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APPARATUS FOR TREATING SOAP

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[Signature]
This invention relates to the art of preparing dry powdered or granular soap, and has for its object the provision of a method and apparatus by which such commodity may be quickly and economically prepared and in which a uniform product of superior quality is produced. The invention is exemplified in the combination and arrangement of parts shown in the accompanying drawing and described in the following specification and in the steps of the process described in said specification. The invention is more particularly pointed out in the appended claims.

In the drawing, the figure is a somewhat diagrammatic vertical sectional view showing one form of apparatus comprised in the present invention.

For a number of purposes there is required a finely divided pure soap in granular or powder form, and relatively low in moisture content. By “pure soap” as here used is meant a finished soap as it comes from the soap kettle without the subsequent addition of other ingredients, such as soda ash, silicate of soda, colloidal clay, etc., known variously as fillers and builders. The pure soap as it comes from the soap kettle contains approximately 30% of moisture. The dried finely divided soap as it is used for many purposes, contains from 2% to 12% moisture. Such finely divided, pure, dry soap is used for some purposes by itself. It is also used in the manufacture of compounds used for washing, bleaching and sterilizing, by mixing the dry powdered soap with a class of salts which may be designated as per-salts; such as, per-sulphate of soda, perborate of soda, etc. These salts when dissolved in water, liberate a portion of their oxygen, which in its nascent state is an effective bleaching, sterilizing, deodorizing and disinfecting agent. By the mixture of such salts with soap, the properties of these salts as described above are added to the cleansing properties of the soap, and the mixture thus serves a useful and multiple purpose as a washing, bleaching and sterilizing agent.

It is to be noted that salts such as described above, liberate their oxygen when dissolved in water, and also in the presence of moisture, and therefore, the powdered soap with which they are mixed must be low in its moisture content so that the liberation of oxygen does not take place immediately on mixing or gradually after mixing. Such powdered soap usually contains 2% to 3% moisture. There are also other salts, including alkaline salts, which are added to dry powdered soap to give a mixture with special properties. Some of these salts have water-softening qualities, and some have cleansing qualities. Among such salts may be mentioned anhydrous sodium carbonate, and also sodium carbonate in its various crystal forms, containing water of crystallization, and sodium triphosphate, containing water of crystallization. It is often desirable to add these various chemicals to dry soap; that is, soap that has had its moisture content reduced to from 2% to 12%, rather than to add them to the wet soap and effect the drying afterwards because of the effect which the moisture in this soap would have upon the particular form in which it is desired that the chemical exist in the finished product.

At the present time there are two methods generally used for making a dry powdered soap. The older method, still used to some extent, is to run the hot molten soap from the kettle into frames and allow it to cool and solidify for several days until it can be slabbed. The slabs are then cut into smaller pieces, or bars, which are then piled on racks and allowed to air-dry under normal atmospheric conditions. The racks may be run into drying chambers which can be warmed to facilitate the drying. When these pieces are dried to the proper degree, they are ground into powder.

The objections to this process are that considerable time is consumed in the drying, much floor space is required, and there is considerable handling. If artificially heated drying rooms are used, there is also the expense of heating. Furthermore, the grinding of soap is a difficult operation on account of the nature of the material. A slight warming up of the grinder causes the soap to be-
come pasty and to stick and gum up the mechanism of the grinder.

The other method commonly used for making a finely divided pure soap is to run the soap from the soap kettle to a set of cooling rolls which cool the soap sufficiently to allow it to be scraped off the rolls in the form of shreds. The cooling rolls are usually cooled with water. The shreds as they come from the roll still contain practically the entire moisture content of the liquid soap; that is, approximately 30%. The cool shredded soap drops onto conveyor belts which carry the soap through a steam heated drying chamber in which the moisture is removed. The dried chips are then ground to powder.

The objections to this method are the time required, the number of different operations, and the cost of the equipment. It will be noted especially that the objectionable grinding operation used in the older method has not been eliminated. There is, furthermore, the double expense of first cooling the soap on the rolls to put it in condition for drying and then the expense for heating it up again to a temperature at which the moisture will be driven off.

To eliminate all the various operations mentioned above and heretofore involved in making a finely divided pure soap, I take the hot liquid soap from the kettle and run it to a tempering tank in which it can be heated to 212° Fahrenheit, and higher by means of steam or other heating medium. The hot soap is then pumped to a spray nozzle and sprayed with the assistance of compressed air. I prefer the form of nozzle shown in my prior application, Serial No. 51,119, filed August 19, 1925. The spraying operation proper is, however, carried out with this modification, that the air or other fluid medium used to spray the soap, is heated to a high temperature, that is, a temperature above 212° Fahrenheit, such as 500° Fahrenheit. In this manner I cause the soap to become finely divided while yet in the liquid condition, and by having both the soap and air used to atomize the soap at a high temperature, much of the moisture is instantly removed when the soap is ejected from the nozzle.

It is an important part of my process in obtaining dry soap in which the moisture content is reduced from approximately 30% to from 9% to 12% that the air used for atomizing be heated to a high temperature, that is, temperatures above 212° Fahrenheit. The temperature used may be so high that if applied continuously to the soap the product would be injured from the heat, but by using this high temperature only for the air used for atomizing or spraying the soap, the contact between the high temperature air and the liquid soap is only momentary. Some of the heat is absorbed temporarily by the soap but most of the heat is immediately absorbed by the moisture in its evaporation as latent heat of evaporation. Thus, not only is no injury done to the soap by the high temperature hot air, but instantaneous evaporation of a portion of the moisture is effected.

