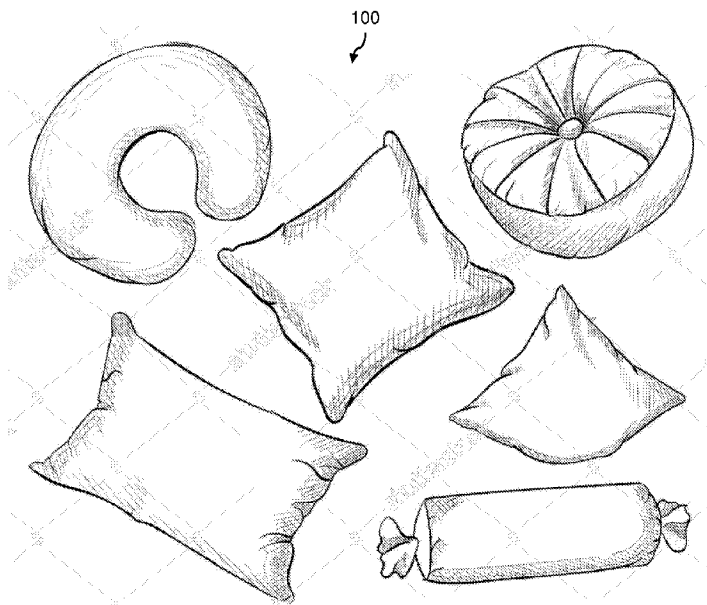




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(54) Title: TEXTILE PRODUCTS COMPRISING NATURAL DOWN AND FIBROUS MATERIALS



(57) Abrégé/Abstract:

A textile product and a method for manufacturing thereof are discussed. The textile product comprises about 5-95% natural down clusters by weight and about 95-5% of a secondary fiber material by weight. The method for manufacturing the textile product includes opening a fiber material, adding natural down clusters to the fiber material, mixing the fiber material with the natural down clusters to form a homogeneous mixture, and filling the textile product with the homogeneous mixture.



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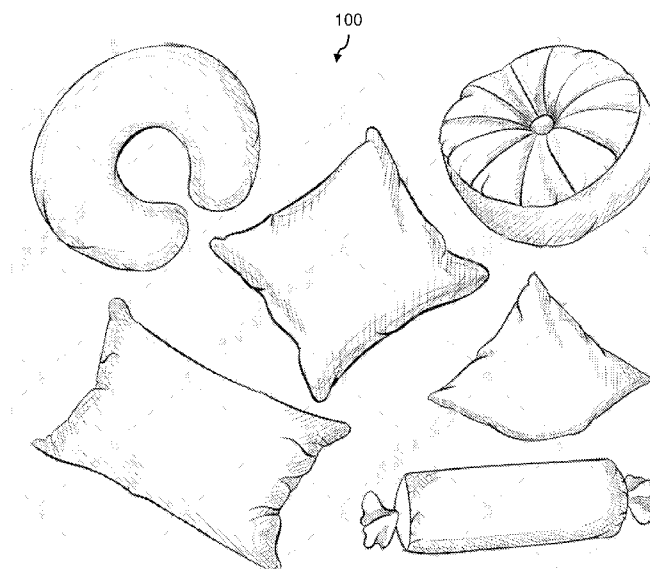


FIG. 1

(57) Abstract: A textile product and a method for manufacturing thereof are discussed. The textile product comprises about 5-95% natural down clusters by weight and about 95-5% of a secondary fiber material by weight. The method for manufacturing the textile product includes opening a fiber material, adding natural down clusters to the fiber material, mixing the fiber material with the natural down clusters to form a homogeneous mixture, and filling the textile product with the homogeneous mixture.



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**TEXTILE PRODUCTS COMPRISING NATURAL DOWN AND FIBROUS****MATERIALS****TECHNICAL FIELD**

[0001] Example embodiments relate to textile products including natural down clusters and natural or synthetic fibers, and methods for manufacturing thereof.

**BACKGROUND**

[0002] There have been many attempts to achieve an insulating material having down-like qualities for use in insulating articles such as clothing, sleeping bags, comforters, and the like. Prior efforts to develop a feasible material have most often yielded those that are too heavy and dense to be considered down-like, and/or are difficult to blow through conventional equipment.

[0003] For example, U.S. Pat. No. 4,588,635 to Donovan discloses a synthetic down and has particular reference to light-weight thermal insulation systems which can be achieved by the use of fine fibers in low density assemblies and describes a range of fiber mixtures, that, when used to fabricate an insulating batt, provides advantageous, down-like qualities such as a high warmth-to-weight ratio, a soft hand, and good compression recovery. This material approaches, and in some cases might even exceed the thermal insulating properties of natural down. From a mechanical standpoint, however extremely fine fibers suffer from deficiencies of rigidity and strength that make them difficult to produce, manipulate and use. Recovery properties of such a synthetic insulator material are enhanced by larger fiber diameters, but an increase in the large fiber component will seriously reduce the thermal insulating properties overall. The problems associated with mechanical stability of fine fiber assemblies are exacerbated in the wet condition since surface tension forces associated with the presence of capillary water are considerably greater than those due to gravitational forces

or other normal use loading and they have a much more deleterious effect on the structure. However, unlike waterfowl down, the fiber combination described in Donovan provides good resistance to wetting.

[0004] Another example is U.S. Pat. No. 4,992,327 to Donovan et al. which discloses the use of binder fiber components to improve insulator integrity without compromising desired attributes. More specifically the invention disclosed therein relates to synthetic fiber thermal insulator material in the form of a cohesive fiber structure, which structure comprises an assemblage of: (a) from 70 to 95 weight percent of synthetic polymeric microfibers having a diameter of from 3 to 12 microns; and (b) from 5 to 30 weight percent of synthetic polymeric macrofibers having a diameter of 12 to 50 microns, characterized in that at least some of the fibers are bonded at their contact points, the bonding being such that the density of the resultant structure is within the range 3 to 16 kg/m<sup>3</sup>, the thermal insulating properties of the bonded assemblage being equal to or not substantially less than the thermal insulating properties of a comparable unbonded assemblage. The reference also describes a down-like cluster form of the preferred fiber blends. The distinct performance advantages of the cluster form over the batt form are also disclosed in the patent.

[0005] Another example, U.S. Pat. No. 6,329,051 described blowable clusters made from shredded bonded batt or bonded web. The web or batt was described as the same fiber blend described in the '327 patent to Donovan. By shredding the batt or web formed of the materials described in the '327 patent the clusters were found to achieve down-like qualities including loft and insulating properties. Such clusters, in an admixture with natural material, is described in U.S. Pat. No. 6,329,052.

[0006] While the above mentioned blowable insulation materials are easily blowable with conventional blowers and can be used as a partial or full replacement for down or down-

like insulative materials, they, however, have problems associated with weight and laundrability when not used properly. These materials could get wet during laundering and can permanently lose their insulative properties due to clumping. Moreover, the blowable insulation clusters of the '051 and '052 patents incorporate only synthetic fibers.

[0007] While some or all of the foregoing references have certain attendant advantages, further improvements and/or alternative forms, is always desirable.

