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## DISTENDED FIBROUS PRODUCT

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The product of the present invention constitutes a modification or variation of the product produced in accordance with the method set forth and described in Bryant Patent No. 1,740,280, issued December 17, 1929, and the present application is in part a continuation of application Serial No. 569,349, filed October 16, 1931, and is directed to the distending of fibrous materials which have been subjected to a preliminary hydrating treatment, for a length of time and under proper conditions, to gelatinize the surfaces of the fibers to a sufficient extent to cause the fibers to more intimately engage and adhere to one another when subjected to the distending treatment set forth in the Bryant Patent No. 1,740,280 aforesaid, with the result that the final product will possess a greater measure of stability and will better maintain its distended condition by reason of the embedment of the gelatinized surfaces of the fibers in one another.

The Bryant Patent No. 1,740,280 aforesaid, relates to the distending of fibrous materials by formation of a mixture of fibers and water, with the addition of bubble-forming ingredients such as saponin which, under agitation, will produce a relatively stable foam and serve to hold the fibers in distended relation to one another during the drying operation, which results in the formation of a light fluffy or cottony product, the fibers of which, when dried, are held distended merely by their intermeshing or interweaving.

By the method of the present invention, the surfaces of the fibers themselves are gelatinized so that when distended they will become more permanently set or interlocked with one another and at the same time the softening of the fiber surfaces better conditions them for a fireproofing or waterproofing treatment or for a dyeing process, since the softened surfaces of the fibers will better hold and retain the ingredients employed in such proofing or dyeing treatment.

In particular, the product of the present invention is intended for use as an insulating agent against heat transfer in buildings or in domestic and industrial equipment such as refrigerators, driers and the like, passenger and refrigerator equipment for railroads, automobiles, airplane cabins, and numerous other applications in which insulating materials such as fiber board, cork, mineral wool, hair, grass, etc., have customarily been used. These materials differ widely in insulating value and in physical characteristics, and in many instances it is necessary to sacrifice insulating value for strength or other considerations. The insulating value of

material depends primarily on its density, those materials having the lower density usually possessing the higher insulating efficiency.

Among other properties which influence the value of material as an insulator, is the conductivity of the material itself and the arrangement of the particles with relation to the resistance which they tend to offer to convection currents.

The weight, also, of the materials employed is an important factor which must be taken into consideration in providing for the framing of the structure which is to be insulated, and the use of certain materials possessing high insulating value, such as hair and cork, is frequently prohibited by reason of their high cost.

The product of the present invention possesses high insulating value by reason of its distended formation and by reason of the fact that the materials of which it is composed are poor conductors of heat; and the method employed in producing the material is one which gives to it sufficient stability and stiffness and resistance to compacting action to render its use advantageous in numerous instances where insulation is required, either with or without a treatment which renders it fireproof and/or waterproof.

In producing the product of the present invention, it is preferred to employ cellulose fibers which are preliminarily subjected to a beating or hydrating action, as set forth and described in application Serial No. 569,349. The beating or hydrating of the pulp converts the exterior surfaces of the fibers to a somewhat gelatinized condition, and in this condition the surfaces are more susceptible to treatment with substances capable of imparting color or fireproof or waterproof properties thereto. For instance, pulp fibers are introduced into a regular paper stock beater of the Holland, Niagara or Jordan type, with sufficient water to give the proper consistency (about 3%), and subjected to the action of the beater for a sufficient length of time to produce the desired degree of hydration. This period may be varied, depending upon the condition of the raw fibers and upon the extent of the gelatinizing effect desired, but for most purposes a treatment of an hour will serve to give to the fibers the desired degree of hydration.

The hydrating action herein referred to, is to be distinguished from an action which results merely in the breaking up of the relatively longer fibers into shorter lengths, but without material softening of the fiber surfaces to produce the gelatinizing effect which is essential in the method of the present invention, and which substantially

modifies the surface condition of the fibers and their capacity to embed themselves into one another at the points where they contact or intersect when held in distended relation and in mesh formation to one another.

