June 7, 1955 G. H. BASSETT ET AL 2,710,057

TUBULAR DRYING OF SOAP

Filed May 22, 1951 4 Sheets-Sheet 1

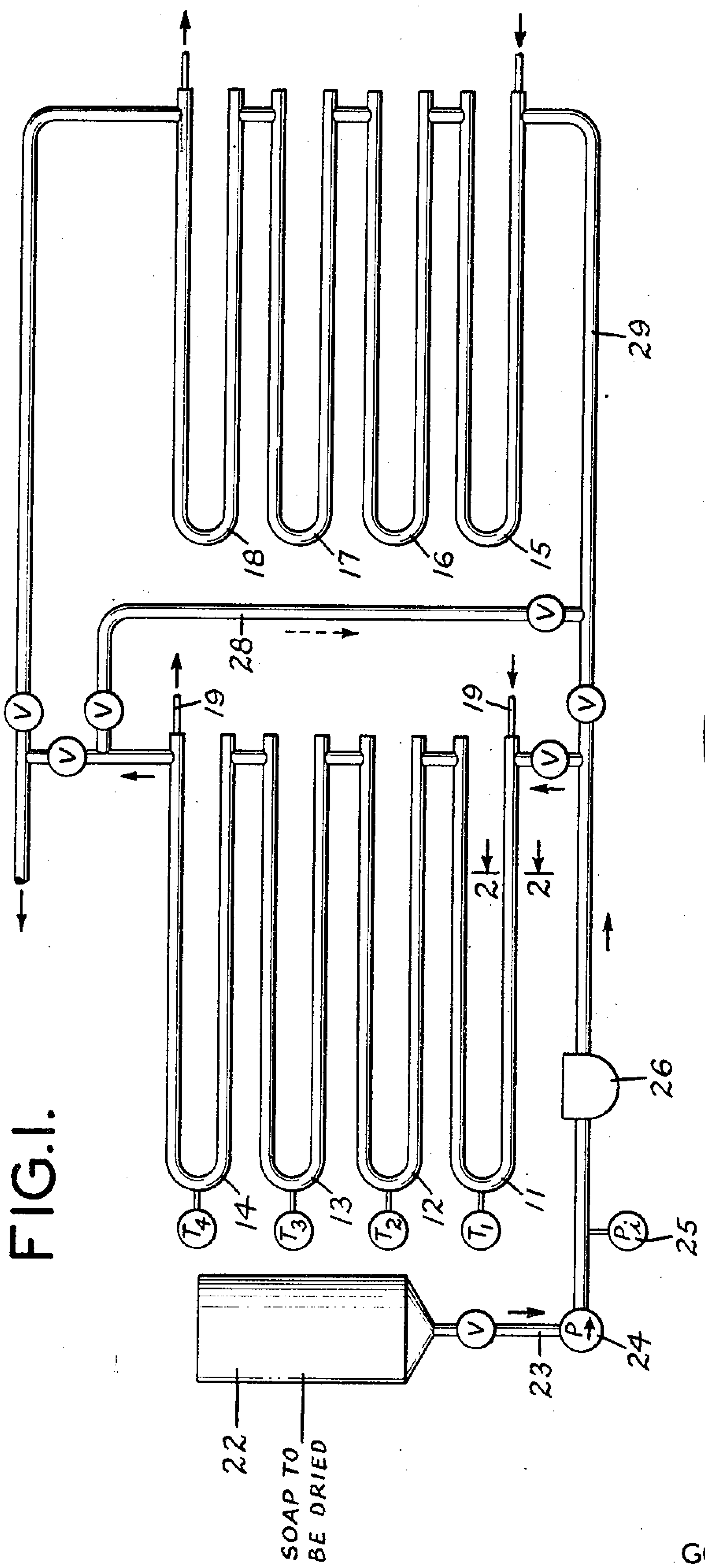

FIG.1.

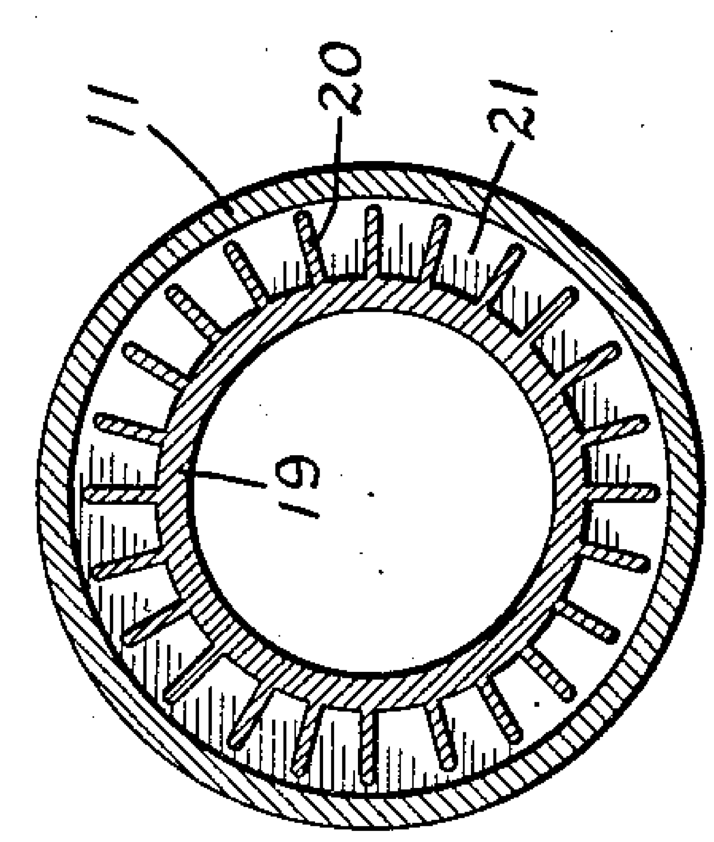

FIG.2.