### SUMMARY

[0008] Accordingly, one example embodiment is a textile product including about 5-95% natural down clusters by weight and about 95-5% of a fiber material by weight. The fiber material may include at least one of polyester, silk, wool, rayon, cotton, acrylic fibers, and polyethylene. The specific gravity of the fiber material may be within 45% of the specific gravity of the natural down clusters. The textile product may be a pillow, a comforter, a mattress pad, a jacket, or a sleeping bag. The fiber material may include at least one of natural, synthetic, and regenerated fiber material. The synthetic fiber material may include recycled fibers. The natural down clusters may include at least one of white and grey down. The natural down clusters may include 10-90% animal feather by weight. The natural down clusters may have a fill power of 500 or more, alternatively 600 or more, alternatively 700 or more, or alternatively 800 or more. For the mixture to be truly homogenous, however, down must be carefully selected. In some embodiments, down with cling is preferred, and higher the cling, the better the mixture and higher the loft. Cling may be found when tiny hooks develop on the filaments of a down cluster. These hooks catch other down clusters to make a more even layer of insulation, and as large pockets of air are filled in and eliminated, the insulating power goes up. A down with a lot of cling may also stay in place on top of the sleeper, rather than shifting to the lowest parts of a duvets chamber.

[0009] Another example embodiment is a method for manufacturing a textile product. The method may include opening a fiber material, adding natural down clusters to the fiber material, mixing the fiber material with the natural down clusters to form a homogeneous mixture, and filling the textile product with the homogeneous mixture. The specific gravity of the fiber material may be within 45% of the specific gravity of the natural down clusters. The method may also include cutting the fiber material to a predetermined length prior to mixing the fiber material with the natural down clusters, wherein the predetermined length is determined based on the diameter of the natural down clusters. The adding step may further include adding about 5-95% natural down clusters by weight to about 95-5% of the fiber material by weight. The fiber material may include at least one of polyester, silk, wool, rayon, cotton, acrylic fibers, and polyethylene. The specific gravity of the fiber material may be within 45% of the specific gravity of the natural down clusters. The textile product may be a pillow, a comforter, a mattress pad, a jacket, or a sleeping bag. The fiber material may include at least one of natural, synthetic, and regenerated fiber material. The synthetic fiber material may include recycled fibers. The natural down clusters may include at least one of white and grey down. The natural down clusters may include 10-90% animal feather by weight. The natural down clusters may have a fill power of 500 or more, alternatively 600 or more, alternatively 700 or more, or alternatively 800 or more. For the mixture to be truly homogenous, however, down must be carefully selected. In some embodiments, down with cling is preferred, and higher the cling, the better the mixture and higher the loft. Cling may be found when tiny hooks develop on the filaments of a down cluster. These hooks catch other down clusters to make a more even layer of insulation, and as large pockets of air are filled in and eliminated, the insulating power goes up. A down with a lot of cling may also stay in place on top of the sleeper, rather than shifting to the lowest parts of a duvets chamber.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] So that the manner in which the features, advantages, and objects of the invention are attained and can be understood in more detail, more particular description of the invention briefly summarized above may be had by reference to the embodiment thereof which is illustrated in the appended drawings, which drawings form a part of this specification. It is to be noted, however, that the drawings illustrate only example embodiments of the invention and is therefore not to be considered limiting of its scope as the invention may admit to other equally effective embodiments.

[0011] FIG. 1 illustrates a textile product such as a pillow, according to one or more example embodiments of the disclosure.

[0012] FIG. 2 illustrates a textile product such as a mattress pad, according to one or more example embodiments of the disclosure.

[0013] FIG. 3 illustrates a textile product such as a comforter, according to one or more example embodiments of the disclosure.

[0014] FIG. 4 illustrates two types of natural down clusters that may be used in a textile product, according to one or more example embodiments of the disclosure.

[0015] FIG. 5 illustrates different types of natural down clusters and down feather that may be used in a textile product, according to one or more example embodiments of the disclosure.

[0016] FIG. 6 illustrates grey and white color natural down clusters that may be used in a textile product, according to one or more example embodiments of the disclosure.

[0017] FIGS. 7A-7F illustrate different types of fiber materials that may be mixed with natural down clusters to form a textile product, according to one or more example embodiments of the disclosure.

[0018] FIG. 8 is a flow diagram showing example steps involved in a method for manufacturing a textile product, according to one or more example embodiments of the disclosure.

[0019] FIG. 9 is a table comparing physical properties such as fill power and drying rate of the material composition according to one or more example embodiments of the disclosure with known materials.

[0020] FIG. 10 is a line graph comparing drying time of a textile product comprising 100% natural down vs. a textile product comprising a homogenous mixture of natural down clusters and fiber materials, according to one or more example embodiments of the disclosure.

#### DETAILED DESCRIPTION

[0021] The products and methods of the present disclosure will now be described more fully hereinafter with reference to the accompanying drawings in which embodiments are shown. The methods and products of the present disclosure may be in many different forms and should not be construed as limited to the illustrated embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey its scope to those skilled in the art. Like numbers refer to like elements throughout.

[0022] Turning now to the figures, FIG. 1 illustrates a textile product 100 such as a pillow, according to one or more example embodiments. FIG. 2 illustrates a textile product 100 such as a mattress pad laid over a mattress, according to one or more example

embodiments of the disclosure. FIG. 3 illustrates a textile product 100 such as a comforter, according to one or more example embodiments of the disclosure.

[0023] In one or more example embodiments the textile product may include about 5-95% by weight natural down clusters and about 95-5% by weight a fiber material. In some embodiments, the composition may preferably include 5-50% natural down clusters by weight and 95-50% fiber material by weight. The fiber material may include at least one of polyester, silk, wool, rayon, cotton, acrylic fibers, and polyethylene. In some embodiments, the specific gravity of the fiber material may be within 45% of the specific gravity of the natural down clusters. In some embodiments, the fiber material may include at least one of natural, synthetic, and regenerated fiber material. The synthetic fiber material, for example, may include recycled fibers also. In some embodiments, the fiber material may be chosen depending on the down cluster diameter. In some example embodiments, the synthetic fibers may be cut to desired length to achieve the required homogenous blend. The length may be determined based on the diameter of the natural down cluster, for example. For the mixture to be truly homogenous, however, down must be carefully selected. In some embodiments, down with cling is preferred, and higher the cling, the better the mixture and higher the loft. Cling may be found when tiny hooks develop on the filaments of a down cluster. These hooks catch other down clusters to make a more even layer of insulation, and as large pockets of air are filled in and eliminated, the insulating power goes up. A down with a lot of cling may also stay in place on top of the sleeper, rather than shifting to the lowest parts of a duvets chamber.

[0024] In some example embodiments, the natural down clusters may include at least one of white and grey down, and the natural down clusters may include 10-90% animal feather by weight, for example. The natural down clusters may have a fill power of 500 or more, alternatively 600 or more, alternatively 700 or more, or alternatively 800 or more. Fill

power is a measure of the loft or “fluffiness” of a down product that may be related to the insulating value of the down. The higher the fill power the more air an ounce of the down can trap, and thus the more insulating ability an ounce of the down will have. For example, one (1) ounce of 500 fill power goose down will loft to 500 cubic inches. The higher the fill power the larger the down cluster. Larger down clusters will loft higher; sleep softer, last longer and sleep warmer. For example, down insulation is made from goose or duck plumage; the lofty, fluffy stuff underneath the feathers. It is an undercoating, or a natural mid layer. Nature’s best insulation, down creates high-loft clusters that trap air and body heat. The feathers on geese or ducks are the outer covering of the bird. They have quills, repel water, and make it possible for the animal to fly. Down lies beneath this protective covering, usually on the belly of a bird, and is light and fluffy. It provides the insulation birds need to keep warm.

[0025] According to one example embodiment, the down chosen preferably has more cling. “Cling” is found when tiny hooks develop on the filaments of a down cluster. As the age or maturity of the bird increases, the density and cling increases as well. This is why the best down comes from much older birds. This is important so that the fibers are hooked to the down cluster more homogeneously and prevent separation. It also allows for less movement of the fibers within the textile product.

