The present invention relates to the manufacture of soap bars or tablets. More particularly, it relates to the manufacture of hard, filled soaps containing relatively low percentages of total fatty matter.

In the manufacture of soap, hot molten soap may be cooled by passing it, in a fluid condition, as a very thin layer over a strongly cooled surface whereby it is caused to solidify and crystallize practically instantaneously throughout its entire thickness. It is appropriately removed from the surface by scrapers or equivalent means. The solidified soap thus obtained may be molded or compressed into bars or tablets by the aid of a plodder. Such treatment may be applied to soap containing from about 50% to 63% of fatty acids or fatty and resinous acids, or may be applied to filled soaps which contain more than the normal quantity of water as well as salts such as sodium silicate, sodium carbonate or sodium sulphate.

The filled soaps may be prepared in the usual manner from molten 63% soap by placing the latter, preferably at a temperature of about 80° C., in a crutcher or other suitable device and adding and stirring in the desired fillers either in concentrated form or in the form of a solution or suspension in water, preferably also at a temperature of about 80° C. The hot molten filled soap may be rapidly chilled and thereafter the solidified filled soap may be plodded.

At relatively high total fatty matter levels within this range, such as from 45% to 60%, the more conventional liquid fillers such as neutral sodium silicate or mixtures thereof with caustic alkalis, alkali carbonates and water in suitable proportions can be mixed with 63% soap made from relatively hard fat charges, such as charges containing, e.g., 50% palm oil and 10% palm kernel oil, to produce firm plodded filled soaps. Weak solutions of salt or other electrolyte may also be used as fillers when the total fatty matter content is above 50%.

However, when these conventional liquid fillings are used in the preparation of plodded filled soaps containing relatively low percentages of total fatty matter or plodded filled soap made from softer fat charges, the resultant soap bars and tablets are found to be too soft for satisfactory handling. It has now been found that it is possible to produce a plodded filled soap having relatively lower total fatty matter levels, or made from softer fat charges, which is hard enough for satisfactory handling. This is accomplished, in accordance with the invention, by adding sodium aluminum silicate gel to hot molten soap. The soap, which may then have a total fatty matter content of about 30% and 60%, is then rapidly chilled and the solidified soap is thereafter plodded.

The sodium aluminum silicate gel may be added to the soap in a number of different ways. One such way is to add the sodium aluminum silicate gel, in an already prepared form, directly to the soap. Another way is to form the sodium aluminum silicate gel in situ within the soap. This may be accomplished, for example, by adding sodium silicate solution and sodium aluminate solution to the hot molten soap, or by adding the required proportions of such ingredients as aluminum silicate gel or alumina gel, silica gel and caustic soda to form a sodium aluminum silicate gel of the desired composition.

The proportion of sodium silicate added may be between 3 and 40 parts and that of sodium aluminate between 1 and 10 parts, in which case the amount of soap will vary between 50 and 96 parts.

The resultant soap may contain up to 50% of sodium aluminum silicate gel.

One advantage of my invention is that the molten filled soap remains relatively fluid for processing purposes.

Another advantage is that I am able to produce a filled soap which, due to the filling, has base exchange and water softening properties.

Moreover, the product in bar form is quite firm without being overloaded with solid material.

Furthermore, my novel soap has a good appearance and is relatively free from the undesirable phenomenon of efflorescence, which in most filled soaps is exhibited in various forms ranging from a white bloom to a whiskery or thick furlike surface deposit.

The alkalinity of the filled soap according to the present invention can be controlled by the relative proportions of the added ingredients. For many purposes it is desirable to avoid excessive alkalinity in the soap. When this object is in view, it is preferred to use a sodium aluminate with a Na2O/Al2O3 ratio of not greater than 1.5 and a neutral sodium silicate with a SiO2/Na2O ratio of 3.2, all such ratios being understood to be molecular proportions. In the mixture of sodium aluminate and neutral sodium silicate, the final SiO2/Na2O ratio should preferably not be substantially less than 1.9 unless rather alkaline products are required. The SiO2/Na2O
ratio should not, in general, be so high that an acid soap is formed. The most suitable proportion of Al₂O₃ required will vary with the total fatty matter content of the finished product and will depend to some extent on the fats used in the soap base and the firmness desired in the finished product. The proportions of SiO₂ and Na₂O can be adjusted to suit the Al₂O₃ content. Thus, for a filled plodded soap containing 40% total fatty matter, the mixer charge can be made up in a number of ways, two of which are shown by way of illustration below:

<table>
<thead>
<tr>
<th>63% soap</th>
<th>Neutral sodium silicate, 89° Twaddell sodium aluminate solution 40% Na₂O/Al₂O₃ ratio 1.46</th>
<th>Sodium aluminate 90% Na₂O/Al₂O₃ ratio 1.27</th>
<th>Water used to dissolve the aluminate</th>
</tr>
</thead>
<tbody>
<tr>
<td>63%</td>
<td>27</td>
<td>4</td>
<td>109</td>
</tr>
<tr>
<td>63%</td>
<td>27</td>
<td>4</td>
<td>109</td>
</tr>
</tbody>
</table>

Various examples of procedures for carrying out the invention will now be described.