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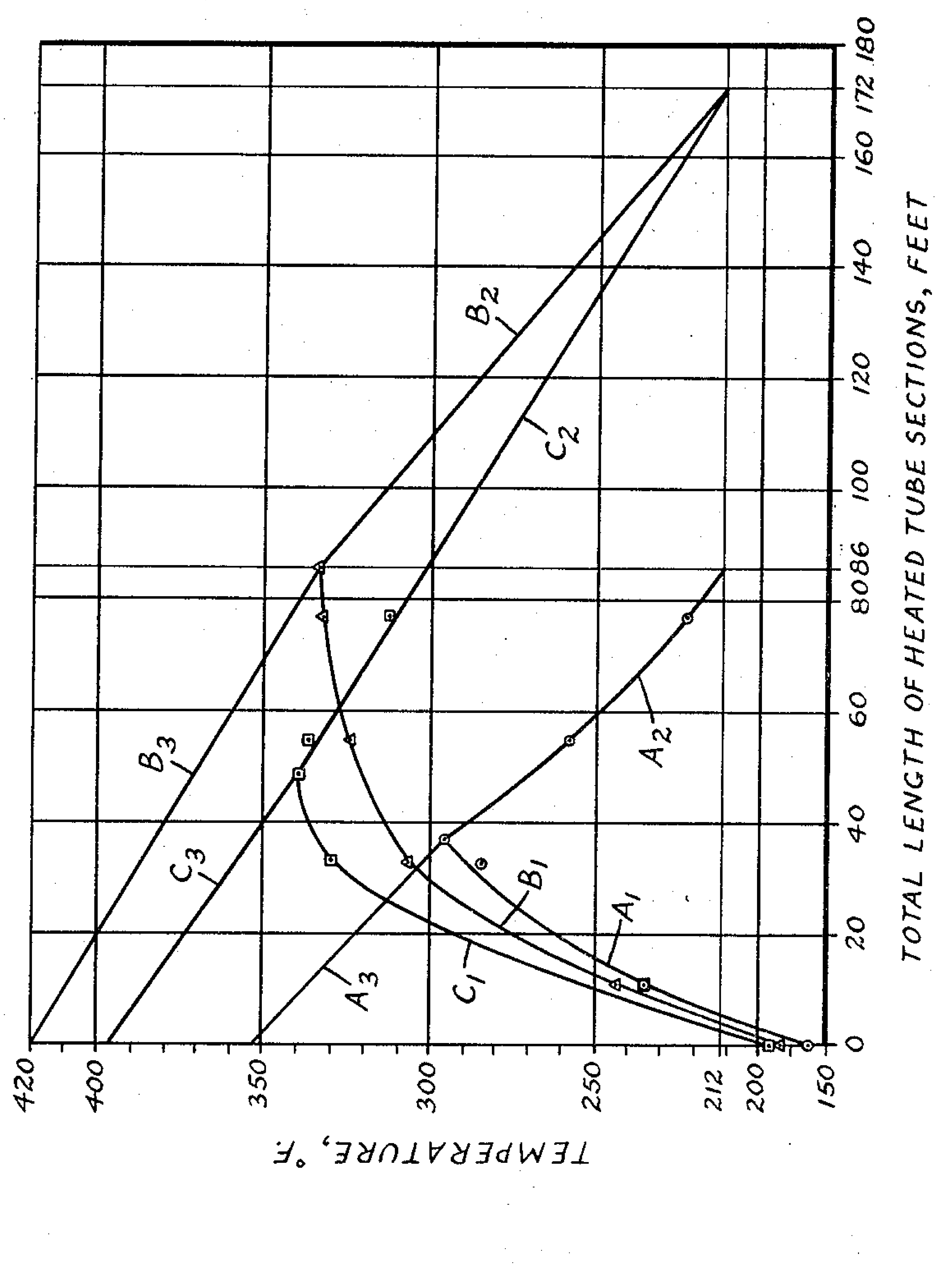
FIG. 3.



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Filed May 22, 1951 4 Sheets-Sheet 3

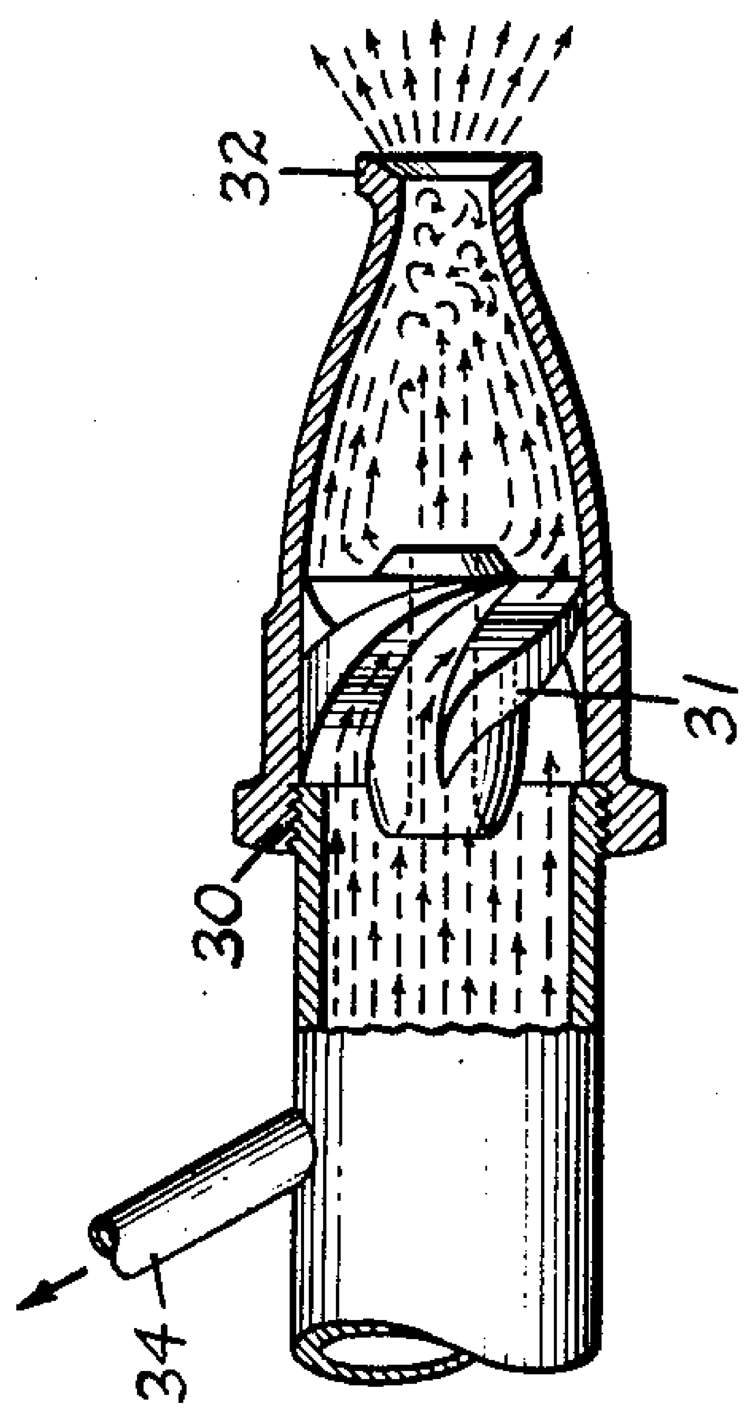
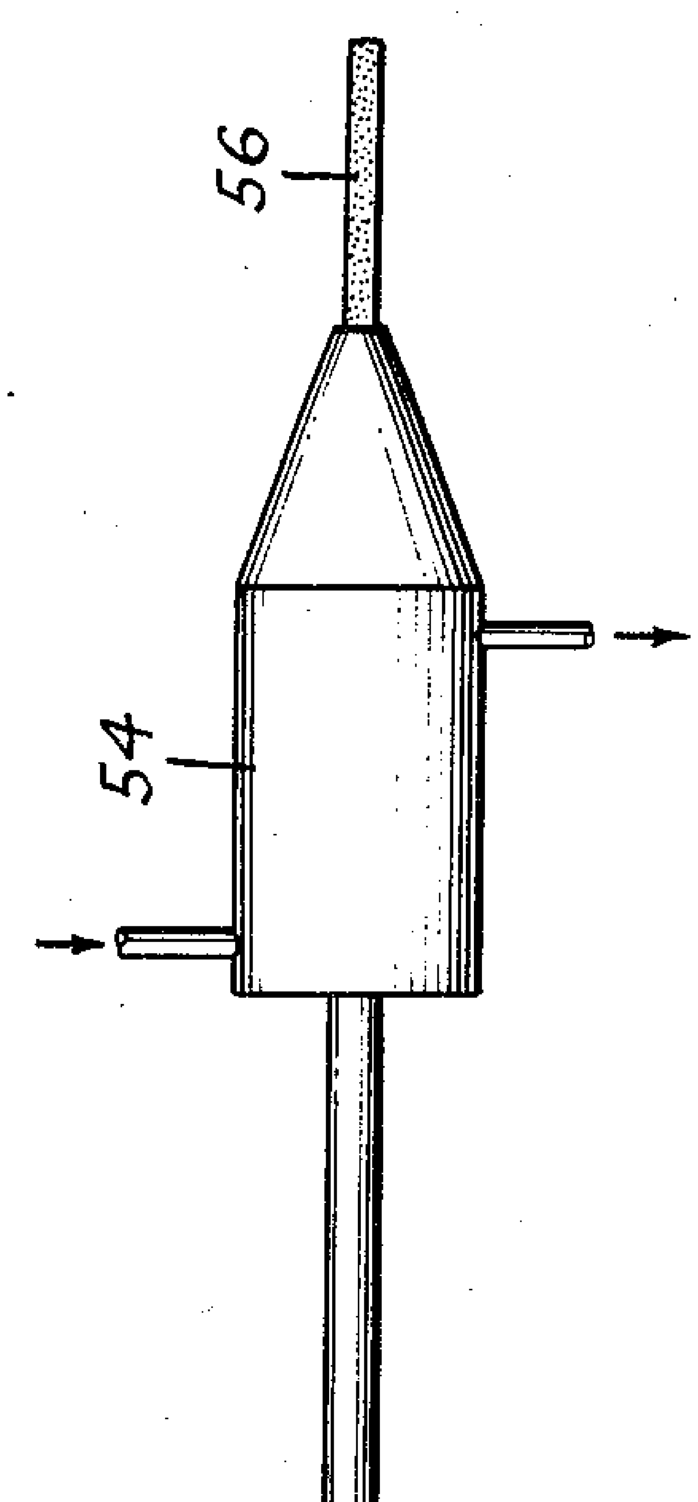


