Feb. 11, 1958 E. B. COYLE 2,823,187

SOAP MANUFACTURE

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BATCH PROCESS

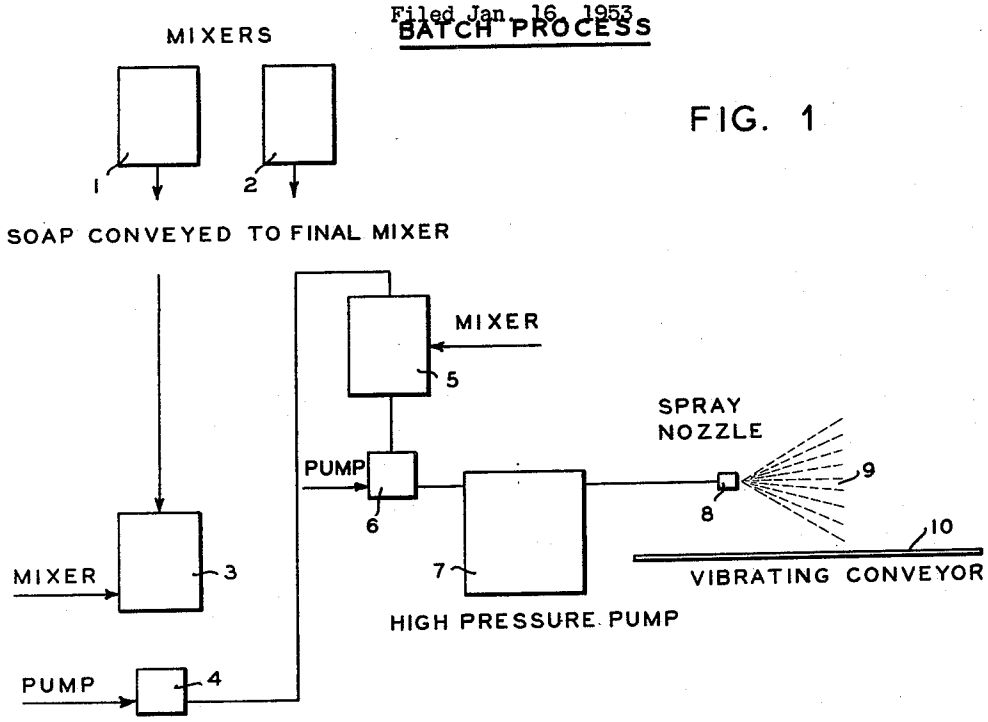


FIG. 1

CONTINUOUS PROCESS

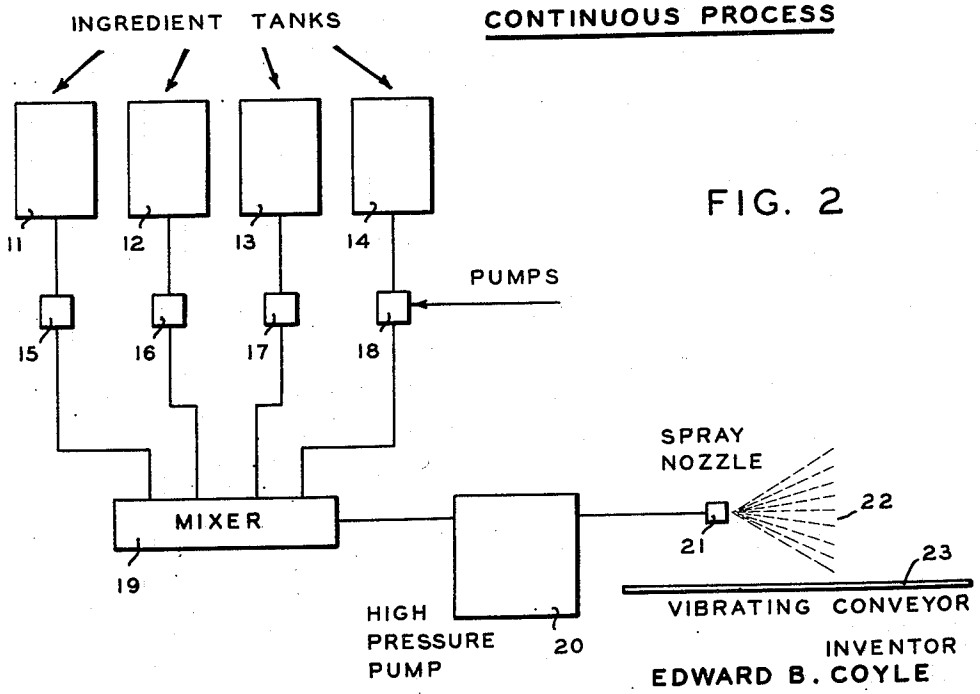


FIG. 2

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SOAP MANUFACTURE

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4 Claims. (Cl. 252—370)