**Example 1**

63 parts by weight of a 63% total fatty acids content soap made from a fat charge consisting of 90% palm oil and 10% palm kernel oil were added to a crutcher in the molten state. Twenty-seven parts by weight of 80° Twaddell neutral sodium silicate and 10 parts by weight of a 40% aqueous solution of sodium aluminate having a Na₂O/Al₂O₃ ratio of 1.46 were added to the crutcher.

The molten filled soap so obtained therefore contained about 40% total fatty matter. It was chilled on a refrigerated drum to 20° C. in the matter of a few seconds, milled and then plodded under vacuum. The resultant bars of filled soap were of good appearance and much harder than plodded filled soap which contained no sodium aluminum silicate gel and were similar in hardness to 63% soap bars prepared by the analogous steps of chilling, milling and vacuum plodding.

**Example 2**

63 parts by weight of a molten 63% total fatty acids content soap made from a fat charge consisting of 86% palm oil and 20% groundnut oil were mixed in a crutcher with 27 parts by weight of 80° Twaddell neutral sodium silicate and 10 parts by weight of a 40% aqueous solution of sodium aluminate having an Na₂O/Al₂O₃ ratio of 1.46. The temperature of the molten mixture was 80° C. The mixture was then chilled to 22° C. in about 1 second over a three-roll, water-cooled mill, re-milled over the same mill and plodded under vacuum. The bars of filled soap thus obtained contained 41.3% total fatty matter and were of good appearance and somewhat harder than 63% soap bars prepared in a similar manner.

**Example 3**

The method of Example 1 was repeated, the amounts of 63% soap, neutral sodium silicate and sodium aluminate being changed, however, to 55, 35 and 10 parts by weight, respectively.

The resultant molten filled soap, which contained about 33% total fatty matter, was chilled, milled and plodded as in Example 1 and resulted in a filled soap bar of similar hardness to that of the soap produced in Example 1.

**Example 4**

The method of Example 2 was repeated, the amounts of 63% soap, neutral sodium silicate and sodium aluminate solution being changed, however, to 84, 11.7 and 4.3 parts by weight respectively.

The resultant molten filled soap was subjected to chilling, milling and plodding as in Example 2. The filled soap bar contained 54.8% total fatty matter and was appreciably harder than 63% soap bars prepared by the analogous steps of chilling, milling and vacuum plodding.

**Example 5**

Sixty-nine parts by weight of a 63% total fatty acids content soap made from a fat charge consisting of 95% palm oil and 5% resin were mixed in a crutcher with 22.5 parts by weight of 80° Twaddell neutral silicate and 8.5 parts by weight of a 40% aqueous solution of 95% sodium aluminate of Na₂O/Al₂O₃ ratio 1.27. The molten filled soap thus obtained at a temperature of 83° C. was chilled in about 1 second to 22° C. over a three-roll, water-cooled mill and then plodded under vacuum. The bars of filled soap thus obtained contained 45.9% total fatty matter and were of good appearance and substantially equal in hardness to 63% total fatty matter soap bars prepared in a similar manner.

**Example 6**

A mixture was made, at a temperature of 76° C., of 27 parts by weight of 80° Twaddell neutral sodium silicate and 10 parts by weight of a 40% aqueous solution of sodium aluminate having a Na₂O/Al₂O₃ ratio of 1.46. The mixture was stirred until it formed a slurry which was then added to 63 parts by weight of a molten 63% soap made from a fat charge consisting of 80% palm oil and 10% palm kernel oil. The mixture was chilled at a temperature of 30° C. for 20 minutes, chilled to 24° C. in about 1 second over a three-roll, water-cooled mill, milled over a three-roll mill and plodded under vacuum. The bars of filled soap so produced contained 42.3% total fatty matter and were of good appearance and substantially equal in hardness to plodded 63% soap bars.

One or more steps may be taken to increase the degree to which the filled soap mass is compacted during plodding. For example, the filled soap may be worked prior to plodding, the said working being carried out by milling or refining. Again the plodding may be carried out at sub-atmospheric pressure or in the presence of carbon dioxide. The steps taken to increase the degree to which the filled soap mass is compressed may also include the step of passing the extruded filled soap bar into an extension tube added to the nozzle of the plodder, the increased resistance of which serves to build up the pressure in the plodder. The sodium aluminum silicate filler used in my invention may be used alone or in conjunction with other fillers such as sodium carbonate, starch, sugar, clay and other well-known filler materials.