FIG. 4.



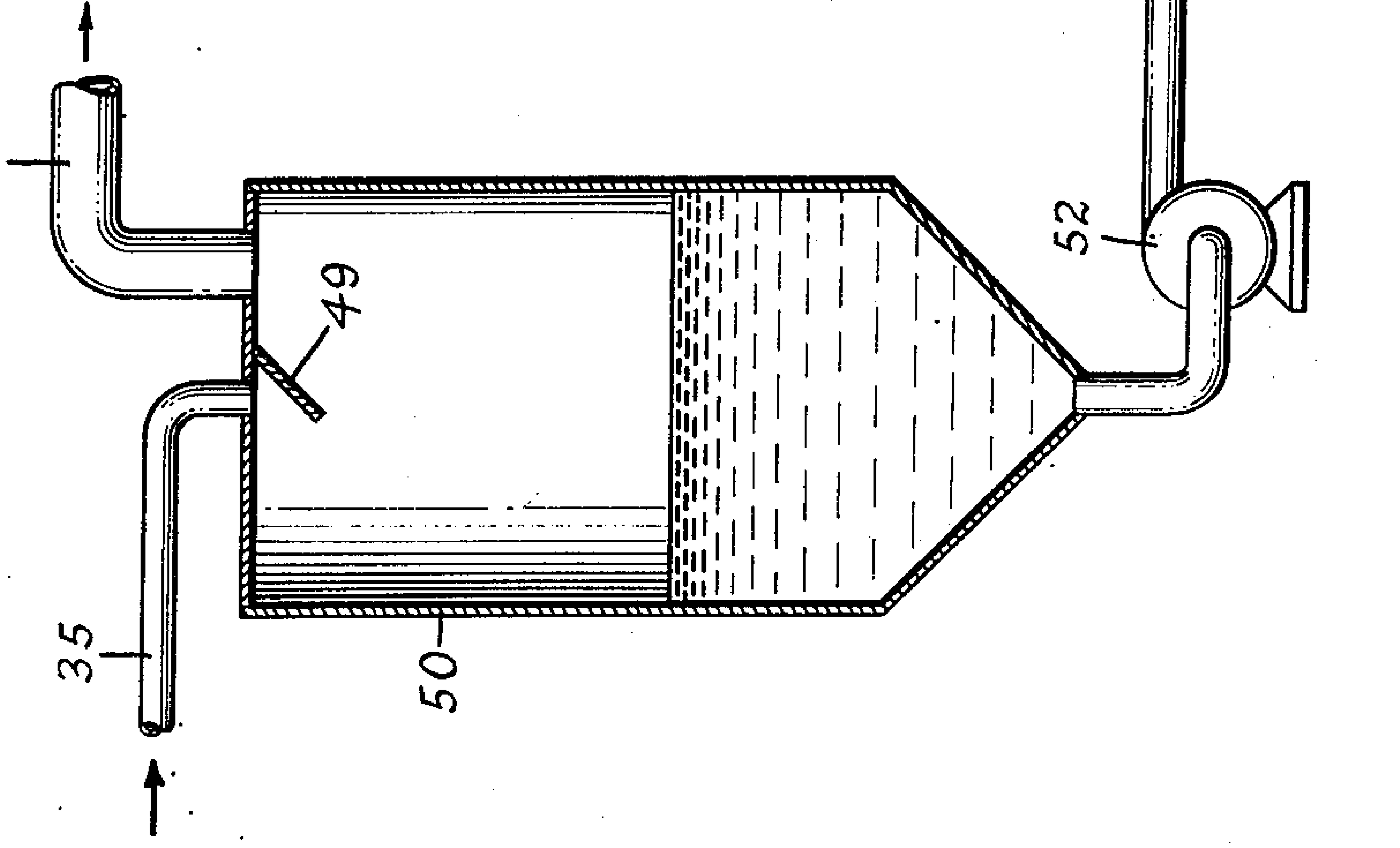


FIG.7.