[0026] FIG. 4 illustrates two types of natural down clusters that may be used in a textile product 100, according to one or more example embodiments of the disclosure. On the left side is a 850 FP duck down cluster 120 and on the right side is shown a 850 FP goose down cluster 140. If during processing, down is “over washed” and too great a percentage of fat and oil is removed, the down can dry out and become brittle, thus making it easier to break down, decreasing fill power.

[0027] Higher fill power down tends to come from older more mature birds, as discussed above. The longer a bird lives, the more developed the down cluster. Furthermore, to achieve a desired fill power, processors sort through feather, small down clusters, large down clusters, etc., to make down of a certain content and fill power. FIG. 5 illustrates different types of natural down clusters 220, 240 and down feather 260 that may be used in a textile product 100, according to one or more example embodiments of the disclosure. In this figure, a large cluster 220, small cluster 240, and down feather 260 are shown for illustrative purposes only.

[0028] The current highest fill power for goose is approximately 1000 FP, but this is available in extremely limited quantities (and usually prohibitively expensive). Comparatively, Eider duck down, the highest-end most expensive down by an order of magnitude, has been anecdotally rated up to 1200 FP. More common fill powers for duck and goose down range from 450-850 FP. High-end duck down in 850 FP has recently become more accessible due to improvements in the sorting process that filters out additional fibers and small down clusters.

[0029] Both duck and goose down are available in white and mottled grey. Historically speaking, white colored down has been more desired in the bedding industry because most bedding fabric is white, and manufacturers prefer to hide the presence of down. Besides a visual difference, there is no performance difference between white and grey colored down of the same specification. FIG. 6, for example, illustrates grey 320 and white color 340 natural down clusters that may be used in a textile product 100, according to one or more example embodiments of the disclosure.

[0030] Duck and goose down can be equally efficient insulators when variables such as fill power, quality of fill, and processing are taken into account. The quality of down is directly tied to everything from the feed of the bird during its life, to the length of its life, to

the wash method used in processing. The natural down clusters used in the present invention have a fill power of 500 or higher, alternatively 600 or higher, alternatively 700 or higher, alternatively 800 or higher, or alternatively 900 or higher. Because of its supreme warmth-to-weight ratio and incredible compressibility, which makes it very easy to pack, down is considered the best of insulators. It remains lightweight and compressible while holding the warmth.

[0031] FIGS. 7A-7F illustrate different types of fiber materials that may be mixed with the natural down clusters to form a textile product 100, according to one or more example embodiments of the disclosure. FIG. 7A, for example, shows silk fibers 710 that may be mixed with the natural down clusters to form a textile product 100. FIG. 7B, for example, shows wool fibers 720 that may be mixed with the natural down clusters to form a textile product 100. FIG. 7C, for example, shows rayon fibers 730 that may be mixed with the natural down clusters to form a textile product 100. FIG. 7D, for example, shows cotton fibers 740 that may be mixed with the natural down clusters to form a textile product 100. FIG. 7E, for example, shows polyester fibers 750 that may be mixed with the natural down clusters to form a textile product 100. FIG. 7F, for example, shows acrylic fibers 760 that may be mixed with the natural down clusters to form a textile product 100.

[0032] Textile product 100 may also include an outer fabric or shell to contain the mixture of the natural down clusters and the fiber material. The outer fabric or shell may include down proof material as defined by International Down and Feather Testing Laboratory (IDFL). A down proof material, for example, may be a fabric which resists the penetration of the natural down. The fabric may be closely woven to be downproof by nature or may be cired or coated to make it downproof. According to one embodiment, the outer fabric or shell may include a fluid impermeable material.

[0033] FIG. 8 is a flow diagram showing example steps involved in a method 800 for manufacturing a textile product, according to one or more example embodiments of the disclosure. The method may include the steps of determining a length of fiber material based on the diameter of natural down clusters in step 802. In step 804, the method may include cutting the fiber material to the predetermined length based on the determination in step 802. In step 806, the method may include adding natural down clusters to the fiber material. In step 808, the method may include mixing the fiber material with the natural down to form a homogenous mixture, and in step 810, the method may include filling the textile product with the homogenous mixture.

[0034] The method may also include opening the fiber material 710-760, adding natural down clusters 120, 140, 320, 340 to the fiber material 710-760, mixing the fiber material 710-760 with the natural down clusters to form a homogeneous mixture, and filling the textile product 100 with the homogeneous mixture. The specific gravity of the fiber material should preferably be within 45% of the specific gravity of the natural down clusters. The adding step may further include adding about 5-95% natural down clusters by weight to about 95-5% of the fiber material by weight. In some embodiments, the composition may preferably include 5-50% natural down clusters by weight and 95-50% fiber material by weight. The fiber material may include at least one of polyester, silk, wool, rayon, cotton, acrylic fibers, and polyethylene. The textile product 100 may be a pillow, a comforter, a mattress pad, a jacket, or a sleeping bag. The fiber material may include at least one of natural, synthetic, and regenerated fiber material. The synthetic fiber material may include recycled fibers. The natural down clusters may include at least one of white and grey down. The natural down clusters may include 10-90% animal feather by weight, for example, and the natural down clusters may have a fill power of 500 or more, alternatively 600 or more, alternatively 700 or more, or alternatively 800 or more.

[0035] The invention further contemplates utilizing synthetic fiber blends that are not discussed above. These blend ranges limit average fiber diameter and length to ensure a high level of insulating performance. In some instances, an average fiber diameter greater than that defined by the cited patents may be desirable. For example, relatively large diameter fibers may be utilized if the end product is a pillow or upholstery and compressional stiffness is an important requirement.

[0036] Natural fibers or material considered to be within the scope of the present invention include but are not limited to wool, cotton, flax, animal hair, silk, down as well as other natural fibers or materials. However, in a preferred embodiment, the natural fibers are down clusters. Although down clusters are referred to herein, "down clusters" include down, natural down, down feathers, down clusters, and a combination thereof. The natural fibers or material can be treated to provide water repellent properties. Several water repellent chemicals can be used in this process, however, a particular polymer solution of zirconium acetate, which can impart durable water repellent properties with no negative effect on fill power on the natural fiber or material, and no negative impact on the environment is the preferred chemical.

[0037] According to one embodiment, the natural down clusters (including feathers) may be provided with a water-repellant, bacterial-resistant, low friction cured zirconium acetate finish, such that the down clusters have faster dry time following washing and enhanced handle and resistance to clumping. More specifically, the down clusters have thereon a water-repellent, bacterial-resistant, low friction cured zirconium acetate finish. Different treatment processes can be used to treat down clusters with solution of zirconium acetate to impart water repellent properties and one such treatment is disclosed in U.S. Pat. No. 4,537,594. The process involves applying to the down feathers an aqueous emulsion of a curable

zirconium acetate, and curing said polymer. The emulsion can be applied by exhaustion, for example. The feathers are thoroughly cleansed prior to application of said copolymer, which can be accomplished by means of a water wash, followed by partial water removal so as to leave a residual moisture content of 5 to 45% based on the weight of completely dry feathers. The copolymer can be cured at 130 degrees to 170 degrees C.

[0038] Alternatively, the water repellent properties for down/natural fibers can be imparted using different techniques which are not just limited to wet bath or dry spraying processes. Various surface energy modification techniques, which are well known in the art such as plasma treatment, can also be employed to treat the down clusters for providing water repellent properties. Such treatments or processes are explained in U.S. Pat. No. 4,869,922, U.S. Pat. No. 5,262,208, U.S. Pat. No. 5,895,558, U.S. Pat. No. 6,416,633, U.S. Pat. No. 7,510,632, U.S. Pat. No. 8,309,033, and U.S. Pat. No. 8,298,627.

