

UNITED STATES PATENT OFFICE

FRANK L. BRYANT, OF CHICAGO, ILLINOIS, ASSIGNOR TO SIDNEY L. SCHWARZ, OF CHICAGO, ILLINOIS

DISTENDED FIBROUS MATERIAL AND PROCESS OF PRODUCING THE SAME

No Drawing.

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This invention relates to distended fibrous materials and process of producing the same.

An object of the invention is to provide a process of treating cellulose pulp and other fibrous materials and wherein the material is mixed with solutions containing foam-forming substances, and the mixture agitated, serving to produce a condition wherein relatively stable bubbles are incorporated with the fibers of the pulp in such manner as to distend or separate the fibers and maintain the same in such condition until fixed by drying.

Another object of the invention is to produce a product of fibrous material wherein the fibers thereof are disarranged or distended in such manner that the normal volume of the material is greatly increased and aerated throughout.

Still another object of the invention is to provide a fibrous product which is characterized by lightness, fluffiness and great absorptive properties, rendering the same suitable for use in many situations in which such a material might be desired and particularly as medical and sanitary dressings and the like.

Generally speaking the process contemplates mixing cellulose pulps, asbestos, wool and other fibrous material, with foam or bubble-forming chemical solutions, separating the fibers of the materials and incorporating the foam or bubbles with the fibers, whereby distention of the fibers takes place resulting in expanded volume and aeration of the product in its dry fixed form.

In practicing the process a solution is first prepared by dissolving in a predetermined quantity of water a predetermined quantity of chemical characterized by its capability of forming a relatively stable foam. Among the chemicals having this property are some of the carbohydrates, for instance, the starches and dextrans, some of the albumens, such as egg albumen, and some of the glucosides, particularly saponin. It is possible to use as the foam-forming medium any of these substances or combinations thereof, and some other substances not mentioned have this property, namely, that of forming relatively

stable bubbles or foam, all of which are contemplated herein.

In the preferred form of the invention, it is intended to use as the bubble or foam-forming medium, saponin, which exhibits excellent results in practice, particularly in connection with forming the soft, fluffy product hereinafter more fully described.

The saponin is completely dissolved in the water, preferably one part of saponin to 400 parts of water. Into this solution is introduced the material to be processed, which in this instance is cellulose pulp of a character commonly used in the manufacture of paper or cotton, the quantity of pulp being relatively small for the best results, consisting of about eight and one-half parts thereof to the approximately four hundred parts of the solution.

The mixture thus provided is then vigorously agitated, beaten or whipped by suitable mechanical means for approximately thirty to sixty minutes so as to thoroughly break up the cellulose material and separate the fibers thereof and thoroughly mix these fibers with the bubbles, lather or foam thus produced.

The mixture after being thoroughly beaten or whipped as referred to, consists of a volume of stable foam in which the pulp fibers are suspended, and a portion of the original solution which has not been converted into foam. In order to thoroughly incorporate the fibers of the pulp within the foam, it appears necessary to use the relatively large amount of solution noted as compared to the amount of pulp treated. The excess solution appears to act as a lubricant between the bubbles or it may be that it simply holds them apart and allows the fibers to penetrate the bubbles of the foam. Whatever this action may be in bringing about the incorporation of the bubbles with the fibers of the pulp, it is certain that the bubbles are so incorporated and are of such stability that the fibers are maintained in separated, distended condition when removed from the solution and during the drying of the product. Instead of adding the dry pulp to the saponaceous solution, it may be desirable to partially or thoroughly

beat the pulp with water, drain off the water and introduce into the solution the wet pulp in place of the dry pulp above referred to. Under these conditions, the action appears to be somewhat facilitated.

After the stable foam above referred to has been formed, including as it does proportions of the pulp and saponaceous solution, it is poured into a suitable mold for forming it into the desired shape, the mold being provided with means for draining off the surplus solution, or the material may be formed on a properly arranged Fourdrinier paper machine wire screen. After the material has been formed into the desired shape and the surplus solution drained off, it is removed from the mold and dried, preferably at a temperature below 200° F., although the temperature may be higher than this toward the end of the drying period.

The amount of pulp added to a given quantity of solution, as above referred to, has considerable bearing upon the density of the finished product, that is, when more pulp than the quantity above referred to is used with the quantity of solution noted, the product will be of greater density than when a less quantity of pulp is added to the solution. Also, the period during which the mixture is beaten or whipped has an effect upon the density of the product, that is, the more prolonged the bearing or whipping action, the less the density of the product, this apparently bearing a relation to the proportion of air incorporated in the foam forming the mixture.

The product which results from practice of the process described has a greater volume as compared with its volume prior to subjection to the process, and is further characterized by extreme softness, fluffiness and great absorptive properties. The completed product, in its dry state, has its fibers disarranged and distended or distorted due to the presence of the stable air bubbles of the saponaceous solution therein during drying, the product after drying, exhibiting a fixed form having corresponding fiber distortion and disarrangement, resulting in the expanded volumes, softness, and fluffiness before referred to and rendering the same suitable for employment in any situation where a product of this character would prove to be useful. In appearance the product resembles short staple cotton and the softness and fluffiness thereof is also comparable with cotton. Although it is in relatively fixed form it may be somewhat subjected to compression action to change its density somewhat and shaped into the desired form for marketing, while retaining its softness and fluffiness.