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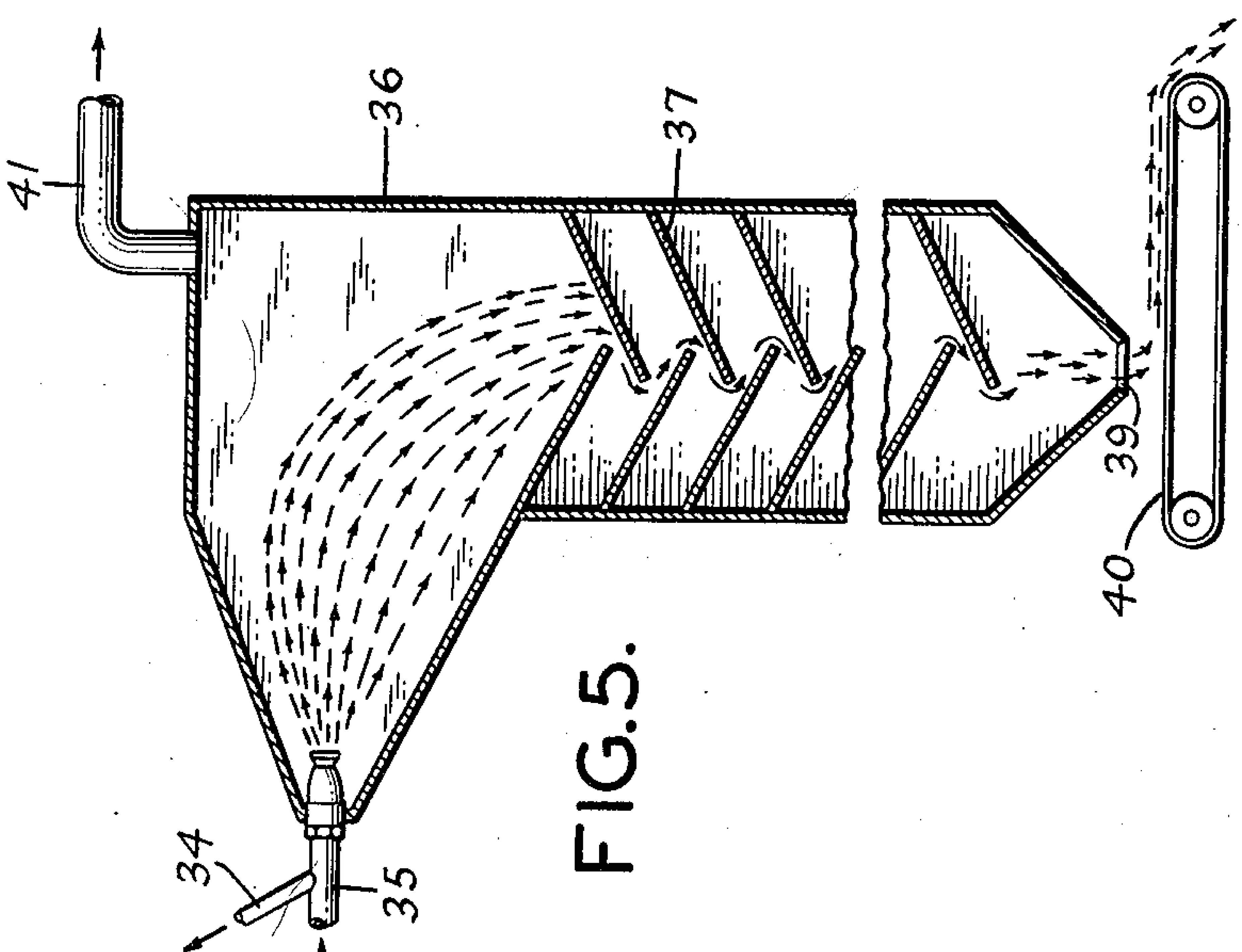

FIG.5.