[0039] The preferred short cut synthetic/man-made fibers can have a fiber denier or linear density between 0.5 denier to 15 denier. However, fibers in excess of 15 denier can also be used in combination with the natural down clusters of the present invention. The short cut fibers can have a length ranging from 5 mm to 25 mm, and can be aerodynamically blended with the natural fibers to get homogeneous blend as described above. The preferred fiber balls made of synthetic/man-made fibers can have a fiber denier or linear density between 0.5 denier to 15 denier, for example. Other preferred embodiments utilize fiber-blends comprising water repellant finished or lubricant finished fiber and/or dry fiber and/or binder fiber. For example, the short cut synthetic/man-made fibers of the present invention can be coated with any slickening agent or lubricant for providing water repellent properties. The synthetic fibers/man-made fibers used in this invention include but are not limited to

solid, hollow-type, as well as other cross-sectional shapes with or without crimp. Fibers with binding agent on the outer shell may also be used for the instant synthetic/man-made fibers.

[0040] The material used to produce the short cut synthetic/man-made fibers used in the present invention are described in U.S. Pat. No. 7,682,693. According to one embodiment, the short cut synthetic/man-made fibers comprise polyester fibers having an average dimension of 0.5 to 15 denier and being coated with a slickener and crimped, the fibers being cut to a length of 5-25 mm and opened. The polyester fibers could be obtained, for instance, by extruding polyester fibers as known in the art. An important aspect of the invention is that the polyester fibers need to have a certain average dimension, i.e., a certain cross-sectional size and the extruded polyester fiber need to be slickened. This is obtained by coating the fibers with a slickener, preferably a silicone slickener, e.g. as described in U.S. Pat. No. 3,454,422. The slickener makes the fibers easier to open and thus provides for separating the fibers from each other. The fibers of the present invention may alternatively be slickened with other slickening agents which may be advantageous in some applications, such as segmented copolymers of polyalkyleneoxide and other polymers, such as polyester, or polyethylene or polyalkylene polymers as is mentioned in U.S. Pat. No. 6,492,020 B1, with the weight percent of the slickener being from about 0.1 to about 1.2% per weight of the fibers.

[0041] To obtain the desired properties of the inventive material it is necessary to provide the polyester fibers with a crimp. One example of a suitable crimp is the so called zig-zag crimp, also called mechanical crimp. This type of crimp, which is per se known, is obtained by passing a tow of extruded fibers through a narrow gap between two crimp rollers. Further examples of mechanical crimp methods are referred to in EP 929700 A1 and U.S. Pat. No. 6,492,020 B1. Another crimp type is the spiral crimp. A spiral crimp is, contrary to the two-dimensional zig-zag crimp, three-dimensional. A spiral crimp could be obtained by,

for example, the methods described in U.S. Pat. No. 3,050,821, U.S. Pat. No. 3,118,012, EP 929700 A1 and U.S. Patent No. 6,492,020 B1. Preferably the crimp frequency is adjusted so that each cut fiber, at the given cut length, is provided with at least one or two crimps. Further it will be appreciated that both solid and hollow fibers could be used as well as fibers of different cross-sections.

[0042] According to one embodiment, the short cut synthetic/man-made fibers can be fully opened and blended with natural fibers or materials. Such opening and blending process is described in U.S. Pat. No. 7,074,242, for example. The method can include the steps of obtaining natural down feathers; washing the down in accordance with a predetermined washing process to produce prepared down; blending the prepared down with the short cut synthetic/man-made fibers in accordance with a predetermined blending process to produce the filling material. The blending step is carried out by blending the prepared down at least 50% by weight short cut synthetic/man-made fibers or fiber balls. The washing step is carried out by the sub-steps of: (a) washing the down with hot soapy water; (b) rinsing the down with hot water; (c) rinsing the down with cold water; (d) treating the down clusters for water repellency; (e) drying the rinsed down; and (f) dedusting and cooling the dried down. The drying sub-step is carried out by drying 40 pounds of washed down for substantially 20 minutes at a temperature of substantially 105 degrees C. The dedusting and cooling sub-step can further include injecting ozone into the down, and can be carried out utilizing a screened centrifuge.

[0043] The method for manufacturing the inventive material, according to one embodiment of the present invention, comprises the steps of:

[0044] (1) Treating the natural fibers or materials to provide water repellent properties. During this process, the natural fibers or materials may be opened, cleaned,

washed, and dried, if necessary. The treatment for water repellency can be done in dry or wet conditions, although a wet process is the preferred method.

[0045] (2) Opening of short cut synthetic/man-made fibers and blending with natural fibers or materials. The blending step can be carried out using dry or wet process, although a dry process is the preferred method, in which down clusters are fed to a storage/mixing chamber using controlled air stream before which it hits an another air stream from opposite direction carrying fully opened short cut fibers and thereby both down clusters and short cut fibers are homogenously blended. This process of aerodynamic blending is preferred method of blending to achieve very less breakage of down clusters and thereby achieving highest possible fill power. For better results it is preferred to go for a batch quantity of at least 100 kg.

[0046] Textile product 100 may also include an outer fabric or shell to contain the mixture of the natural down clusters and the fiber material. The outer fabric or shell may include down proof material as defined by International Down and Feather Testing Laboratory (IDFL). A down proof material, for example, may be a fabric which resists the penetration of the natural down. The fabric may be closely woven to be downproof by nature or may be cired or coated to make it downproof. According to one embodiment, the outer fabric or shell may include a fluid impermeable material.

[0047] **EXAMPLES**

[0048] Some of the advantages of the present textile product 100 include reduced cost of production when compared to 100% down products; faster drying rates (100% down products take a very long time to dry); better fill power; and better breathability or improved Ret value. Natural down in its original form is incapable of efficiently repelling moisture. In fact, it loses many of its insulating properties when it gets wet and is often slow to dry. For example, FIG. 9 is a table comparing physical properties such as fill power and drying rate of

the material composition according to one or more example embodiments of the disclosure with known materials. As it can be seen from this table, the product with the combination of 50/50 White Duck Down (WDD) and Polyester (2) has the highest weight before washing, and a fill power that is comparable to 100% WDD (1) and the 50/50 combination of WDD and Lyocell (5). However, after being washed, the product with the combination of 50/50 WDD and Polyester (2) has the lowest water content among all samples, after spinning, after drying for 30 min, after drying for 50 min, or after drying for 70 min.

[0049] FIG. 10 is an example line graph comparing drying time (in minutes) of a textile product 1200 comprising 100% natural down vs. a textile product 1000 comprising a homogenous mixture of 50/50 WDD and Polyester, according to one or more example embodiments of the disclosure. As it can be seen from this figure, textile product 1000 dries significantly faster and returns to its original weight (before washing) much faster when compared to textile product 1200 comprising 100% natural down.

[0050] The Specification, which includes the Summary, Brief Description of the Drawings and the Detailed Description, and the appended Claims refer to particular features (including process or method steps) of the disclosure. Those of skill in the art understand that the invention includes all possible combinations and uses of particular features described in the Specification. Those of skill in the art understand that the disclosure is not limited to or by the description of embodiments given in the Specification.

[0051] Those of skill in the art also understand that the terminology used for describing particular embodiments does not limit the scope or breadth of the disclosure. In interpreting the Specification and appended Claims, all terms should be interpreted in the broadest possible manner consistent with the context of each term. All technical and scientific terms used in the Specification and appended Claims have the same meaning as

commonly understood by one of ordinary skill in the art to which this invention belongs unless defined otherwise.