It is to be expressly understood that the foregoing examples are by way of illustration only and that the invention may be modified in numerous ways obvious to those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. A method of forming a hard solid filled soap
product which includes the steps of chilling hot molten filled soap containing sodium aluminum silicate gel and thereafter plodding the resultant solidified filled soap.

2. A method of forming a hard solid filled soap product which includes the successive steps of forming sodium aluminum silicate gel in situ within hot molten soap, chilling the molten filled soap and plodding the resultant solidified filled soap.

3. A method of forming a hard solid filled soap product which includes the successive steps of adding up to about 30% by weight of sodium aluminum silicate gel to hot molten soap, chilling the molten filled soap and plodding the resultant solidified filled soap.

4. A method of forming a hard solid filled soap product which includes the successive steps of adding to hot molten soap about 3 to 40 parts by weight of 80° Tw. neutral sodium silicate having a SiO₂/NaO ratio of not substantially less than 3.2 and about 1 to 10 parts by weight of 40% aqueous sodium aluminate, chilling the molten filled soap and plodding the resultant filled soap.

5. A method of forming a hard solid filled soap product which includes the successive steps of adding to hot molten soap about 1 to 10 parts by weight of 40% aqueous sodium aluminate having a NaO/Al₂O₃ ratio of not greater than about 1.5 and about 3 to 40 parts by weight of 80° Tw. neutral sodium silicate, chilling the hot molten filled soap and plodding the resultant filled soap.

6. A method of forming a hard solid filled soap product which includes the successive steps of adding to hot molten soap sodium silicate having a SiO₂/NaO ratio of not substantially less than 3.2 and sodium aluminate having a NaO/Al₂O₃ ratio of not greater than about 1.5 to form a sodium aluminum silicate having a SiO₂/NaO ratio not substantially less than 1.9, chilling the hot molten filled soap and plodding the resultant filled soap.

7. A method of forming a hard solid filled soap product which includes the successive steps of adding about 3 to 40 parts by weight of 80° Tw. neutral sodium silicate and about 1 to 10 parts of 40% aqueous sodium aluminate to about 50 to 96 parts of hot molten soap, chilling the hot molten filled soap and plodding the resultant solidified filled soap.

8. A method of forming a hard solid filled soap product which includes the successive steps of chilling hot molten filled soap containing sodium aluminum silicate gel, working the resultant solidified filled soap and plodding the worked solidified filled soap.

9. A method as claimed in claim 8 in which the solidified filled soap is worked by milling.

10. A method of forming a hard solid filled soap product which includes the steps of chilling hot molten filled soap containing sodium aluminum silicate gel and thereafter plodding the resultant solidified filled soap at sub-atmospheric pressure.

11. A method as claimed in claim 10 in which the resultant solidified filled soap is worked prior to plodding.

12. A method of forming a hard solid filled soap product which includes the successive steps of chilling hot molten filled soap containing sodium aluminum silicate gel, milling the resultant solidified filled soap and plodding the milled filled soap at subatmospheric pressure.

13. A method of forming a hard, solid, filled soap product which includes the successive steps of adding about 3 to 40 parts by weight of 80° Tw. neutral sodium silicate and about 1 to 10 parts of 40% aqueous sodium aluminate to about 50 to 96 parts of hot molten soap to form sodium aluminum silicate gel in situ within the hot molten soap, chilling the molten filled soap, and plodding the resultant solidified filled soap.


15. A plodded filled soap containing up to about 50% sodium aluminum silicate gel prepared by the method of claim 1.

16. A plodded filled soap containing sodium aluminum silicate gel having a SiO₂/NaO ratio not substantially less than 1.9 prepared by the method of claim 1.

17. A plodded filled soap containing about 4 to 50 parts of sodium aluminum silicate gel per about 50 to 96 parts of soap prepared by the method of claim 1.

18. A hard plodded filled soap containing from about 30 to about 60% by weight of total fatty matter and up to about 50% by weight of sodium aluminum silicate gel prepared by the method of claim 1.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
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</tr>
</thead>
<tbody>
<tr>
<td>934,792</td>
<td>Kayser</td>
<td>June 15, 1909</td>
</tr>
<tr>
<td>2,257,545</td>
<td>Curtis</td>
<td>Sept. 30, 1941</td>
</tr>
<tr>
<td>2,295,594</td>
<td>Mills</td>
<td>Sept. 15, 1942</td>
</tr>
<tr>
<td>2,299,768</td>
<td>Shabaker</td>
<td>Oct. 27, 1942</td>
</tr>
<tr>
<td>2,316,889</td>
<td>Reid</td>
<td>Apr. 13, 1943</td>
</tr>
<tr>
<td>2,304,221</td>
<td>McGhee</td>
<td>Feb. 5, 1946</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Country</th>
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<td>Great Britain</td>
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</tr>
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