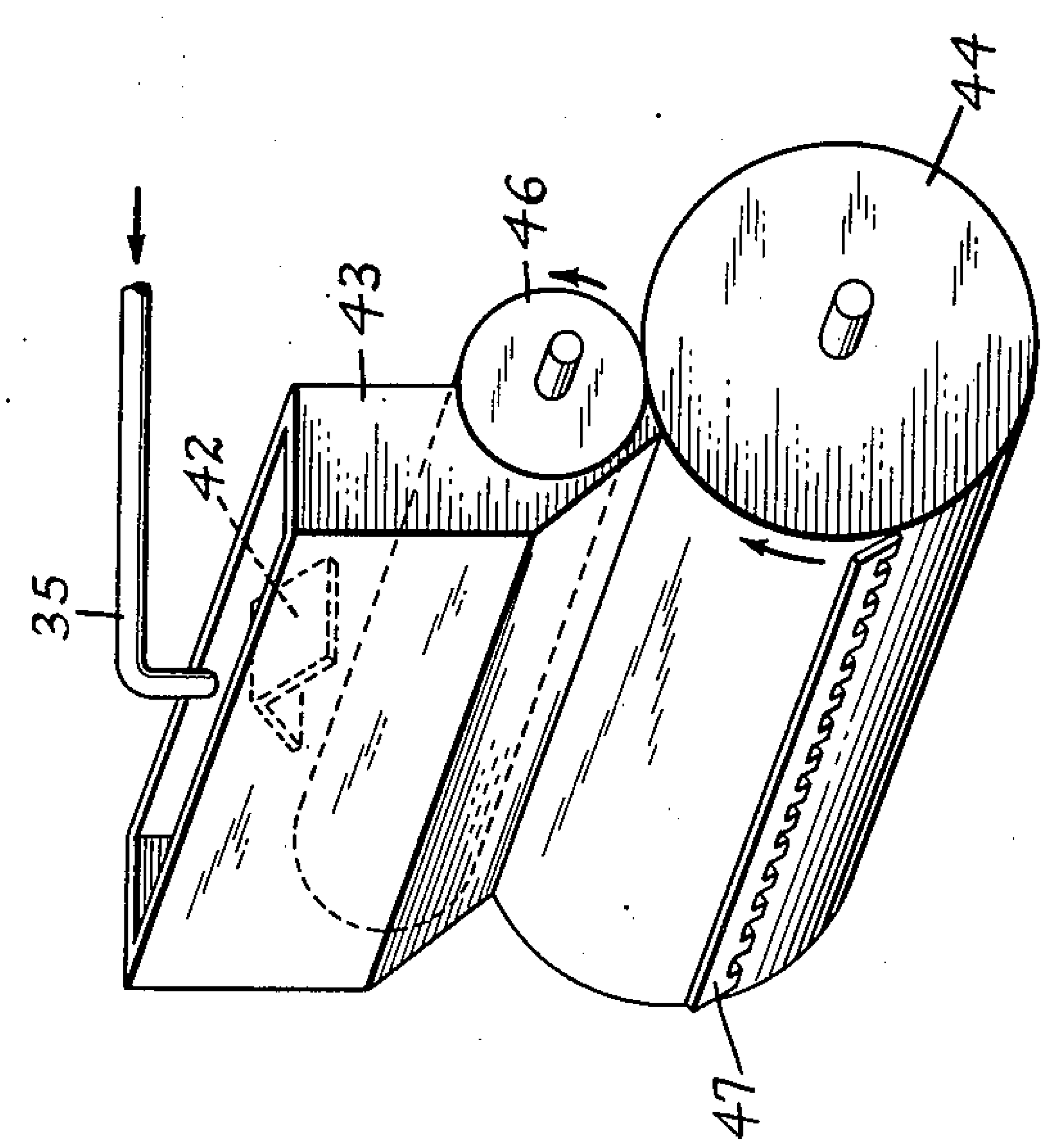

FIG.6.

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United States Patent Office

2,710,057

Patented June 7, 1955

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2,710,057

TUBULAR DRYING OF SOAP

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Application May 22, 1951, Serial No. 227,572

7 Claims. (Cl. 159—47)

The present invention relates to a continuous method of drying soap in a tubular heat exchanger.

One method of drying soap that has found favor in recent years is generally referred to as "flash drying." This involves passing a continuous stream of liquid soap through a tube, heating the soap while it is advanced through the tube and discharging the heated soap through an orifice into a flash chamber. In this method the soap is heated to a temperature of the order of 390° F. or higher and maintained at a pressure, within the tube, of about 120 p. s. i. g. or greater, this pressure being maintained in part by a high-pressure feed pump and in part by a small orifice at the discharge end of the tube. As a result of the high pressure within the tube, the contents thereof are maintained in the liquid phase and no steam is generated until it is flashed off as the heated soap passes through the orifice into the flash chamber which is maintained at a relatively low pressure.

It has now been found that the drying of soap can be accomplished with greater advantage by generating steam gradually from a continuous stream of moisture-containing soap and thus converting the stream into a heterogeneous, two-phase stream of steam and dried soap.

In the preferred embodiment of this invention the method is carried out in a tubular heat exchanger. Liquid, moisture-containing soap is pumped under pressure into the tube of the heat exchanger as a continuous and substantially homogeneous stream. While advancing through the tube toward the discharge end, the pressure on the soap stream, and therefore the vaporization temperature of the moisture in the soap, is gradually lowered. At the same time, the temperature of the stream of soap is quickly raised by the absorption of heat from the heating medium. When the rising temperature of the soap stream equals the falling temperature of vaporization, at a point intermediate the ends of the tube, vaporization of the moisture in the soap begins and the homogeneous liquid stream is converted into a heterogeneous, two-phase stream of steam and dried soap. As the heterogeneous stream continues its advance through the tube, more steam is generated within the tube from the moisture in the soap stream. The volumetric expansion occasioned by the conversion of a portion of the moisture from the liquid to the vapor phase results in an acceleration of the stream flowing through the tube when, as ordinarily, the cross-sectional area in the tube available to the flow of soap and steam remains the same throughout the length of the tube. It is believed that the steam generated within the tube acts as a pneumatic conveyor for the soap which becomes progressively drier as it is advanced towards the discharge end of the tube and that the pressure within the tube diminishes progressively toward the discharge end. Upon emerging from the tube, the dried soap becomes separated from the steam due to the absence of continued confinement of all or part of the steam with the dried soap.

The term "homogeneous" as used herein is intended to refer to the physical state or phase of the moisture-containing soap subjected to drying and not to the chemical constitution of the soap solution. The word "phase" as used herein is intended to refer to the physical state of the material, i. e., whether it is solid, liquid or gaseous, rather than to a phase within an emulsion. The term "tube" is intended to refer to any enclosed conduit, including an annular space between two concentric tubes, having an opening at one end for the introduction of soap and an opening at the other end for the discharge of soap, and that is capable of confining at least part of the steam generated therein until it is discharged at the discharge end. The term "soap" is intended to include built and unbuilt soaps.

The present method is to be distinguished from the flash drying method by the fact that a portion of the moisture separated from the soap is converted into steam while the soap is advanced through a tube. In other words, the tubular drying method of this invention contemplates generation of steam from the moisture in liquid soap by adding sufficient heat to boil the liquid soap under the pressure conditions within the tube whereas flash drying contemplates first adding heat to liquid soap while the soap is under sufficient pressure to keep the moisture in the heated soap from forming steam in the tube and then generating steam therefrom by suddenly reducing the pressure on the heated soap. Thus the basic difference between these methods is that in flash drying all of the moisture removed from the soap in the form of steam or vapor is removed after the heated soap is discharged from the tube and no steam is generated within the tube whereas in tubular drying some of the moisture in the soap is transformed into steam before the soap is discharged from the tube and less than all of the moisture removed is vaporized after discharge. In flash drying, the discharge pressure is sufficiently high to prevent vaporization of the moisture in the soap while the soap is in the heating tube. In tubular drying, however, the discharge pressure is low enough so that a curve representing the pressure gradient of the soap, and therefore also the vaporization temperature gradient, between the inlet and discharge ends of the tube is intersected, at a point prior to the discharge point, by a curve representing the increase in temperature of the soap as it absorbs heat from the heating medium while passing through the tube.

It is to be understood that it is not necessary, in practicing the tubular drying method of this invention, to maintain the pressure of the soap at discharge as low as atmospheric pressure. The only requirement is that it be low enough to permit some appreciable vaporization to take place within the tube. It is also not necessary that all of the steam generated within the tube be confined with the progressively drier soap as it passes through the tube. Portions of the steam generated may be bled off so long as sufficient steam remains in the tube to avoid blockage by the dried soap.