After the fibrous materials have been sufficiently beaten and hydrated, it is necessary to incorporate with the liquid mixture a suitable quantity of bubble-forming or foam-forming ingredients of the character set forth and described in Bryant Patent No. 1,740,280 aforesaid. It may also at this stage be desirable in proper cases, to incorporate with the mass a quantity of hair or other fibrous material which it is desired to introduce into the completed product. Experience has shown that the incorporation into the mass, of an amount of hair equal in weight to 50% of the cellulose or other fibrous material contained in the liquid mixture, will produce a highly desirable product having greater elements of strength and resistance to compacting, although it will be understood that the introduction of such materials as hair or the like is optional.

The foam-forming ingredient which is preferred is saponin, which may be added in the proportion of substantially one part of saponin to 400 parts of water in the mixture, and after the addition of the saponin or other bubble-forming ingredients, the mixture, either with or without the addition of proofing agents, is subjected to agitation in the manner set forth in the Bryant Patent No. 1,740,280, for a sufficient period to cause the mass to expand and assume a foamy condition through the action of the bubble-forming or foam-forming ingredients, and until the mass has expanded to about two and one-half times its original liquid volume and until the hair or other material, if any, which has been added to the cellulose fibers, has become thoroughly impregnated with and evenly distributed throughout the mass.

After the material has been brought to a foamy or creamy state, due to the presence of the minute bubbles formed therein, it is discharged in the form of a layer and dried either on the moving surface of a Fourdrinier machine or in molds, or in any other suitable manner.

During the drying operation, the layer of material may have formed thereon a surface skin or coating, produced in the manner set forth and described in Bryant Patent No. 1,841,785, granted Jan. 19, 1932, which results from the momentary application of a somewhat heavy suction applied to the surface of the layer, which has the effect of compacting the exterior surface fibers of the mass in such a way as to produce a close textured paper surface, but without, however, subjecting the interior of the layer to such compacting action as pointed out in detail in the patent last referred to. The production of such a closely textured paper surface is materially facilitated in the present instance by reason of the gelatinized condition of the fibrous surfaces due to the preliminary hydration to which the fibers were first subjected. The softening of the fibers causes them to more intimately unite or coalesce with one another on the surface when subjected to the close compacting action of a suction, with the result that products formed from the previously hydrated fibrous material, when subjected to the action tending to produce a surface skin or layer, will have formed thereon a more closely knit or integrated surface skin which is bonded or united to the interior of the layer more closely or intimately than in cases

where the preliminary hydrating has been omitted.

Furthermore, the body of the layer behind the skin will be composed of fibers which are held distended by the inclusion of the bubbles during the setting and drying operations, and the fibers are held in open mesh relation by their surface embedment with one another so that the resulting product will be stiffer and more resistant to compressive action and better adapted to permanently retain its distended condition as a result of the softening of the fiber surfaces produced by the preliminary hydrating treatment.

Furthermore, the formation of the closely textured skin surface on one or both sides of the layer will add toughness and coherence to the completed product, so that for many purposes it will not be necessary to enclose the product in a paper sheath, adhered or otherwise secured thereto, in the manner at present customary in the production of layers or sheets intended for insulating purposes.

Furthermore, the intermeshing or coalescing effect produced as a result of the gelatinizing of the fiber surfaces, results in a more intimate union of the fibers throughout the entire layer, so that there is little or no tendency for the paperlike surface layers to become displaced or torn away since the surface fibers are intimately anchored and united with the underlying body fibers in a permanent union.

Layers of materials produced in the manner described possess sufficient rigidity and stiffness to enable them to be cut, shipped and utilized after the manner of fiber board or similar materials, and although the layers of the present invention are sufficiently rigid and self-sustaining to permit ready manipulation, they are nevertheless extremely light and porous in texture and possess high insulating properties.

