist of helical grain bars extruded as described in U. S. Patent No. 2,414,097 and referred to in greater detail hereafter, or, alternatively may comprise bars cut from a block of framed soap. Notwithstanding the usually substantially different moisture contents of extruded and framed bars, a good surface of high gloss can be obtained through the action of the tubular polishing member provided care is taken to ensure that the temperature conditions are correct, as pointed out hereinbefore. In such an arrangement, the bars may be pre-heated but, preferably, heat is supplied to the surface of the soap by contact with the walls 37 of the tubular polishing member, the strip heaters 44 being operative.

It should also be noted that the tubular polishing member is capable of imparting a surface polish to pre-cut cakes of soap. This feature is advantageous when operating with multi-surface cakes cut from a soap bar having a longitudinal grain. For example, if an octagonal cake is required from a soap bar having a longitudinal grain as illustrated in Figure 4, the bar 46 is first cut transversely into cakes as already described and the corners of the resulting cake are, thereafter, cut off as indicated by the dotted lines 71, 72, 73 and 74. An octagonal cake as shown in Figure 5 is thereby obtained. To polish the six end surfaces (and, if desired, to repolish the two opposite sides if these have already been polished with the faces in an initial operation), a tubular polishing member may be employed having internal convergent walls of octagonal cross-section corresponding to that of the cakes under consideration. The polishing member may be supported in a fixed mounting as already described and the octagonal cakes fed, one at a time, into the outlet 35 of the member with their sides and cut ends in register with the corresponding walls of the octagonal passage and are then pushed through the polishing member to and through the outlet 36. Upon emergence from the outlet the cakes are found to have acquired a smooth surface of high gloss not only upon the sides extending parallel to the grain (if these were not already polished) but also upon the cut end faces which extend transversely to the grain structure. If the faces of the octagonal soap cakes have not previously been polished simultaneously with the sides before severance from the bar, they can then be finished in the apparatus of Figure 3 or, by again passing the cakes, this time in a direction parallel with the faces, through a further tubular polishing member with an appropriate internal wall configuration.

The plodder shown in part in Figure 6 is similar to one form of apparatus disclosed in U. S. Patent No. 2,414,097 but fitted, in the present instance, with a tubular polishing member similar to that of Figures 1 and 2. The right hand end of the plodder of Figure 6 is not shown being assumed to be identical with that of Figure 1. In the present instance, a forming plate 80 having an octagonal central die aperture 81 is secured at the apex of the forming nozzle 17 by the collar 23.

In place of the transverse perforated plate 20 of Figure 1, a perforated plate 83 provided with a large number of small extrusion openings 84 is mounted longitudinally of the feed screw 15 between the last two flights 85 and 86 thereof. The plate 83 extends from the shaft 87 to the periphery of the feed screw and is let into slots in the shaft and in the adjacent flights 85 and 86.

Upon rotation of the feed screw 15, the openings 84 are swept around the axis of the feed screw each in an orbital path in a plane; the individual openings 84 open tangentially to their related orbital paths each also being directed within the plane containing its orbital path.

There may, if desired, be arranged on the leading side of the plate 84, a strainer screen 88 for removal of any impurities present in the soap. The tubular polishing member and associated thermostatically controlled heater is similar to that of Figures 1 and 2, but in the present instance the tubular element and its extension 31 have an axial passage bounded by a wall 89 of octagonal cross-section corresponding to the octagonal die aperture 81 of the forming plate 80. The walls 90 of the passage through the collar 23 are also so shaped.

In the operation of the helical grain plodder of Figure 6, plastic soap is force-fed by the feed screw 15 along the cylindrical casing 12 to pass through the openings 84 in the perforated plate 83 and the soap emerges from each opening 84 in a direction tangential to the path of orbital rotation of the opening and in the plane containing the or-

bital path of rotation. The resultant strips have a longitudinally extending grain and, upon continued rotation of the plate 83 are left curled helically about an axis substantially coinciding with the axis of the feed screw. As the operation of the plodder continues, the forming nozzle 17 becomes filled with soap strips coiled about an axis which extends out through the opening 81 of the forming plate 80. Continued movement of these coiled strips towards the opening 81 under the action of the feed screw, causes the coiled strips to be compressed both longitudinally and transversely of their axis by the conical portion of the plodder nozzle until they are extruded from the die-aperture 81 in the form of a bar.

Figure 7 shows a portion of a coiled mass of soap as it would be found in the nozzle 17 of Figure 6 looking from the point at which the strips 91 of soap are first extruded from the openings 84 of the plate 83. 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 7 by showing the individual strips as entirely separate at first and then in contact, with their boundaries defined by lines 92 which are at first continuous and then become more and broken. Figure 7 also illustrates diagrammatically the longitudinal compression of the coils which takes place as they advance through the plodder nozzle, the lines 93 indicating the boundaries between successive coils of the group of strips extruding from the plate 83, becoming, as can be seen, closer and closer together as the end of the forming nozzle is approached. For the purpose of clarity the lines 93 are 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.