This invention is directed to the manufacture of soap, particularly naphtha containing soap, to products, their utilization, and methods of making and using such products.

In prior art processes during soap making, to obtain satisfactory workability in the product the moisture content is relatively high and may for example run to the order of 25 to 30% by weight and even higher. The use of aqueous solutions of caustic as the saponifying agent necessarily entails relatively high moisture content. Such high moisture content enables the product to be pumped or otherwise handled as desired. However such high moisture content requires after treatment to reduce the moisture present and not only is extensive treatment required for that purpose, but volatiles may be lost excessively during the moisture removal treatment, particularly where bead or other particulate soap products are made.

Among the objects of the present invention is the production of soap of relatively low moisture content by utilization of initially low-moisture content blends thus eliminating excessive moisture removal in later phases of soap making.

Further objects include such soap production from soap blends containing volatiles without loss of volatiles below desired levels during the various treatments.

Still further objects include the production of such soap products in particulate condition.

Still further objects and advantages of the present invention will appear from the more detailed description set forth below, it being understood that such more detailed description is given by way of illustration and explanation only, and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In connection with that more detailed description, the drawing illustrates the invention wherein:

Figure 1 is a flow sheet of one method of carrying out the invention; and

Figure 2 is a flow sheet of a modified form of method.

In accordance with the present invention, the total amount of water present in the saponification blend is kept below about 10% by weight on the weight of the blend including any moisture present in the materials initially used and any water formed during saponification. By control of the water content of the mix in this way, the water that must ultimately be eliminated from the final soap product is severely limited and in fact may in some operations be such that the final product is obtained with a water content requiring substantially no moisture removal therefrom. Since the fluidity or workability of the saponification mix is limited because of the low moisture content, thus maintained, the desired fluidity of the saponification mass may be controlled by temperature or by naphtha content or by pressure or combinations of such expedients.

To obtain such controlled water content at the stated

low levels, the caustic alkali which is used is employed not in the usual caustic water mix, but caustic alkali is used with water and any other components such as alkali metal silicate added with the caustic, so that when such caustic is added to produce saponification, the total water present including any water formed during saponification, is less than 10%. For this purpose solid caustic alkali may be dissolved in water or in a concentrated alkali metal silicate solution in water. Water glass commonly available on the market may be used as the silicate component for this purpose or any other equivalent material may be used. Where greater purity is desired, sodium silicate may be dissolved in water. An exemplary product is that containing 38% solid sodium silicate and 62% water. But other proportions may be used such as 50% silicate and 50% water. Such sodium silicate or equivalent solution may then be used to dissolve the desired caustic for saponification, for example caustic soda. Desirably the caustic in solid form, such as caustic soda flakes (100%), is dissolved in water or in the silicate solution. One method of control of the moisture present in a saponification mix is obtained by variation in the amount of sodium silicate solution used for dissolving the caustic alkali. Another is by the concentration of the solution, and combinations of these and other factors such as relative proportions.

In utilizing such caustic-silicate composition, any desired soap making methods and compositions may be employed. Thus a blend of fatty acid soap forming components, such as any desired mix of fat acids, or fats and oils, or both, with or without naphtha, with or without any desired builder such as soluble carbonates and phosphates, and with or without rosin or similar components, all in soap making proportions, is made as by heating to saponification temperatures. The operation may thus be carried out in a crutcher at a temperature of the order of from about 150 to 190° F. To this blend, the saponification alkali is added, for example a solution of solid caustic flakes in water with or without sodium silicate. The solid caustic, dissolved in water or in the sodium silicate etc., raises the temperature of the saponification agent to about 220° F. to 235° F. This depends of course on proportions, nature of ingredients, etc.