The sheets or layers above described, especially when produced in the manner to afford a closely textured paperlike surface skin, may be readily subjected to a proofing surface treatment with wax, asphaltum or other materials commonly employed for proofing surfaces, since the close texture of the paper surface renders such a treatment easy and advantageous. However, for many purposes, it may be desirable to subject the fibers, either preliminarily or concurrently with the foaming operation, to a fireproofing or waterproofing treatment, so that the completed layer throughout will be either fire-resistant or water-resistant. The gelatinized condition of the fiber surfaces renders such a fireproofing or waterproofing treatment peculiarly advantageous since the softening of the fiber surfaces produces a condition which renders the retention of the proofing agents more effective and perfect.

Where it is desired to waterproof the gelatinized fibers, the following illustrates a method adapted to be performed concurrently with the foaming or distending of the fibers in a single operation.

Water resistance is obtained by dispersing with the fibers in the foam-forming solution previously described a water repellent substance which serves to proof the fibers in greater or less degree and which will fuse or flux onto the fibers to form a protective coating. Proofing substances may be employed which will fuse or melt at temperatures less than the temperatures required for drying, but will not flux onto the fibers while they are in a wet condition, due to the water coating on the individual fibers, which prevents the adherence of the proofing material thereto. It is

essential, therefore, that the drying temperature be higher than the fusion temperature of the water repellent—"proofing"—substance, or the mass may be dried at temperatures below the fusion point of such substance, and the material may thereafter be subjected to temperatures sufficient to cause a fluxing of the waterproofing materials.

For the above purpose, such materials as wax, resin, asphaltum, and some salts of fatty acids, are recommended. Such materials are introduced in a finely divided state into the foaming solution with the fibers, and the whole whipped or agitated to incorporate the air necessary to form a stable foam, as previously set forth.

The method of reducing wax, resin, asphaltum, etc., to a fine state of subdivision is by converting them into emulsions with water and a dispersing agent, and then breaking the emulsion in order to release such finely divided particles, by the addition of some setting agent, such as an acid or acid salt. Such an emulsion may be added to the foaming solution with the fibers and the setting agent, and then foamed by agitation, or the emulsion may be added to the foaming solution with the fibers and then whipped to form the foam, after which the setting agent may be added.

In lieu of the above, the setting agent may be added to a diluted solution of the emulsion and the formed precipitate added to the foaming solution with the fibers and then whipped to form the foam. Emulsions are also available which when diluted with large amounts of water have the effect of breaking down without the addition of a setting agent, and these may therefore be added to the foaming solution and the fibers without employing a setting agent. It is also possible to dissolve the water repellent or proofing agent in a non-aqueous miscible solvent, which when diluted with water will throw out the finely divided precipitate of insoluble water repellent.

For example, resin may be dissolved in alcohol, the solution introduced into the mixture of foam-forming solution and fibers, and the mass whipped to form a stable foam and afterwards dried at a temperature sufficient to flux the resin onto the fibers.

Soluble salts of some of the fatty acids, such as sodium stearate, or sodium resinate, may be introduced into the mixture of water and fibers and foam-forming chemicals, and the coating is formed onto the fibers either during the foaming period or thereafter, in an insoluble form by the addition of metallic salt capable of reacting with them.

As an example of the above method, I may use a soluble sodium stearate, which, after being mixed with the other ingredients, is converted into an insoluble zinc stearate by the addition of zinc chloride. In like manner, a sodium resinate may be used and converted into aluminum resinate by the addition of aluminum sulphate.

As a detailed example of a waterproofing treatment by the use of sodium stearate, I employ the following method:

Take approximately 150 parts of pulp on an air dried basis, 4700 parts of water, 15 parts of sodium stearate dissolved in the water, 4 parts of zinc chloride required to convert the soluble sodium stearate into an insoluble zinc stearate, and thoroughly distribute it throughout the fibers in the water, to which mixture is added 10 parts of saponin, and the whole whipped to incorporate the air and form the stable foam in con-

formity with the principles set forth in the Bryant patent aforesaid. The proofing ingredients and the saponin can be mixed separately, or can be incorporated and all mixed together during the foaming operation.

As an alternative to the above method, the foam-forming agent may be added before the zinc chloride, the mixture may be foamed, and then the zinc chloride added to precipitate the insoluble zinc stearate.