To further dry the fine particles of soap as they descend in the drying chamber at the top of which the spray nozzle is placed I have an upward current of hot air sufficiently high in temperature and in sufficient volume to dry the soap to the desired percentage of moisture between 2% and 12%.

As the drying of the soap in this manner keeps the soap at a fairly high temperature, it becomes desirable to cool it before the particles come together in the bottom of the tower, so that the hot particles of soap, even though dried to a moisture content of 2% to 12%, will not stick together. This cooling I accomplish by forcing or drawing into the bottom of the tower, a stream of cool air.

An important feature of my process is that I use the same air for finally cooling the finely divided soap in the bottom portion of the chamber which I use in the top of the chamber as warm air for removing the moisture. This I accomplish by placing steam heated coils in the tower at a suitable location between the top and the bottom of the tower. These coils are so placed that the finely divided soap can pass down between the pipes, and that the air in passing up through the pipes becomes heated.

To prevent the heating pipes from becoming covered on the top with a deposit of powdered soap, and thus have their effective heating surface reduced, I place an air pipe between each two steam pipes. The air pipes have openings placed at proper intervals in the bottom, and a current of air can be blown continuously or intermittently from the air pipes on the top of each steam pipe so as to effectively keep the steam pipe free from powdered soap. The air so used and impinging on the steam pipe becomes heated, and in passing upward with the current of air from the bottom, also assists in removing moisture from the soap.

The important features of my process are that I make a dry powdered or granular soap in one operation, eliminating manual labor, eliminating the grinding operation, reduce time and floor space required for the operation, and consequently effect economies by my process which are lacking in the old processes.

I do this by spraying hot soap into the top of a deep chamber using a heated fluid as air to effect the atomizing of the soap. In the chamber I have steam heated coils. Cool air enters the bottom of the chamber, and passes up through the coils and becomes heated. The finely powdered soap as it is sprayed from the nozzles, loses much of its moisture immediately on account of the high tempera-
ture of the soap and atomizing air, and the steam formed is carried upward by the air current through the top of the tower. In passing down through the warm air in the upper portion of the tower, the finely divided powdered soap loses more of its moisture, and then after the soap passes through the openings between the heated coils and comes in contact with the cool air entering the bottom of the tower, it cools off sufficiently that it may be collected and handled as a fine granular dry powder.

In the manufacture of products containing dry powdered pure soap, it has heretofore been customary to make the dry powdered soap by one of the two processes described above and then mixing the chemical or chemical or other ingredients with the dry powdered soap. Now make such mixtures of soap and per-salts, such as per-sulphate of soda and per-borate of soda and alkaline salts, such as sodium carbonate and sodium triphosphate by making the dry powdered soap in one operation as is described above, and then mixing or grinding together the dry powdered soap so made and the desired chemical or chemicals.

The drawing shows one arrangement of equipment for carrying out the invention; 10 being the tempering tank in which the soap is heated; 11 the soap pump, and 12 the nozzle. The heated soap enters the nozzle 12 through a pipe 14 provided with a valve 15 for regulating the flow. Heated air is supplied to the nozzle 12 from a superheater 16 through a pipe 18 having a valve for controlling the air supply. Below the nozzle 12 is a bank of heating coils 17 through which steam or other heating medium is circulated. Interposed between the coils 17 are air pipes 18 having downwardly directed openings for blowing off powdered soap that may lodge on the coils 17. An outlet air duct 19 is located at the top of the tower 20 and is supplied with a suitable suction fan for causing an up current of air through the tower. The bottom of the tower may be open to admit cool air below the coils 17 and a conveyor 21 may be arranged beneath the tower for receiving and removing the powdered soap as it is deposited.

The operation of the above equipment will be clear from what has already been stated above, and from the following description. Pure, hot liquid soap from the kettle is pumped into the tempering tank 10. This is a jacketed vessel in which the soap can be heated to as high a temperature as desired by means of steam or other heating medium, and contains a stirrer to keep the mass at a uniform temperature, and to prevent scorching the material which is directly in contact with the heating surfaces. Pump 11 takes the soap from the tempering tank and pumps it to spray nozzle 12. Air under pressure from a tank or direct from an air pump is passed through superheater 16 where it is superheated to the desired temperature, and then goes to the spray nozzle to atomize the soap. Both the soap line and the air line have control valves for regulating the amounts of soap and air respectively. The sprayed soap now passes down through the elongated chamber or tower 20 which is divided into an upper and lower portion by the bank of heated coils 17. The finely divided soap in its downward course passes consecutively through the upper portion of the chamber, then through the coils, then through the lower portion of the chamber. Air taken in at the bottom of the chamber cools the soap before the particles drop to the bottom and touch each other. This cool air passing upward through the lower chamber and then through the coils, becomes heated and in continuing up through the upper chamber this heated air removes the moisture from the soap in its downward course. The hot moisture laden air passes on upward and out through air ducts located in the top of the tower.

I claim:

1. Apparatus for preparing finely divided soap comprising a tower, a spray nozzle located near the top of said tower, means for supplying soap paste and air to said spray nozzle, means for heating the air supplied to said spray nozzle, heating coils disposed across said tower below said nozzle and above the bottom of said tower, means for discharging air against the upper surface of said heating coils, and means for causing an up current of air in said tower through said heating coils.

2. In combination, a tower for treating soap having heating coils within the tower dividing the tower into an upper and a lower compartment, means for spraying soap above the coils so that the soap drops down through or between the heating coils, means for causing a current of air to pass up through or between the coils at a velocity permitting the sprayed soap to fall downwardly through the heating coils, and means in addition to said current of air for preventing accumulation of soap on the heating coils.

In testimony whereof I have signed my name to this specification on this 21st day of October, A. D. 1925.

OSCAR H. WURSTER.