The addition of the caustic causes an immediate reaction in the crutcher and the saponification reaction is completed in a very short period of time, when the soap is ready for further treatment. Conditions during saponification are controlled to prevent overflowing of the mixture. Generally this is accomplished by controlled addition of the caustic to prevent boiling over. In general the temperature during saponification will not exceed about 245° F. The moisture content of the soap may be varied by the amount of water used to dissolve the solid caustic, the amount of moisture present in reaction components, and whether fat or oil acids are present in the reaction mixture. By utilizing materials which result in a low moisture batch (containing for example less than about 10% moisture by weight) subsequent manipulation of the soap mass is simplified. Any necessity for spray tower removal of moisture may be completely eliminated in this way. An enclosed space may if desired be used to restrain any fines.

The soap product resulting from the saponification step contains very low moisture, is quite viscous, and consequently solidifies very rapidly unless temperatures are kept relatively high. When finished in the saponification step, it has a temperature of about 225° F. to 245° F. It should be kept at a temperature of for example from about 225 to 250° F. sufficient to maintain the desired fluidity depending on the treatment to which it is to be

subjected. It may be converted into bar soap for example.

Or it may be taken from the crutcher and sprayed in an open room or enclosed space or tank at ambient temperature which can be conducted so as to maintain the moisture content and not to reduce the naphtha content when present, below a desired minimum. In such operation, if, for example, the soap being subjected to spraying, has a moisture content of from 3 to 10% and a naphtha content of from 3 to 10% the spray operation of the type referred to can be carried out so that the moisture content in the sprayed product remains substantially as it was, while the naphtha content may be somewhat lower for example from 2 to 8%.

Various factors materially affect the viscosity of the soap as it comes from the saponification zone. Temperature, aging or time of standing, or time of transfer from point of production to point of spraying may have a substantial effect on the viscosity of the product. The moisture and naphtha contents at the time of spraying and the temperature range and pressure maintained are very important in controlling the character of product produced. These factors materially affect the operation carried out and also the manipulation applicable. Whether a batch or a continuous process is conducted, may also determine factors in this connection.

A product sprayed in an open room as set forth above may be collected on a mechanically vibrating conveyor and then screened to size and packaged. The resulting product is in particulate condition, and the character of the particle will vary with factors including nature of batch, temperature, medium into which sprayed, pressure of spray device, etc. If sprayed into cold air, a bead may be obtained. A viscous mix may be blown through a spray unit under conditions where it is more or less torn apart. Thus produced, it is not essentially or completely hollow, and may perhaps best be described as granular. Thus when relatively high spray pressures are used, the particles produced may be described as granulets, or micro-nodules of free-flowing irregular character, having high surface area which makes them readily soluble in water. Under low spray pressure, the viscous material may exude from the nozzle in a more or less ribbon of irregular thickness that congeals and separates into granular form.

Another type of treatment of the saponification product is to transport it as rapidly as possible, as by pumping, into for example, a steam jacketed soap crutcher from which it may be delivered by a pressure pump (at pressures for example of from about 150 to 200#) to the spray unit.

Where continuous soap making procedure is employed, the procedure may be as follows. Each ingredient may be pumped through a pipe in the desired controlled and timed amount into the main mixer where complete mixing and finishing of the soap is accomplished. From the mixer, the finished soap is delivered under pressure to a high pressure pump from which it is forced through the spray nozzles to give the particle size and type desired. Change in pressure, and variation in size and type of spray nozzle may be adjusted to the viscosity of the mixture. The high pressure pump may deliver to the nozzles at pressures of for example from about 1000 to 5000#, depending on the size of the nozzle and other factors.

The sprayed product may be collected in any desired way. For example it may fall on to a long vibrating conveyor, which advances the product by vibrations of the conveyor to a take-off conveyor, which may deliver it to collecting drums. Conditions may be adjusted so that the temperature and moisture and volatile matter contents are those desired at the time that the product reaches the drums.

In some cases, the sprayed product may be dried further depending on its moisture or volatile content, to give it the flow properties desired. A product that will flow readily into and from a carton is desired. If further drying is desired, it may be subjected on a conveyor to air blowing and temperature control to deliver a product of the character sought. Roll drum drying or dehumidifiers may be used. But control of the moisture content may be readily effected without tower use, because of the low moisture content of the original blend.