[0052] As used in the Specification and appended Claims, the singular forms “a,” “an,” and “the” include plural references unless the context clearly indicates otherwise. The verb “comprises” and its conjugated forms should be interpreted as referring to elements, components or steps in a non-exclusive manner. The referenced elements, components or steps may be present, utilized or combined with other elements, components or steps not expressly referenced. The verb “operatively connecting” and its conjugated forms means to complete any type of required junction, including electrical, mechanical or fluid, to form a connection between two or more previously non-joined objects. If a first component is operatively connected to a second component, the connection can occur either directly or through a common connector. “Optionally” and its various forms means that the subsequently described event or circumstance may or may not occur. The description includes instances where the event or circumstance occurs and instances where it does not occur.

[0053] Conditional language, such as, among others, “can,” “could,” “might,” or “may,” unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain implementations could include, while other implementations do not include, certain features, elements, and/or operations. Thus, such conditional language generally is not intended to imply that features, elements, and/or operations are in any way required for one or more implementations or that one or more implementations necessarily include logic for deciding, with or without user input or prompting, whether these features, elements, and/or operations are included or are to be performed in any particular implementation.

[0054] The products and methods described herein, therefore, are well adapted to carry out the objects and attain the ends and advantages mentioned, as well as others inherent therein. While example embodiments of the product and method have been given for purposes of disclosure, numerous changes exist in the details of procedures for accomplishing the desired results. These and other similar modifications may readily suggest themselves to those skilled in the art, and are intended to be encompassed within the scope of the system and method disclosed herein and the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A textile product comprising a homogenous mixture of about 5-95% natural down clusters by weight and about 5-95% of a fiber material by weight, wherein the specific gravity of the fiber material is within 45% of the specific gravity of the natural down clusters.
2. The textile product of claim 1, wherein the fiber material comprises at least one of natural, synthetic, and regenerated fiber material.
3. The textile product of claim 2, wherein the fiber material comprises at least one of polyester, silk, wool, rayon, cotton, acrylic fibers, and polyethylene.
4. The textile product of claim 1, wherein the natural down clusters have cling or tiny hooks formed on filaments of the down clusters to form a homogenous mixture.
5. The textile product of claim 1, wherein the textile product is a pillow, a comforter, or a mattress pad.
6. The textile product of claim 2, wherein the synthetic fiber material comprises recycled fibers.
7. The textile product of claim 1, wherein the natural down clusters comprise at least one of goose down and duck down.
8. The textile product of claim 1, wherein the natural down clusters comprise 10-90% animal feather by weight.
9. The textile product of claim 5, further comprising an outer fabric or shell to contain the mixture of the natural down clusters and the fiber material, wherein the outer fabric or shell comprises down proof material.

10. A method for manufacturing a textile product, the method comprising:  
opening a fiber material;  
adding natural down clusters to the fiber material;  
mixing the fiber material with the natural down clusters to form a homogeneous mixture; and  
filling the textile product with the homogeneous mixture,  
wherein the specific gravity of the fiber material is within 45% of the specific gravity of the natural down clusters.
11. The method of claim 10, further comprising the step of:  
cutting the fiber material to a predetermined length prior to mixing the fiber material with the natural down clusters, wherein the predetermined length is determined based on the diameter of the natural down clusters.
12. The method of claim 10, wherein the adding step further comprises:  
adding about 5-95% natural down clusters by weight to about 5-95% of the fiber material by weight.
13. The method of claim 10, wherein the textile product is a pillow, a comforter, or a mattress pad.
14. The method of claim 10, wherein the fiber material comprises at least one of natural, synthetic, and regenerated fiber material.
15. The method of claim 14, wherein the fiber material comprises at least one of polyester, silk, wool, rayon, cotton, acrylic fibers, and polyethylene.
16. The method of claim 14, wherein the synthetic fiber material comprises recycled fibers.
17. The method of claim 14, wherein the natural down clusters comprise at least one of goose down and duck down.

18. The method of claim 14, wherein the natural down clusters comprise 10-90% animal feather by weight.

19. The method of claim 10, wherein the natural down clusters have cling or tiny hooks formed on filaments of the down clusters to form the homogenous mixture.

20. The method of claim 10, further comprising:

providing an outer fabric or shell to contain the mixture of the natural down clusters and the fiber material, wherein the outer fabric or shell comprises down proof material.

21. A textile product comprising a homogeneous mixture of about 5-95% natural down clusters by weight and about 5-95% of a fiber material by weight, wherein the specific gravity of the fiber material is within 45% of the specific gravity of the natural down clusters, and wherein the fill power of the natural down clusters is at least 500 or higher.

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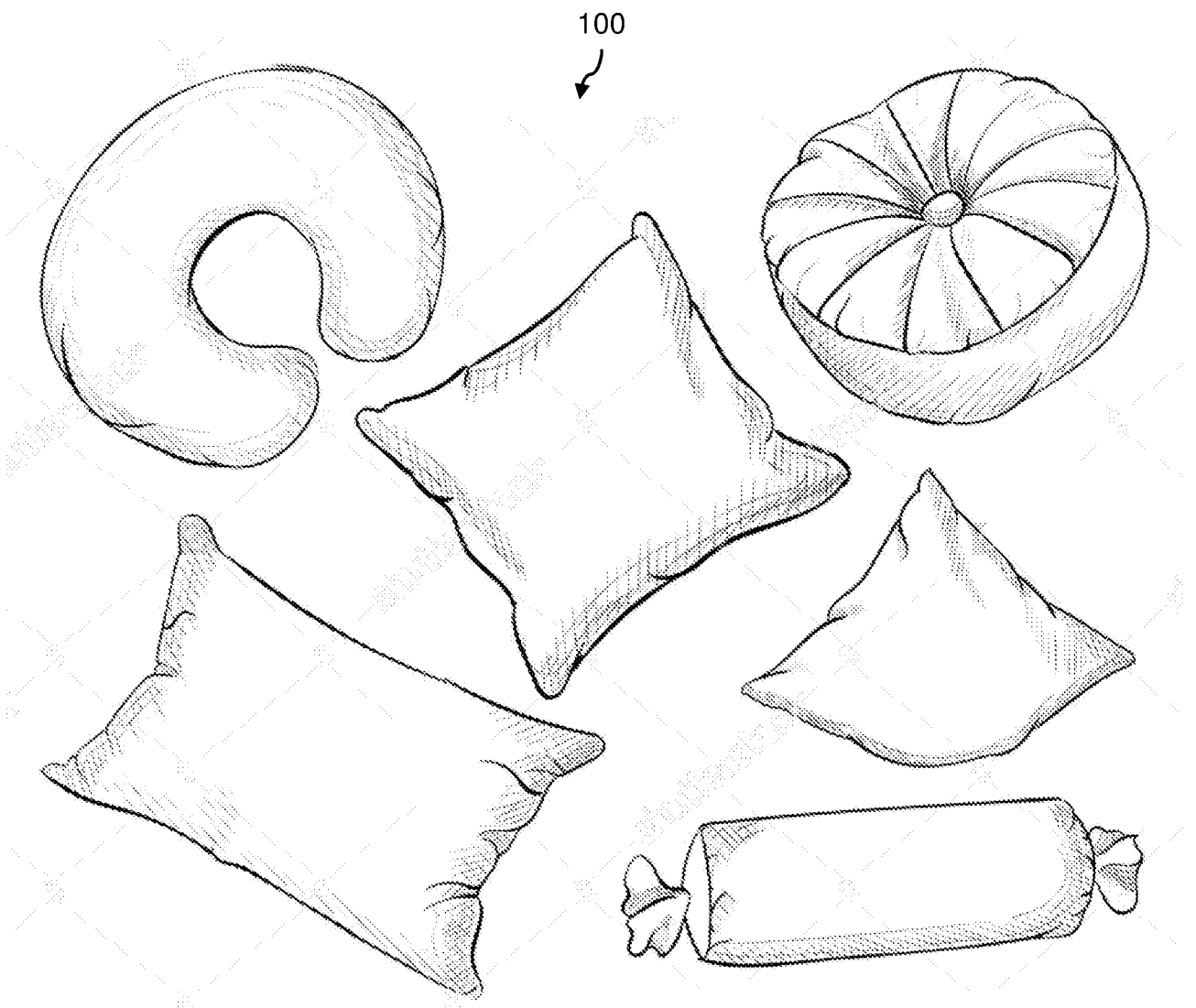