The steam in the tube promotes turbulence within the tube and to some extent operates to shatter the soap into finer division as is accomplished, with steam from an external source, in the conventional method of atomization used in spray drying. By allowing the soap and the steam generated in the tube to exhaust through a properly designed nozzle, i. e., a nozzle of such cross-sectional area as to prevent the development of a back pressure sufficient to inhibit unduly vaporization within the tube, the self-generated steam is in effect directed into the dried soap mass at high velocities to at least partially atomize and accomplish a finer division of the soap product. The products produced by conventional spray drying and self-atomization in tubular drying differ in that the product produced by the tubular method, being at the desired moisture level, requires only cooling whereas the spray-dried product requires subsequent drying, which in turn alters its physical state somewhat.

The soap discharged from the tube may be in the form of a liquid pumpable mass or in a form suitable for collection as discrete particles. When it is desired to collect the soap in the form of discrete particles, it is advantageous to remove most of the moisture desired to be removed by vaporization within the tube, to atomize the soap by discharging it into a large vented chamber through a nozzle with the self-generated steam, and to cool the soap by radiation, surface evaporation, or both. Such cooling is accomplished with considerably greater economy and has important advantages over the cooling and evaporation in the usual spray drying process wherein all the moisture which is to be removed is evaporated after the soap leaves the nozzle. The spray drying method is efficient from the standpoint of heat utilization only when the particles of soap are very finely divided. This, however, makes for a product that is dusty, objectionable in use, and wherein the separation of the product from the drying air is difficult. When the particles produced by spray drying are larger and the time of contact thereof with drying air is limited to that of free fall, the drying air must be at a relatively high temperature and of a rather low relative humidity, the consequence of this being that the volume of air that must be handled and the heat that must be supplied thereto is to a large extent not utilized and therefore wasted. A combination of spray cooling with tubular drying, on the other hand, is considerably more efficient in that most of the drying takes place in the tubular heater where the heat transfer is relatively efficient and where the time of contact is readily controllable.

For most economical operation, from the standpoint of economy of steam consumption, low initial cost of equipment and minimum space requirements, it is preferable to carry out the method under such conditions that a major portion of the moisture separated is vaporized within the heating tube and only a minor portion thereof is flash evaporated upon discharge of the soap from the tube. It will be appreciated that an increase in discharge pressure will decrease the ratio of amount of steam generated within the tube to the amount of steam flash evaporated upon discharge.

The method of the present invention has a number of important advantages not possessed by the flash drying method. Among these advantages are the elimination of the hazards of high pressure operations as well as an avoidance of the relatively high initial and maintenance costs of high pressure equipment. The method is also more economical with regard to steam requirements and utilizes less equipment and floor space.

These and other advantages, as well as the utility, of the method of this invention will become more apparent from the following examples and description made with reference to the accompanying drawing wherein:

Fig. 1 is a schematic illustration of one form of apparatus in which the method of this invention may be carried out;

Fig. 2 is a view in cross section taken on section line **2—2** of Fig. 1;

Fig. 3 is a graphic representation showing the conditions present in typical tubular drying operation such as the three drying runs described by way of illustration in Example 1;

Fig. 4 is an illustration, in partial cross-section, of one embodiment of a discharge nozzle that may be utilized in carrying out the method of the invention; and

Figs. 5 to 7 illustrate schematically several of the after-treating processes to which soap, dried in accordance with the method of the invention, may be subjected.

The apparatus illustrated by way of example in Fig. **1** includes two banks of tubular heaters, the heaters in

one bank being designated by reference numerals **11**, **12**, **13** and **14** and the heaters in the other bank being designated by reference numerals **15**, **16**, **17** and **18**. Each heater section is a U-tube having an inside diameter of 3 inches and a total length of 22 feet. Within the 3 inch I. D. tube there is a 2 inch O. D. tube **19** provided with twenty-four longitudinal fins **20**, each fin having a height of one-half inch and a length of 10 feet 9 inches. Each heating section has an effective heating surface of 51 square feet and the cross-sectional area of the annular space **21** between the inner and outer tubes is 3.8 square inches.

The soap to be dried is passed from a vessel **22** through line **23** and pumped, preferably by a variable speed non-pulsating pump **24**, into and through the annular space **21** between the inner and outer tubes. A pressure gauge **25** and a weight recorder **26** are preferably provided as a check on the pressure and rate of throughput of the initial soap.

Heating steam is introduced into the inner tube **19** of heating section **11** and withdrawn at the end of heating section **14**. The soap dried in heating sections **11** to **14** may then be discharged to a soap chill roll, as illustrated by way of example in Fig. 6, pumped directly to a Votator or converter to be cooled and extruded as a bar, as illustrated by way of example in Fig. 7, or discharged through a nozzle into a vented receiver to produce a granular product by self-atomization, as illustrated by way of example in Fig. 5. If desired, the soap may be passed by way of lines **28** and **29** to the second bank of heating sections **15** to **18**, whereupon it is similarly discharged. The banks of heaters may be used in parallel or in series.

In operation, the moisture-containing soap advances through the annular space **21** as a continuous and substantially homogeneous liquid stream and is heated by steam flowing through tube **19**. As it is advanced through the heaters, the pressure on the soap, and therefore also the vaporization temperature of the moisture it contains, is gradually reduced. At the same time, the sensible temperature of the stream is increased by absorption of heat from the steam in tube **19**. When the rising sensible temperature of the soap stream reaches the decreasing vaporization temperature of the moisture in the soap stream, vaporization of the moisture begins. The steam thus generated converts the stream into a heterogeneous, two-phase stream of steam and partially dried soap. Upon absorbing still more heat from the steam in tube **19**, additional steam is generated from the moisture in the soap stream. This additional steam accelerates the movement of the now heterogeneous stream until it is discharged from the heater at high velocity.

During its advance through the heaters from the point of initial vaporization to the point of discharge, the pressure on the heterogeneous stream of soap and steam is further progressively reduced at an increased rate and its equivalent, and now sensible, temperature likewise becomes further reduced. This decrease in temperature increases the temperature difference between the heating medium and the heterogeneous stream with the result that heat continues to be transferred from the heating medium to the soap. As a result, further quantities of moisture are vaporized due partly to the decrease in vaporization temperature as the pressure decreases and partly to the continued absorption of heat by the soap.

Upon discharge of the heterogeneous stream of steam and partially dried soap, the steam may be vented off or recovered for further use and the dried soap may be further processed, e. g., subjected to chill roll cooling, cooling in a Votator or converter, or simply discharged into a vented receiver. If desired, the heterogeneous stream may be discharged through a nozzle, such as is illustrated by way of example in Fig. 4, designed to direct all or part of the steam generated within the tube into the soap mass so as to shatter the soap into small particles.