According to the above technique, the proofing and foam-forming steps in the process are either partly or wholly combined into a single operation, which in many cases may be most desirable, but in other cases it may be found better to pre-treat the fibers in advance of the foam-forming operation, and under such conditions the addition of the saponin may be deferred until the waterproofing operation has been completely performed by the transformation of the sodium stearate into zinc stearate, after which, and as a separate step in the operation, the saponin may be added and the proofed fibers whipped to distend them and give to the product the physical characteristics set forth and described in the Bryant patent aforesaid.

As a detailed example of the use of sodium resinate for waterproofing the fibers, the following example is given:

Take approximately 150 parts of pulp on an air dried basis, in 4700 parts of water to which sodium resinate is added in the proportion of from two to five percent of the weight of the fibers. Sufficient alum is then added to precipitate the sodium resinate as aluminum resinate by rendering the solution slightly acid. To the above solution ten parts of the foaming agent are added and the mixture agitated and foamed in the manner previously described. If desired, the proofing agents and the foaming agent may be added separately, or all of the ingredients may be combined and foamed together in a single operation.

If desired, the proofing step in the operation may be completely performed as a pre-treatment, after which the proofed fibers may be foamed and distended in the manner previously described.

In lieu of any of the above methods of waterproofing, a similar result may be obtained by the use of solutions of albumen, which may be mixed with the fibers and the foam-forming solution, and then rendered insoluble by the use of formaldehyde. As a further alternative, finely divided rubber latex may be dispersed with the fibers and fused onto them by heat, in accordance with methods well understood in the paper industry.

The degree of water resistance is controlled by the amount and type of water repellent used. four to six percent of the weight of the air dried fiber being sufficient in the case of wax to reduce the water capillarity to approximately zero. Where asphaltum is used, approximately 15 to 20 percent of the weight of the air dried fiber is required to produce a like result.

Although in many cases it is immaterial whether the fibers be pre-treated with a proofing substance and afterwards subjected to the foaming operation, or whether the proofing and foaming operations be performed concurrently, nevertheless, it will be found that in some cases a pre-treatment for proofing is desirable in order that the precipitating of the water repellent substance upon the fibers may not be deleteriously

influenced by the presence of the foaming agent.

For many purposes, the following method of waterproofing is preferred above all others previously described:

- 5 Take substantially 150 parts by weight of air dried fibers, 4700 parts of water, ten parts of the foam-forming ingredient saponin, and 8 to 9 parts wax which has been precipitated by acid or an acid salt before mixing with the other ingredients. Whip the whole to form a stable foam with the fibers and wax dispersed throughout the mass, form the mass into the desired shape, remove the excess solution, and dry the former mass of fibers at temperatures sufficient to cause a fluxing of the minute wax particles onto the fibers to form a waterproof coating or covering for each fiber. In the above process it will be noted that the foaming and waterproofing steps are concurrently performed in a single operation, which is desirable from the standpoint of economy in cases where other considerations do not indicate the necessity for performing the steps separately.

- 25 Where it is desired to fireproof the fibers, a similar technique may be employed and the operations performed either in sequence or concurrently in most cases. Fireproofing or flameproofing is generally considered to be caused, first by the fireproofing agent melting at temperatures less than the ignition temperature of the material, and thus coating the surfaces thereof with a film impervious to air; second by the liberation of gases which mix with those produced from the heated fibrous material and render them non-inflammable; and third by endothermic changes which are responsible for the lowering of the temperatures below that required for ignition.

- 40 In the fireproofing of the present materials, it will be understood that the term "proofing" is employed in a relative sense and is intended to cover any treatment which increases the fire resistance of the materials to a substantial degree. The fireproofing may be attained by the addition of proper quantities of the desired chemicals, such as aluminum chloride, ammonium sulphate, ammonium phosphate, borax, boric acid, or other well known fireproofing salts, either singly or in combination, into the mixture of the foam-forming ingredients and fibers, which are then whipped to form a stable foam, and formed into the desired shape and dried in the manner heretofore described.