Figures 8 and 9 show respectively, octagonal and rectangular sections of helically grained bars of soap made by extrusion through forming plates having die apertures corresponding to the sections in question. It will be understood, however, that helically grained bars of other section, for example, oval or circular section, may be extruded using a forming plate with an appropriately shaped die aperture.

As previously noted, the individual strips or groups of strips cannot be detected by ordinary observation or as the result of ordinary use; dotted lines 94 in Figures 8 and 9 show, however, the general run of the grain. The angles of the lines 94 are deliberately exaggerated to show the helically coiled structure. 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 more-or-less following the contour of the die from which the bar was extruded.

In the octagonal soap bar of Figure 8, the helical arrangement of the grain permits the bar to be cut transversely, as in the plane indicated by the chain-line 95, to provide an octagonal soap cake in which the faces of the soap extend transversely to the bar. In the resultant cake the coils run helically from face-to-face of the soap at only a very slight angle to the faces of the soap. This cake is thus shaped octagonally by the extruding operation of the plodder rather than by a separate cutting operation such as is necessary to obtain an octagonal cake from a longitudinal grain bar as shown in Figure 4.

The rectangular bar of Figure 9 may be cut transversely, as in the plane indicated by the chain-line 96, to form cakes with faces extending parallel to the bar or, alternatively, may be cut transversely, as in the plane indicated by the chain-line 97, to provide cakes having faces transverse to the axis of the bar. Whichever method of cutting is employed, since the pitch of the helices is very slight, the sides, ends and faces all run substantially parallel to the run of the grain. The same holds for octagonal cakes from the bar of Figure 8.

The action of the tubular polishing member in association with the plodder of Figure 6 is similar to that already described in connection with Figure 1 but is subject to the important difference that the sliding engagement between the soap and the internal walls of the polishing member takes place upon a helical grain which, while running substantially parallel to the walls 89 of the polishing member also extends transversely to the direction of feed of the bar. A helical structure of this kind has been found to yield an exceptionally smooth surface of very high gloss upon all the surfaces of the extruded bar after it has travelled through the polishing nozzle. This feature, taken in conjunction with the fact that the soap bar can be extruded with a multiplicity of pre-formed surfaces permits octagonal soap cakes to be produced which possess a very high surface gloss, even upon slant-wise surfaces extending transversely to the length of the cake and without the necessity for the intermediate cutting operation as is required, for example in forming an octagonal cake from a bar with a longitudinal grain.

Helical grain octagonal soap cakes produced in the above manner can, thereafter, have their face surfaces polished by being passed lengthwise through the apparatus of Figure 3 or, alternatively, they may be passed lengthwise through a secondary polishing member having an internal wall configuration appropriate to the cross-section of the cake taken transversely to its length.

What I claim as my invention is:

1. Apparatus for polishing soap comprising means for forming a soap bar, a platen, means for sliding the formed soap bar to be polished relatively to said platen and means for exerting a shear stress between the platen and the surface of the soap bar.

2. Apparatus for polishing soap, comprising a pair of flat platens each having a highly polished face, which faces are arranged in opposed substantially parallel relationship, means for feeding soap between the platens with opposed surfaces of the soap in sliding contact each with one of the platen faces and means for exerting a shear stress between the platen faces and the soap surfaces.

3. Apparatus as claimed in claim 2, in which the platens are supported for yielding movement in a direction transverse to the feed of the soap by resilient means operative to urge the platens towards each other.

4. Apparatus for producing a polished bar of soap comprising a forming plate, means for extruding a mass of soap through said forming plate to form a bar of soap, a tubular member having an axial passage therethrough with a highly polished internal wall surface, and means for feeding the formed soap bar through said member from an inlet to an outlet end, the cross-section of said axial passage being progressively modified towards at least the outlet end to impose a shear stress upon the surface of the soap bar fed therethrough.

5. A device as claimed in claim 4, in which the tubular member includes a tubular element having a substantially parallel-walled axial passage and a tubular extension detachably secured at one end to one end of said element, said extension having an axial passage in axial alignment with and forming at the secured end a smooth continuation of the parallel-walled passage and being reduced progressively in cross-section axially thereof towards its other end.

6. A device as claimed in claim 4, including means for maintaining the tubular member at a predetermined temperature in the region of from about 90° F. to about 115° F.

References Cited in the file of this patent

UNITED STATES PATENTS

484,777	Chase	Oct. 25, 1892
711,493	Gottschalk	Oct. 21, 1902
806,502	Rutschman	Dec. 5, 1905
2,494,891	Marshall	Jan. 17, 1950