FIG. 1

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FIG. 2

3/10

100



FIG. 3

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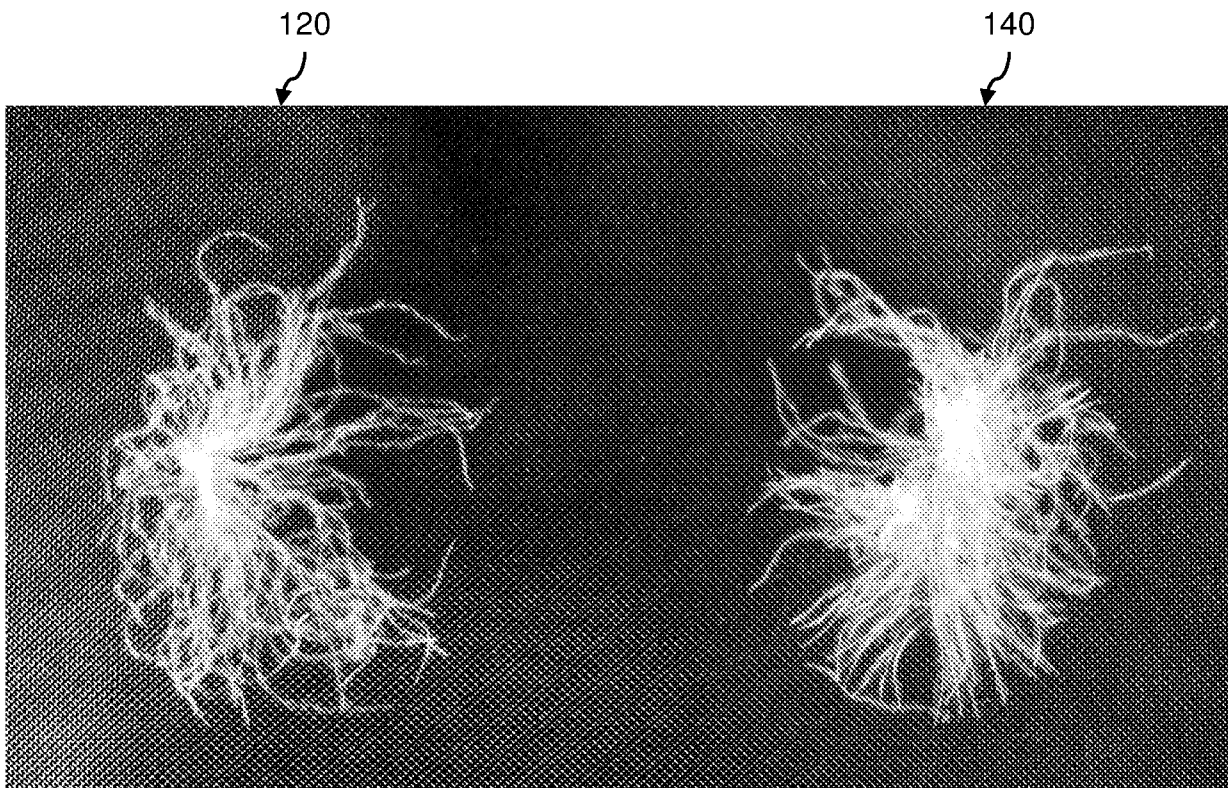


FIG. 4

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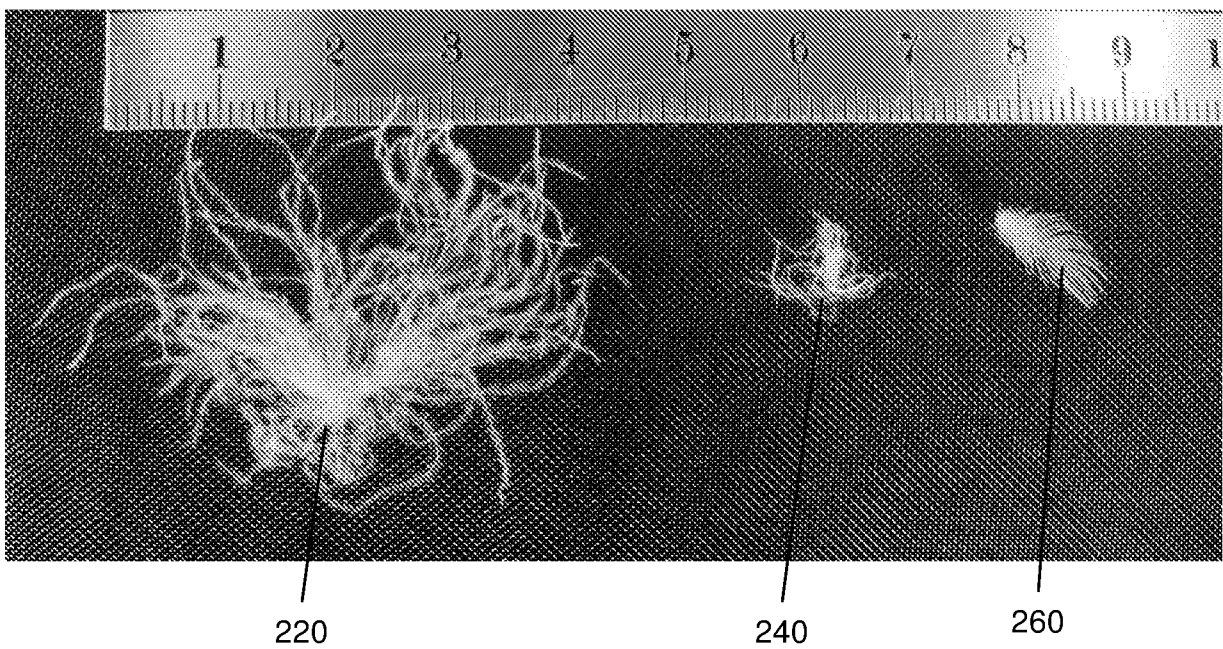