- 55 In lieu of the above treatment, the fireproofing step may be performed as a preliminary step or pre-treatment before the fibers are subjected to the foaming operation, in which latter case the foaming operation will be performed on a mass of proofed fibers instead of upon a mass of raw fibers as in the case of the Bryant patent previously referred to.

- 60 As an example of pre-treatment of the fibers by the use of aluminum chloride, the following is given:

- 65 To approximately 100 parts of pulp on an air dried basis add 4700 parts of a saturated solution of aluminum chloride, which serves to fireproof the fibers to a substantial degree. The fibers thus fireproofed may be subjected to the foam-forming operation and dried in conformity with the method previously set forth to produce a fire proof product.

- 70 In lieu of the pre-treatment above described, the foam-forming ingredient may be added to the pulp in suspension in the aluminum chloride solution and the mass as a whole subjected to

the foam-forming operation and thereafter dried in a single operation.

As a second example of a fireproofing operation, which I prefer in certain cases, I take a slurry of fibers with water, to which is added a foam-forming ingredient such as saponin, together with 15 parts of borax, 6.5 parts of boric acid based on the weight of water used, the whole being whipped to form a stable foam with the fibers incorporated therein, and afterwards formed to shape and dried in the manner previously described.

It may also be desirable to color the materials made by this process, and this may be accomplished by introducing into the mixture of fibers and foam-forming solution a color pigment or dye, either in the presence of fireproofing or waterproofing agents, or without them, as desired, in sufficient proportions to give the desired depth of coloration. For instance, to 150 parts of fibers add 4700 parts of water, and with 10 parts of saponin I add 1.5 parts of direct dye, after which the mixture is foamed, formed and dried in the manner previously described.

While I have endeavored to point out in detail a number of different methods which may be employed in producing a product having the desired characteristics, it will be understood that it is not my intention in the appended claims to limit myself to the details of any one or more of the processes described by way of exemplification, since I contemplate numerous modifications in detail and within the scope of the claims appended hereto.

I claim:

1. The process of treating fibrous material in the production of a distended fibrous product which consists in first hydrating the fibrous material to partially gelatinize the surfaces of the fibers, and in thereafter incorporating with the fibers of said material a chemical agent adapted to produce a foam and to hold said fibers in distended relation during the drying of a product.

2. The process of treating fibrous material in the production of a distended fibrous product which consists in first hydrating the fibrous material to soften and gelatinize the surfaces of the fibers, and in thereafter distending the fibers through the introduction between the fibers of an agent containing relatively stable chemically induced bubbles.

3. The process of treating fibrous material in the production of a distended fibrous product which consists in softening the surfaces of the fibers by a gelatinizing process and in introducing an agent adapted under agitation to produce relatively stable bubbles, in agitating the mixture to produce a foamy condition, and in drying the mixture while the fibers are in a distended condition.

4. The process of treating cellulose fibers which consists in hydrating the same to gelatinize the surfaces of the fibers, mixing the same with a foam-forming ingredient, agitating the mixture to form a foamy mass and drying the mixture.

5. The process of treating cellulose fibers which consists in subjecting said fibers to a gelatinizing process, mixing the same with a saponin solution, agitating the mixture to form a foamy mass, and drying said mixture.

6. The process of treating cellulose fibers which consists in subjecting the fibers thereof to a gelatinizing treatment to soften the surfaces of the fibers, introducing an agent capable under agitation of producing relatively stable bubbles throughout, agitating the mass to produce a foam,

including the fibers, subjecting a layer of the foamy mass to an action tending to coalesce the surface fibers in the formation of a closely textured surface skin, and drying the layer with the skin formed thereon and with the fibers of the body of the layer in distended relation.

7. The process of treating cellulose fibers which consists in subjecting the fibers thereof to a gelatinizing treatment to soften the surfaces of the fibers, introducing an agent capable under agitation of producing relatively stable bubbles throughout, agitating the mass to produce a foam, including the fibers, subjecting a layer of the foamy mass to suction sufficient to coalesce the surface fibers in the formation of a closely textured surface skin, and drying the layer with the skin formed thereon and with the fibers of the body of the layer in distended relation.