As shown in Figure 1, the desired soap making materials from preliminary mixers **1** and **2** are conveyed to mixer **3** from which they are delivered by pump **4** to mixer **5** where saponification may be carried out and then by pump **6** to high pressure pump **7**, then to nozzle **8**, then spray **9** falls on conveyor **10** to produce the desired final product. The latter is collected and packaged in any desired way.

In the continuous process illustrated in Figure 2, ingredient tanks **11**, **12**, **13**, **14** deliver the desired components in soap making proportions by pumps **15**, **16**, **17**, **18** to mixer **19** from which pump **20** conveys the saponification mixture to spray nozzle **21**. The spray **22** is collected on vibrating conveyor **23** and packaged as desired.

The over all proportions of the components of the blend may vary substantially while obtaining products of low moisture content and desired character. To illustrate generally, the mixed oils may be 35 to 85%, rosin from 0 to 15%, naphtha from 2 to 15%, caustic flakes from 5 to 15%, sodium silicate from 0 to 20%, soluble phosphates from 0 to 20%, and soluble carbonates 0 to 10%, the percentages being by weight on the total blend. The moisture content may be from about 5 to 10% whatever its source.

Free flowing irregular granules or granulets may be readily produced in accordance with the present invention. It is noteworthy that such products containing volatiles such as naphtha may be obtained which retain their desired volatile content despite the spraying or other treatment used; and when packaged in a sealed carton or other container, deliver after usual shelf-life, an effective naphtha or volatile content containing soap.

The following examples illustrate soap formulations that may be utilized in accordance with the present invention and subjected to processing as set forth above.

I

	Weight	Percent
Materials:		
Mixed Oils	2,200	56.40
Rosin	165	4.20
Naphtha	247	6.30
Caustic Flakes	400	10.20
Sodium Silicate	400	10.20
Phosphates	400	10.20
Carbonates	100	2.56
Total	3,912	100.06
Moisture Content		6.35
Naphtha Content		6.30

II

	Weight	Percent
Materials:		
Mixed Oils	2,035	49.00
Rosin	330	7.92
Naphtha	494	11.85
Caustic Flakes	400	9.60
Silicate	400	9.60
Phosphates	400	9.60
Carbonates	100	2.40
Total	4,159	99.97
Moisture Content		5.96
Naphtha Content		11.85

III

	Weight	Percent
Materials:		
Mixed Oils	2,035	44.70
Rosin	330	7.25
Naphtha	494	10.80
Caustic Flakes	400	8.76
Sodium Silicate	400	8.76
Phosphates	800	17.50
Carbonates	100	2.19
Total	4,559	99.96
Moisture Content		5.45
Naphtha Content		10.80

IV

	Weight	Percent
Materials:		
Mixed Oils	2,035	39.45
Rosin	330	6.40
Naphtha	494	9.60
Caustic Flakes	400	7.75
Sodium Silicate	800	15.50
Phosphates	800	15.50
Carbonates	300	5.82
Total	5,159	100.02
Moisture Content		9.62
Naphtha Content		9.60

V

	Weight	Percent
Materials:		
Mixed Oils	2,365	63.86
Naphtha	247	6.67
Caustic Flakes	400	10.80
Sodium Silicate	400	10.80
Phosphates	200	5.40
Carbonates	100	2.70
Total	3,712	100.23
Moisture Content		6.70
Naphtha Content		6.67

The soap forming components in the above mixes were as follows:

#1. Mixed oils	2200	1840 tallow. 360 coconut oil.
#2. Mixed oils	2035	1735 tallow. 150 coconut oil. 150 palm kernel oil.
#3. Mixed oils	2035	1635 tallow. 200 cottonseed fatty acids. 200 coconut oil.
#4. Mixed oils	2035	1235 tallow. 200 cottonseed fatty acids. 300 tallow fatty acids. 300 coconut oil.
#5. Mixed oils	2365	1700 tallow. 100 tallow fatty acids. 100 cottonseed fatty acids. 200 palm kernel oil. 265 coconut oil.