FIG. 5

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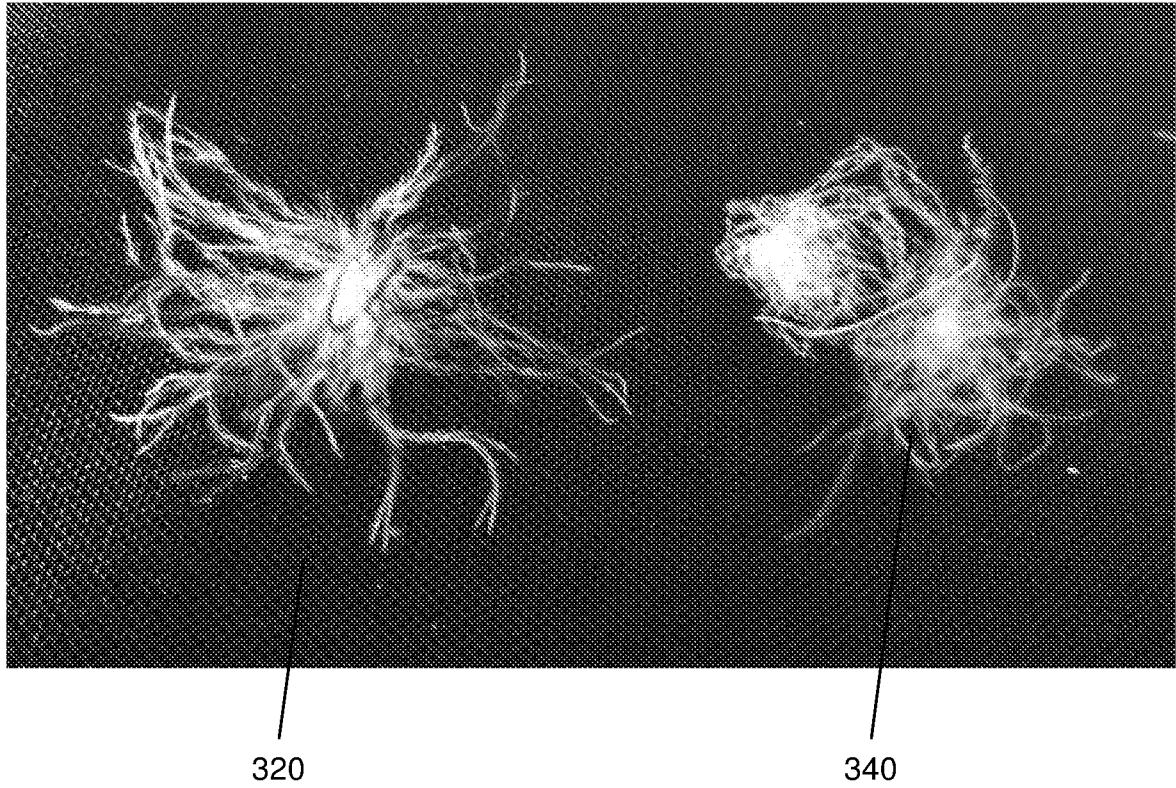


FIG. 6

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710

FIG. 7A

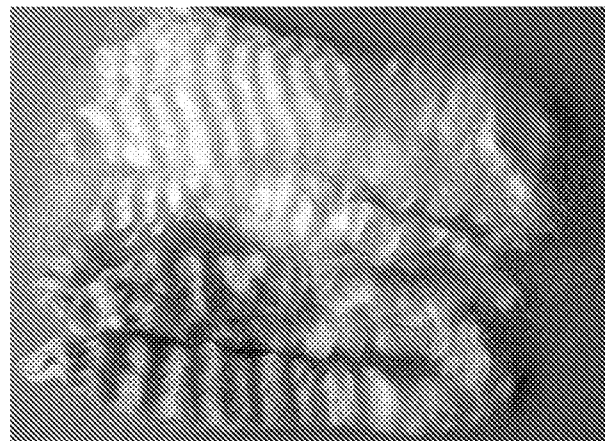
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FIG. 7B

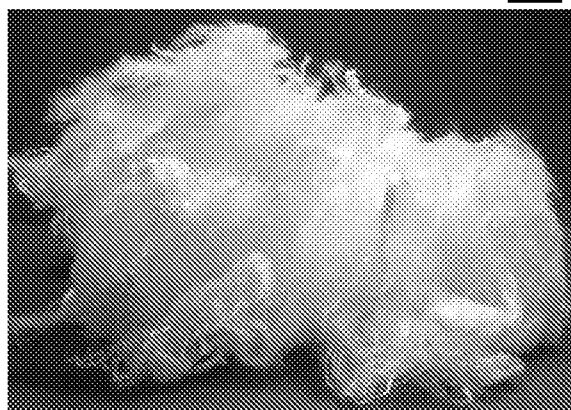
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FIG. 7C

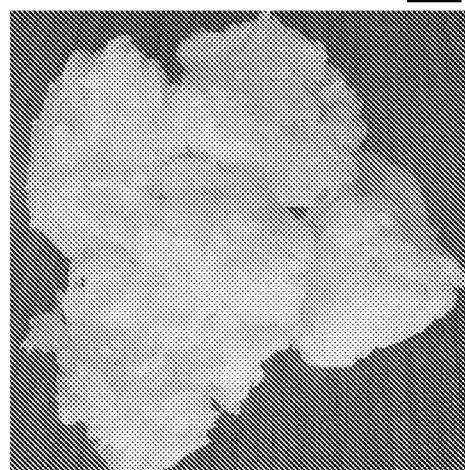
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FIG. 7D

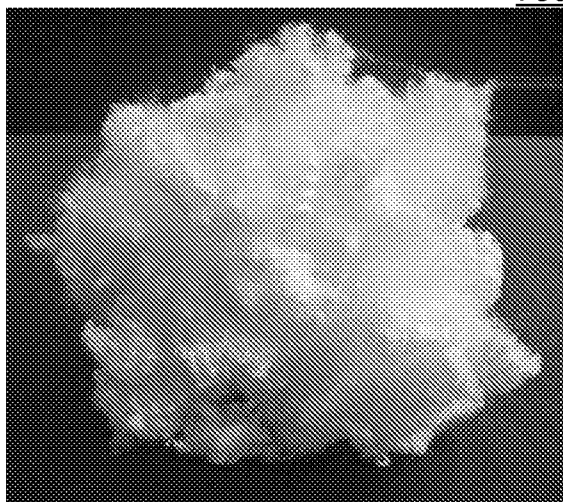
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FIG. 7E

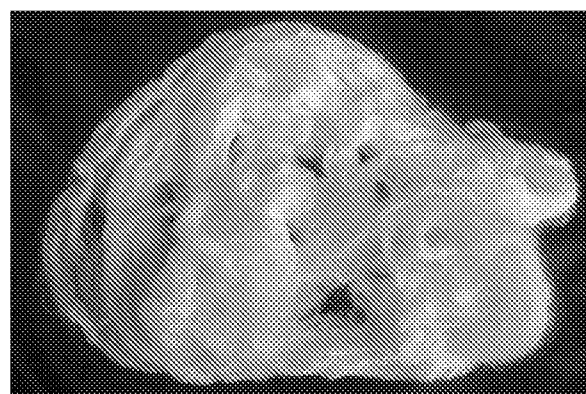
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FIG. 7F