8. The process of treating fibrous material in the production of a distended fibrous product which consists in subjecting the fibrous material to a gelatinizing process in a liquid bath to soften the surfaces of the fibers, subjecting the fibers to a water proofing treatment, distending the fibers by the use of a foaming agent capable of forming a foam in the presence of the proofed fibers, agitating the mixture to form bubbles distributed throughout the mass, and drying the mass with the fibers in distended relation to one another.

9. The process of treating fibrous material in the production of a distended fibrous product which consists in subjecting the fibrous material to a gelatinizing process in a liquid bath to soften the surfaces of the fibers, subjecting the fibers to a water proofing treatment, distending the fibers by the use of a foaming agent capable of forming a foam in the presence of the proofed fibers, agitating the mixture to form bubbles distributed throughout the mass, drying the mass with the fibers in distended relation to one another, and in subjecting the fibers, during the drying operation, to an action tending to compact the surface fibers in formation with a closely textured surface skin.

10. The process of treating fibrous material in the production of a distended fibrous product which consists in subjecting the fibrous material to a gelatinizing process in a liquid bath to soften the surfaces of the fibers, subjecting the fibers to a water proofing treatment, distending the fibers by the use of a foaming agent capable of forming a foam in the presence of the proofed fibers, agitating the mixture to form bubbles distributed throughout the mass, drying the mass with the fibers in distended relation to one another, and in subjecting the fibers, during the drying operation, to sufficient suction to compact the surface fibers in formation with a closely textured surface skin.

11. The process of treating fibrous material to produce a distended fibrous product which consists in subjecting the fibers in a liquid bath to a gelatinizing process adapted to soften the surfaces of the fibers, chemically water proofing the fibers by the addition of a chemical agent, adding a foam-forming agent adapted under agitation to produce a foam containing relatively stable bubbles, agitating the mass to distend the fibers and produce a foamy mass, and drying the mass in layer form and with the proofed fibers in distended relation to one another.

12. The process of treating cellulose fibers which consists in subjecting the fibers mixed with water, to a hydrating treatment adapted to gelatinize the surfaces of the fibers, adding thereto a foam-forming ingredient, adding wax in the

form of minute particles, agitating the mass to form a stable foam with the fibers and wax dispersed therein to cure adherents of the wax to the gelatinized surfaces of the fibers, drying the mass and subjecting the fibers to a temperature adequate to cause fluxing of the wax onto the gelatinized surfaces of the fibers to form a water-proof coating.

13. The process of treating fibrous material to produce a distended product which consists in subjecting the fibers and water to a hydrating treatment adapted to gelatinize the surfaces of the fibers, adding thereto a foam-forming ingredient, adding wax previously precipitated by acid, whipping the whole to form a stable foam with the fibers and wax-dispersed therein, removing the fibrous wax adhering to the gelatinized surfaces of the fibers, drying the mass and subjecting the fibers to a temperature adequate to cause fluxing of the wax onto the fibers to form a waterproof coating.

14. The process of treating fibrous materials to produce a distended product which consists in forming a mixture of fibers and water, treating the mixture to a process adapted to gelatinize the surfaces of the fibers, adding thereto a foam-forming material and borax and boric acid, whipping the whole to form a stable foam with the fibers incorporated therein, and drying the foam to form a fireproofed distended product.

15. The process of treating fibrous material to produce a distended product which consists in forming a mixture of fibers and water, subjecting the mixture to a hydrating action adapted to gelatinize the surfaces of the fibers, adding thereto a foam-forming material, adding a dyeing ingredient adapted to dye the gelatinized surfaces of the fibers, whipping the whole to form a stable foam with the fibers incorporated therein, and drying the foam to produce a dyed distended product.

16. As an article of manufacture, a distended fibrous product having the fibers thereof held in open intermeshing relation to one another by adherents of the gelatinized surfaces of the fibers.

17. As an article of manufacture, a distended fibrous product composed of fibers having their surfaces gelatinized and treated with a water proofing agent and held in open mesh formation by the embedment of the gelatinized fiber surfaces with one another at the points of intersection.