The nozzle, illustrated by way of example in Fig. 4, may be integral with, or attached to the discharge end of the tube by any suitable means, such as screw threads **30**. In the nozzle illustrated, the heterogeneous mass of dried, molten soap and steam moving through the nozzle is in essence divided into an inner, substantially undeflected stream and, by means of vanes **31** or the like, into an outer swirling stream. Inside the discharge end **32** of the nozzle, the inner stream strikes the outer rotating stream and causes the soap to be shattered into small particles and to issue from the nozzle in a full conical formation. The particle size of the finished soap product can be controlled, if desired, by controlling the rate of removal of excess steam from the heterogeneous mass of soap and steam by way of a bleed-off line **34**.

If it is desired to discharge the heterogeneous stream of dried soap and steam into a vented receiver, it is feasible to utilize apparatus such as that illustrated by way of example in Fig. 5, wherein reference numeral **35** indicates the discharge end of the tubular heater provided, if desired, with a bleed-off line **34**. The mixture of dried soap and steam is discharged into a cooling tower **36**, preferably having cascade baffles **37**, from which the dried soap particles are discharged through an outlet **39**, which may also be utilized as an inlet for cooling air, onto a conveyor belt **40**. At the top of the cooling tower there is provided a vent **41** for exhausting air and vapor from the tower.

If it is desired to subject the dried soap to chill roll cooling, it is possible to utilize apparatus such as that illustrated in Fig. 6 wherein the dried soap is discharged from the tubular heater **35** onto a splash plate **42** in an open top hopper **43**, deposited on the peripheral surface of a chilling roll **44** by means of a hot roll **46** and scraped off the chilling roll by a serrated stripping knife **47**, or the like. The vapor discharged from the tube **35** with the dried soap may be removed by any suitable means such as, for example, by hood and fan suction system located above the open top hopper **43**.

If it is desired to cool the dried soap in a Votator or converter and to extrude soap as a bar, it is advantageous to utilize apparatus such as that illustrated by way of example in Fig. 7. The heterogeneous mixture of dried soap and steam leaving tube **35** is directed onto a splash plate **49** in a holding tank **50** provided with a vapor discharge vent **51**, the dried, molten soap is collected in the bottom of the holding tank **50** and from thence pumped, by means of pump **52** to a cooling unit **54** and finally extruded as a bar as shown at **56**.

It is to be understood of course that the construction shown in the drawing and described in detail herein is merely illustrative of the apparatus that may be used in practicing the method of this invention. The use of fins in the annular space between the inner and outer tubes is not essential but is preferred because of the increased heat conductivity they provide. The method of this invention may be carried out in a tube of any desired shape or length and the soap subjected to heating therein may be heated in any suitable manner. Thus, for example, the tube through which the soap is advanced may be of circular, square or other cross section and it may be disposed horizontally, vertically or otherwise. The heating medium may flow through an internal jacket, as illustrated, or through an external jacket. It is also possible to heat the soap by submerging the tube in an oil bath or surrounding it with electrical or other heating means. The essential feature of the invention is not the particular means of heating but the generation of steam from a continuous stream of the soap to be dried while it is confined in a tube and the utilization of part or all of the steam so generated to accelerate and convey the dried soap through the remainder of the system.

In operation it is essential merely that the volume of soap, the cross-sectional area available to the flow thereof and the rate of input of heat be correlated so that the amount of steam generated and the rate of flow to which the soap is accelerated by the steam are sufficient to prevent clogging of the tube by the dried soap.

The following examples are included to illustrate the method of this invention, it being understood, however, that the invention is not limited to the particular operations described in these examples.

EXAMPLE 1

Three soap-drying runs were carried out in the apparatus illustrated in, and described with reference to, Figure 1. The rate of throughput in each run was 1830 pounds per hour of wet soap.

Run No. 1

The soap had an initial water content of 30.6%, an initial temperature of 185° F. and was passed through heaters **11**, **12**, **13** and **14** in series, the pressure at the feed pump being maintained at 126 p. s. i. g. The heating steam was saturated steam at a pressure of 105 p. s. i. g., i. e., at a temperature of about 341° F. The combined length of the four heating tubes along which the soap was subjected to heating by the heating steam was 86 feet.

The temperatures recorded at the end of each heater, i. e., after the soap had passed through 11, 33, 55 and 77 feet of heating tube, were 235, 286, 257 and 223° F., respectively. The dried soap was discharged from the heating tubes through an opening two inches in diameter at substantially atmospheric pressure. It was calculated that the point of vaporization of the wet soap in the tube occurred at a temperature of about 296° F. after the soap had passed through 37 feet of heating tube.

The rise in temperature of the soap to the vaporization point and the decline in the temperature of the soap from the vaporization point to the point of discharge were plotted as curves A_1 and A_2, respectively, in the graph of Fig. 3. The straight line A_3 in Fig. 3 represents the decline in vaporization temperature of the soap from its initial pressure upon introduction into heating tubes to the pressure at the point of vaporization.

The soap discharged was found to have a final water content of 15.4%.

Run No. 2

The soap had an initial water content of 31.2, an initial temperature of 194° F. and was passed through both banks of heaters, i. e., heaters **11** to **18** in series, the pressure at the feed pump being maintained at 295 p. s. i. g. The heating steam was saturated steam at a pressure of 113 p. s. i. g., i. e., at a temperature of about 346° F. The combined length of the eight heating tubes along which the soap was subjected to heating by the heating steam was 172 feet.

The temperatures recorded at the end of each of the first four heaters, i. e., after the soap had passed through 11, 33, 55 and 77 feet of heating tube, were 244, 308, 325 and 333° F., respectively. The dried soap was discharged from the heating tubes through an opening two inches in diameter at substantially atmospheric pressure. It was calculated that the point of vaporization of the wet soap in the tube occurred at a temperature of about 335° F. after the soap had passed through 86 feet of heating tube.

The rise in temperature of the soap to the vaporization point and the decline in the temperature of the soap from the vaporization point to the point of discharge were plotted as curves B_1 and B_2, respectively, in the graph of Fig. 3. The straight line B_3 in Fig. 3 represents the decline in vaporization temperature of the soap from its initial pressure upon introduction into heating tubes to the pressure at the point vaporization.

The soap discharged was found to have a final water content of 10.7%.

Run No. 3

The soap had an initial water content of 31.2%, an initial temperature of 197° F. and was passed through both banks of heaters, i. e., heaters 11 to 18 in series, the pressure at the feed pump being maintained at 223 p. s. i. g. The heating steam was saturated steam at a pressure of 165 p. s. i. g., i. e., at a temperature of about 373° F. The combined length of the eight heating tubes along which the soap was subjected to heating by the heating steam was 172 feet.

The temperatures recorded at the end of each the first four heaters, i. e., after the soap has passed through 11, 33, 55 and 77 feet of heating tube were 235, 330, 336 and 313° F., respectively. The dried soap was discharged from the heating tubes through an opening two inches in diameter at substantially atmospheric pressure. It was calculated that the point of vaporization of the wet soap in the tube occurred at a temperature of about 340° F. after the soap had passed through 48 feet of heating tube.