Examples of soap formulations containing less than 10% moisture and no builders:

	Percent
#6. 2250 tallow	61.47
750 coconut oil	20.49
480 100% solid caustic flakes	13.12
180 water	4.92
3660	100.00

	Percent
#7. 2000 tallow	52.91
250 cottonseed fatty acids	6.61
250 palm kernel oil	6.61
500 coconut oil	13.23
480 solid caustic flakes	12.69
300 water	7.95
3780	100.00

The reactants used in the blends may include any of the materials employed in soap making. Sodium silicate may be a varied concentration of sodium silicate solution, or dry sodium meta-silicates dissolved in an appropriate quantity of water, or any other silicates used in soap making operations. Phosphates may include any of the phosphates usually used for water-softening, sequestering or detergent properties, such as trisodium phosphates, tripolyphosphates, tetrasodium pyrophosphates, hexametaphosphates or sodium tetraphosphates. Carbonates may include any of the carbonates used in general soap making operations, such as sodium carbonate or sodium sesquicarbonate.

Other materials that may be used in various concentrations are soap builders such as borates and perborates, carboxymethyl cellulose, mild abrasives such as talc, chalk, and feldspar, also fluorescent dyes that are commonly used in soaps and detergents at the present time.

A final particulate product having a density of about 20 lbs./cu. ft. is particularly desirable for packaging. Such product made from any of the compositions set forth herein, in the form of the free-flowing irregular granules, and particularly the naphtha containing soap products, is desirable since it may be readily packaged in standard size cartons.

Having thus set forth my invention, I claim:

1. In a method of making soap, the step of forming a saponification mixture by heating at a temperature to maintain fluidity but not above about 250° F., fat acid components, caustic soda, and water, in soap making proportions including in percentages by weight 35 to 85% of fat-acid components, 5 to 15% of caustic soda, and rosin up to 15%, the total amount of water present at any time including any water formed by saponification being of from about 3 to 10% by weight, and spraying the resulting saponification mixture as it comes hot and fluid from the saponification step at a pump pressure of from 1000 to 5000 p. s. i. to produce a soap product of particulate free-flowing character without substantial change in the water content.

2. In a method of making soap, the step of forming a saponification mixture by heating at a temperature to maintain fluidity but not above about 250° F., fat acid components, naphtha, caustic soda, and water, in soap making proportions including in percentages by weight 35 to 85% of fat-acid components and 5 to 15% of caustic soda, the total amount of water present at any time including any water formed by saponification being of from about 3 to 10% by weight, the product containing more than 1% but not more than 11.85% by weight of naphtha, and spraying the resulting saponification mixture as it comes hot and fluid from the saponification step at a pump pressure of from 1000 to 5000 p. s. i. to produce a soap product of particulate free-flowing character without substantial change in the water content and with little loss of naphtha.

3. In a method of making soap, the step of forming a saponification mixture by heating at a temperature to maintain fluidity but not above about 250° F., fat acid components, caustic soda, alkali metal silicate, and water, in soap making proportions, including in percentages by weight 35 to 85% of fat acid components, 5 to 15% of caustic soda, and up to 20% alkali metal silicate, the total amount of water present at any time including any water formed by saponification being of from about 3% to 10% by weight, and spraying the resulting saponification mixture as it comes hot and fluid from the saponification step at a pump pressure of from 1000 to 5000 p. s. i. to produce a soap product of particulate free-flowing character without substantial change in the water content.

4. The method of making soap which comprises forming a saponification mixture by heating a blend of fats, oils, rosin, naphtha, soda ash and soluble phosphate at a temperature of about 150° F. to 190° F., incorporating caustic soda, alkali metal silicate, and water, the components being present in soap making proportions including in percentages by weight 35 to 85% of fats and

oils, 5 to 15% of caustic soda and up to 20% alkali metal silicate, while maintaining the temperature below about 245° F., and the caustic soda being added at a rate to prevent boiling over, the total water present at any time including any water formed by saponification being from about 3 to 10% by weight, the product containing more than 1% but not more than 11.85% by weight of naphtha, and spraying the resulting saponification mixture as it comes hot and fluid from the saponification step at a pump pressure of from 1000 to 5000 p. s. i. to produce a soap product of particulate free-flowing character without substantial change in the water content and with little loss of naphtha.

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