18. As an article of manufacture, a distended fibrous product consisting of fibers having their surfaces gelatinized and the body fibers being held in open mesh distended relation by the embedment of the gelatinized surfaces at the points of contact, and having a skin surface formed by the close compacting of the gelatinized surface fibers.

19. As an article of manufacture, a distended fibrous product consisting of fibers having their surfaces gelatinized and the body fibers being held in open mesh distended relation by the embedment of the gelatinized surfaces at the points of contact, and having a skin surface formed by the close compacting of the gelatinized surface fibers, the fibers having a water proofing agent applied thereto.

20. As an article of manufacture, a distended fibrous product in the form of a dried layer, having the surface texture of the fibers modified as a result of a gelatinizing action, the fibers being held in open mesh distended relation to one another.

other by the coalescence of the surface materials displaced by the gelatinizing action.

21. As an article of manufacture a distended fibrous product in the form of a dried layer, having the surface texture of the fibers modified as a result of a gelatinizing action, the fibers being held in open mesh distended relation to one another by the coalescence of the surface materials displaced by the gelatinizing action, and having a closely textured surface skin formed by the compacting of the surface fibers of the mass interspersed with the materials displaced by the gelatinizing action of the fibers.

22. As an article of manufacture, a distended fibrous product in the form of a dried layer, having the surface texture of the fibers modified as a result of a gelatinizing action, the fibers being held in open mesh distended relation to one another by the coalescence of the surface materials displaced by the gelatinizing action, the fibers being modified by the inclusion of a water proofing agent.

23. As an article of manufacture, a distended fibrous product in the form of a dried layer, having the surface texture of the fibers modified as a result of a gelatinizing action, the fibers being held in open mesh distended relation to one another by the coalescence of the surface materials displaced by the gelatinizing action, and having a closely textured surface skin formed by the compacting of the surface fibers of the mass interspersed with the materials displaced by the gelatinizing action of the fibers, the fibers being modified by the inclusion of a water proofing agent.

24. The process of treating fibrous material in the production of a distended fibrous product which consists in subjecting the fibrous material to a gelatinizing process in a liquid bath to soften the surfaces of the fibers, subjecting the fibers to a fireproofing treatment, distending the fibers by the use of a foaming agent capable of forming a foam in the presence of the proofed fibers, agitating the mixture to form bubbles distributed throughout the mass, and drying the mass with the fibers in distended relation to one another.

25. The process of treating fibrous material in the production of a distended fibrous product

which consists in subjecting the fibrous material to a gelatinizing process in a liquid bath to soften the surfaces of the fibers, subjecting the fibers to a fireproofing treatment, distending the fibers by the use of a foaming agent capable of forming a foam in the presence of the proofed fibers, agitating the mixture to form bubbles distributed throughout the mass, drying the mass with the fibers in distended relation to one another, and in subjecting the fibers during the drying operation to an action tending to compact the surface fibers in formation with a closely textured surface skin.

26. The process of treating fibrous material in the production of a distended fibrous product which consists in subjecting the fibrous material to a gelatinizing process in a liquid bath to soften the surfaces of the fibers, subjecting the fibers to a fireproofing treatment, distending the fibers by the use of a foaming agent capable of forming a foam in the presence of the proofed fibers, agitating the mixture to form bubbles distributed throughout the mass, drying the mass with the fibers in distended relation to one another, and in subjecting the fibers during the drying operation to sufficient suction to compact the surface fibers in formation with a closely textured surface skin.

27. As an article of manufacture, a distended fibrous product composed of fibers having their surfaces gelatinized and treated with a fireproofing agent and held in open mesh formation by the embedment of the gelatinized fiber surfaces with one another at the points of intersection.

28. As an article of manufacture, a distended fibrous product in the form of a dried layer, having the surface texture of the fibers modified as a result of a gelatinizing action, the fibers being held in open mesh distended relation to one another by the coalescence of the surface materials displaced by the gelatinizing action, and having a closely textured surface skin formed by the compacting of the surface fibers of the mass interspersed with the materials displaced by the gelatinizing action of the fibers, the fibers being modified by the inclusion of a fireproofing agent.

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