The rise in temperature of the soap to the vaporization point and the decline in the temperature of the soap from the vaporization point to the point of discharge were plotted as curves C_1 and C_2, respectively, in the graph of Fig. 3. The straight line C_3 in Fig. 3 represents the decline in vaporization temperature of the soap from its initial pressure upon introduction into heating tubes to the pressure at the point of vaporization.

The soap discharged was found to have a final water content of 2.3%.

EXAMPLE 2

Two tests were conducted to compare the tubular drying method of this invention with a conventional flash drying. In each test the number of heating tube sections, the number of heating stages, and the temperature and pressure conditions were adjusted to reduce the moisture content of liquid soap, on the average, from 31.0% to 16.0% at a production rate of 1800 lbs. of dried soap per hour.

The heating tube sections used in both tests were identical to those described with reference to Figs. 1 and 2 of the drawing and utilized in Example 1.

The pertinent data, including the average temperature and pressure conditions, is listed in the following table:

	Tubular Method	Flash Drying Method	
Number of heating stages required	1	2	
		First Stage	*Second Stage*
Number of heating tube sections required.	3 (in series)	3 (in series)	4 (2 sets of 2 in parallel).
Soap feed pressure, p. s. i. g.	100	220	400.
Saturated heating steam pressure, p. s. i. g.	140	155	145.
Soap pressure at discharge, p. s. i. g.	20-35	120	120.
Soap temperature at discharge, ° F.	292	355	340.

The data tabulated above illustrates the very considerable difference in the pressure at which the soap passes through the tube. This factor of itself is an important advantage in view of the greater initial and maintenance costs of the high pressure feed pumps required by the flash drying method. In addition the data illustrates the need, to accomplish the same results by flash drying, for seven instead of three heating tube sections, two feed pumps in place of one, and heating steam at somewhat higher pressure. A further advantage resides in the lower temperature to which the soap is heated in the tubular drying method.

EXAMPLE 3

Soap having a moisture content of 30% was subjected to tubular drying in three 22 ft. lengths, arranged in series, of heater sections identical with those described with reference to Figs. 1 and 2 of the drawing. Saturated steam at 165 p. s. i. g. (373° F.) was supplied and maintained in the inner 2" O. D. tube.

The soap was continuously introduced into the heater at one end at a rate of 1300 lbs. per hour and under a feed pressure of 60 p. s. i. g. A valve at the discharge end of the tube maintained a pressure, at discharge of 24 p. s. i. g. and a soap flash temperature of 301° F.

It was found that 1,000 lbs. per hour of soap having a moisture content of 9.3% were continuously produced, the major portion of the water having been boiled off inside the tube and a minor amount having been flash evaporated from the soap upon discharge from the tube.

EXAMPLE 4

Two test runs were conducted with the apparatus illustrated in Figs. 1 and 2 of the drawing. In each run the two banks of heater sections were operated in parallel, each bank having a heated length of 86 ft. The openings of the tubes at the discharge ends were 1 inch in diameter and no control valve was used. The pertinent data from these two test runs is tabulated below:

	Run No. 1	Run No. 2
Duration of run, hours	5½	8¾
Initial moisture content of wet soap percent	31.8	31.6
Moisture content of dried soap do	17.6	18
Initial temperature of wet soap ° F	187	187
Wet soap rate, lbs. per hour	3,040	3,140
Feed pump pressure p. s. i. g.	110	126
Pressure of saturated heating steam p. s. i. g.	110	100
Dried soap rate, lbs. per hour	2,520	2,580
Approximate pressure of soap at discharge p. s. i. g.	5	5

This data is indicative of the high rate and degree of drying that is possible by the method of this invention and the duration of the runs is indicative of the freedom from interruption that is inherent therewith.

It is to be expected that many variations and modifications will occur to those skilled in the art upon reading the present discussion. All such variations and modifications are intended to be included within the scope of the invention as defined in the accompanying claims.

We claim:

1. A method of partially drying soap by removal of a substantial portion of moisture from soap having an initial high moisture content which comprises introducing a continuous and substantially homogeneous liquid stream of the soap into the inlet end of a tube at a pressure between about 50 and about 300 p. s. i. g. for advancing the stream through said tube, subjecting the advancing stream of soap to a supply of heat, correlating the supply of heat to the rate of throughput of soap within the tube to boil the liquid soap under the pressure conditions within the tube for initiating the generation of steam at a point in the tube in substantial advance of the discharge end, but insufficient to dehydrate the soap completely, and increasing the sensible temperature of the soap from the inlet end to said point of boiling, and continuously discharging from the discharge end of the tube and at a reduced pressure below about 35 p. s. i. g., a heterogeneous mixture of steam and partially dried soap, said partially dried soap having substantially less than said high initial moisture content, whereby the temperature decreases from the point of boiling to the discharge end.

2. A method of drying soap containing about 30 to 32% moisture for removing a preselected portion of said moisture which comprises introducing a continuous and substantially homogeneous liquid stream of the soap into

the inlet end of a tube at a pressure beneath about 50 and about 300 p. s. i. g. for advancing the stream through said tube, subjecting the advancing stream of soap to a supply of heat, correlating the supply of heat to the rate of throughput of soap within the tube to boil the liquid soap under the pressure conditions within the tube for initiating the generation of steam at a point in the tube in substantial advance of the discharge end, but insufficient to dehydrate the soap completely, and increasing the sensible temperature of the soap from the inlet end to said point of boiling, and continuously discharging from the discharge end of the tube and at a reduced pressure below about 35 p. s. i. g., a heterogeneous mixture of steam and partially dried soap, said partially dried soap containing between about 2 and about 20% moisture, whereby the temperature decreases from the point of boiling to the discharge end.

3. The method defined in claim 1 wherein the partially dried soap phase is separated from the steam after discharge and solidified.

4. The method defined in claim 1 wherein all of the steam generated within the tube is retained within the tube prior to discharge of the stream of heterogeneous steam and partially dried soap from the tube.

5. The method defined in claim 1 wherein the heterogeneous stream of partially dried soap and steam is discharged from the tube through a discharge nozzle into a zone of lower pressure and thereby utilizing the steam in said stream before discharge for shattering the partially dried soap in the stream into finely divided particles.

6. The method defined in claim 2 wherein the partially dried soap phase is separated from the steam after discharge and solidified.

7. The method defined in claim 2 wherein the heterogeneous stream of partially dried soap and steam is discharged from the tube through a discharge nozzle into a zone of lower pressure and thereby utilizing the steam in said stream, before discharge, for shattering the partially dried soap in the stream into finely divided particles.

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