The product may be somewhat varied by slightly varying the ingredients of the foam-forming solution to include a substance which will become rigid when dried. For in-

stance, when a small amount of such a substance, casein for instance, is added to the solution, the resulting product, while still of the expanded aerated form due to the incorporation of the foam with its fibers, when dried, exhibits considerable rigidity, this apparently being due to the stiffness imparted thereto by the residual casein incorporated with the distended or disarranged fibers of the material.

Although only one method of producing the foam has been referred to, that is by mechanical agitation, it is apparent that the foam may be formed in other ways, as for instance, by combining with the ingredients referred to, certain of the well-known gas-forming chemicals. Also, it is possible to form the foam by introducing compressed air or gas into the mixture of fibrous material and the solution.

Although certain other variations might be made in the process and product without departing from the spirit of the invention, attention is directed to an important feature of the invention which resides in separating the fibers of the material treated through the medium of relatively stable bubbles or foam which are incorporated with the fibers, whereby the distention and separation occasioned by the presence of the foam or bubbles incorporated with the fibers are perpetuated or fixed by drying, resulting in the expanded aerated product, whether it be soft and fluffy in character or of the more rigid type referred to.

While I have herein shown and described what I now consider the preferred manner of carrying out my invention, the same is merely illustrative and I contemplate all changes and variations which come within the scope of the claims appended hereto.

I claim:

1. A process of treating fibrous matter to produce soft, fluffy material, consisting in incorporating with the fibers of said matter a chemical solution containing relatively stable air bubbles and drying said matter, said air bubbles serving to maintain said fibers in separated condition during the drying of said matter.

2. A process of treating fibrous material consisting in distending the fibers thereof through the introduction between the fibers of an agent containing relatively stable chemically induced bubbles.

3. A process of treating fibrous pulp consisting in mixing with the pulp a glucoside solution, agitating the mixture to separate the fibers of the pulp and incorporate with the fibers relatively stable bubbles, and drying the mixture while the fibers are in distended condition.

4. A process of treating fibrous material consisting in mixing said material and a solution capable of incorporating relatively

stable bubbles, agitating said mixture to effect incorporation of the bubbles with the fibers of said material, and drying the material with the bubbles incorporated there-within.

5 5. A process of treating cellulose, consisting in mixing the same with a saponin solution, agitating the mixture to form a bibulous, aerated mass and drying said mixture.

10 6. A process of treating cellulose material consisting in distending the fibres of the same through the incorporation with the fibers of relatively stable saponaceous lather, and drying said material while in distended
15 condition.

7. A process of treating cellulose consisting in the following steps: mixing a solution of saponaceous material and cellulose, agitating said material to induce incorporation
20 of the lather with the fibers of said cellulose, and drying the cellulose with the lather incorporated therewithin.

8. A process of treating fibrous matter to produce soft, fluffy material of different densities, consisting in mixing the fibrous matter with a solution of foam-forming material,
25 agitating said mixture, and drying said mixture, the proportions of the strength of the foam-forming solution and of the period of agitation determining the density of the
30 product.

9. A process of treating fibrous material consisting in distending the fibers thereof through the introduction between the fibers
35 of an agent containing relatively stable bubbles.

10. A process of treating cellulose, consisting in mixing the same with a foam-forming solution, agitating the mixture, and drying
40 said mixture.

11. A process of treating fibrous material to produce an expanded volume consisting in mixing the fibrous matter with a foam-forming solution, agitating said mixture and drying
45 the same.

12. A dry cellulose material characterized by expanded volume, softness and fluffiness, said material having incorporated throughout its mass residual lather of saponaceous
50 substances.

13. A dry fibrous material characterized by expanded volume, said material having incorporated throughout its mass residual foam-forming substances.

55 14. A product consisting of chemically aerated cellulose material.

15. A dry fibrous material characterized by softness and fluffiness resulting from the presence of saponaceous bubbles incorporated
60 with its fibers during the drying of the material.

16. A fibrous material having incorporated with its fibers a saponaceous lather and characterized in a dry state by expanded volume,
65 softness and fluffiness.

17. A fibrous material in its fixed state characterized by residual fibre distension occasioned by the presence of aerating bubbles in a formative state.

18. The process which comprises converting a slurry of fibers into a stiff foam in the
70 presence of a foam stabilizing agent.

19. As a new material, a stiff foam containing included fibers distributed therein, said foam yielding a bibulous, spongy fibrous
75 material on being allowed to dry.

20. The process of preparing a bibulous, spongy, cellulosic, fibrous material which comprises aerating and agitating an aqueous slurry of cellulosic fibers in the presence of
80 a foam stabilizing agent until a stiff dense foam is formed containing the cellulosic fibers and then carefully drying the foam.

In witness that I claim the foregoing I have hereunto subscribed my name this 15th
85 day of December, 1928.

FRANK L. BRYANT.

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