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800

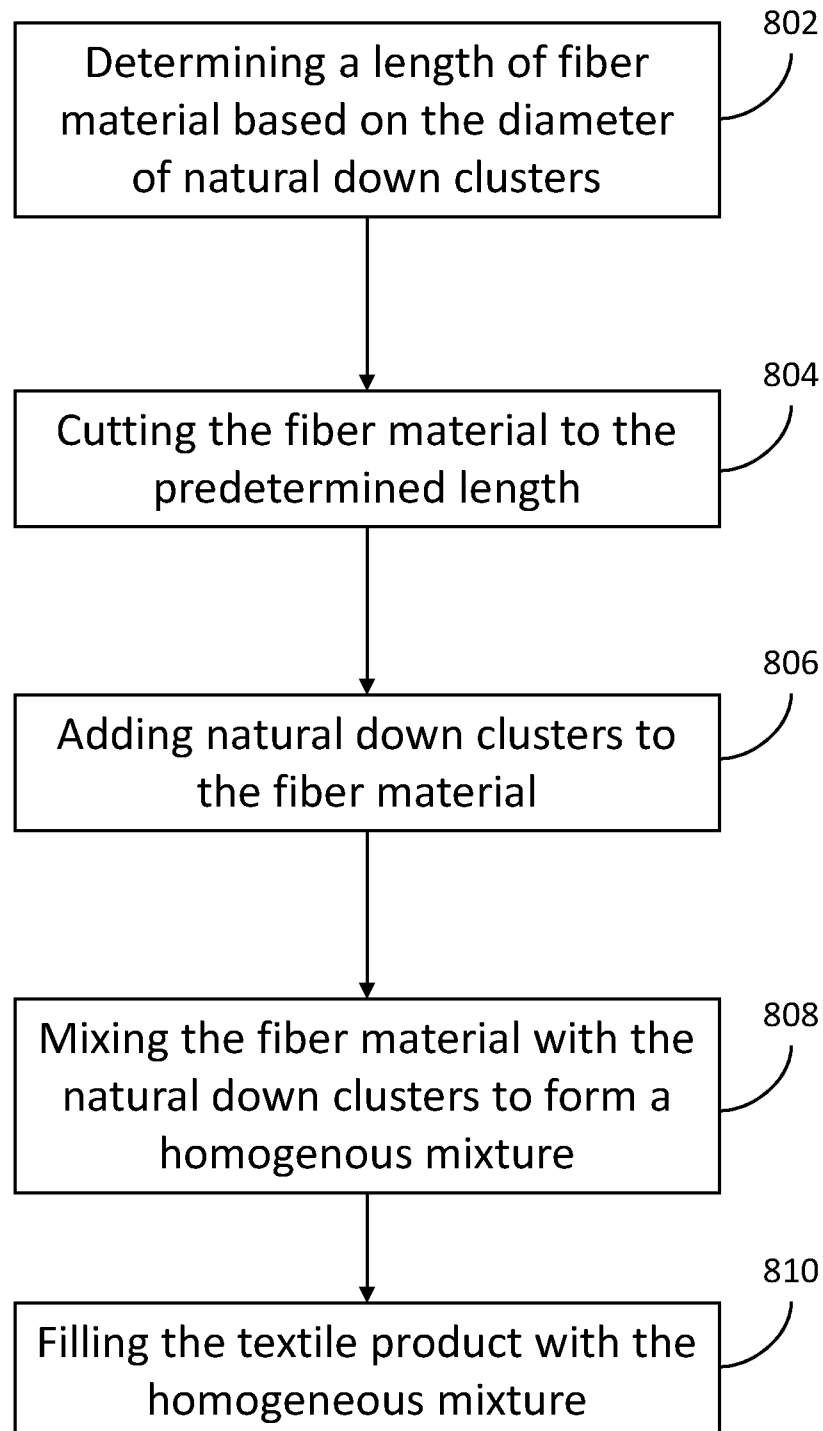


FIG. 8

|                 |                                   | 50/50 WDD/                                                |               |                    |                    |                       |
|-----------------|-----------------------------------|-----------------------------------------------------------|---------------|--------------------|--------------------|-----------------------|
|                 | Filling Material                  | 100% WDD (1)                                              | Polyester (2) | 50/50 WDD/Silk (3) | 50/50 WDD/Wool (4) | 50/50 WDD/Lyocell (5) |
| Fill Power (a)  |                                   | 607                                                       | 518           | 482                | 435                | 523                   |
|                 |                                   |                                                           |               |                    |                    |                       |
| Drying Rate (b) | Weight before washing             | 24.86g                                                    | 25.18g        | 24.46g             | 24.91g             | 24.85g                |
|                 | Weight after washing and spinning | 35.91g                                                    | 34.93g        | 34.37g             | 34.79g             | 36.82g                |
|                 | Results                           | Ranking of water content from low to high: 2, 4, 3, 1, 5. |               |                    |                    |                       |
|                 | Weight after drying for 30 mins   | 28.38g                                                    | 26.71g        | 26.95g             | 26.88g             | 28.74g                |
|                 | Results                           | Ranking of water content from low to high: 2, 4, 3, 1, 5. |               |                    |                    |                       |
|                 | Weight after drying for 50 mins   | 25.37g                                                    | 24.49g        | 24.56g             | 24.92g             | 25.52g                |
|                 | Results                           | Ranking of water content from low to high: 2, 4, 3, 1, 5. |               |                    |                    |                       |
|                 | Weight after drying 70 mins       | 23.87g                                                    | 23.94g        | 23.46g             | 24.08g             | 23.82g                |
|                 | Results                           | Ranking of water content from low to high: 2, 5, 3, 1, 4. |               |                    |                    |                       |

FIG. 9

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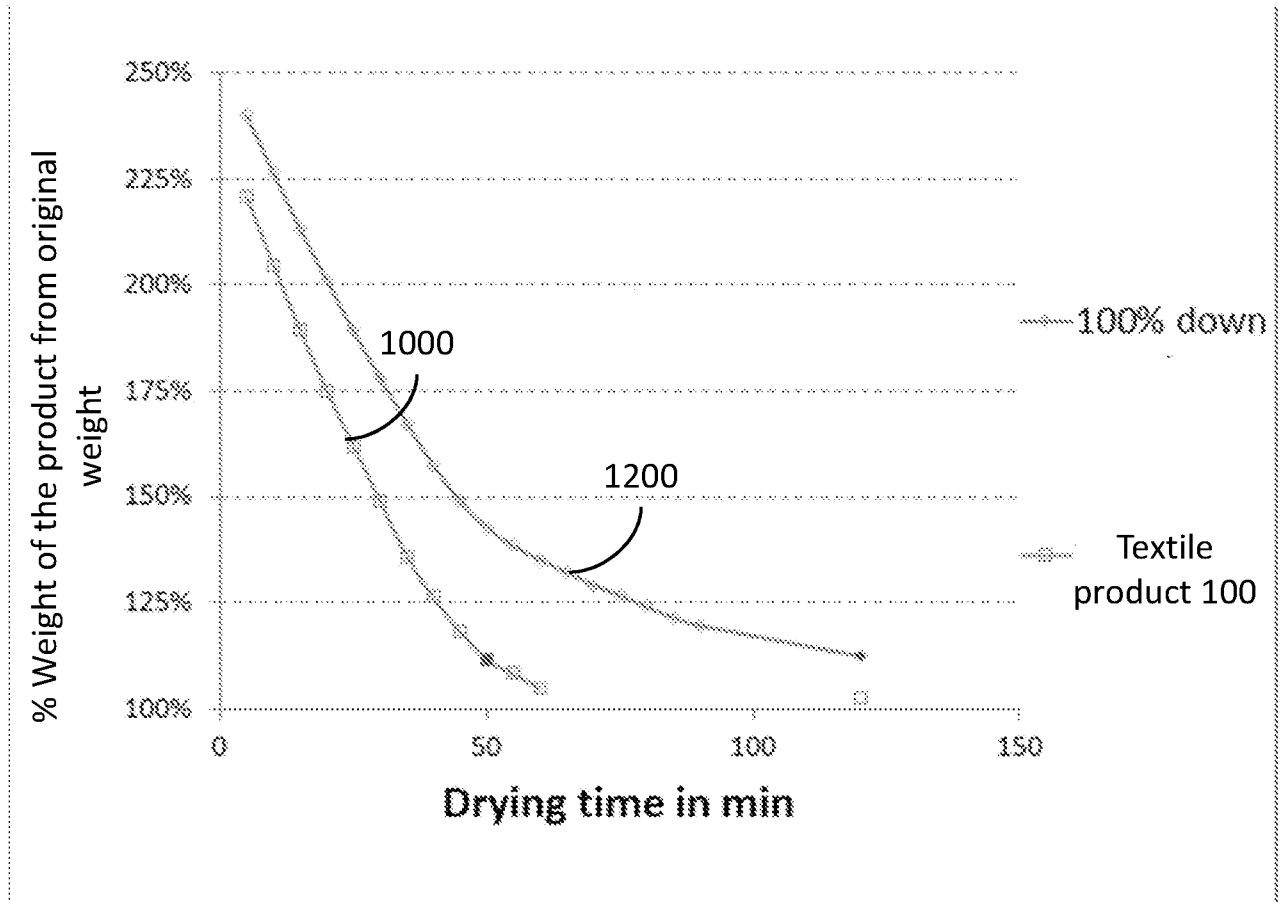


FIG. 10

100

