UNWOVEN TEXTILE SURFACE STRUCTURE
AND METHOD FOR ITS PRODUCTION

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24 Claims

ABSTRACT OF THE DISCLOSURE

A method for the production of a non-woven textile surface structure wherein filamentary material, such as staple fibers or continuous threads or strands, is temporarily bonded to a base layer with a portion of the filamentary material protruding from such base layer. Thereafter, at least a part of the protruding portion of the filamentary material is thinned while supported by the aforesaid base layer. The protruding thinned portions of the filamentary material are then embedded in a mat and the mat is firmly bonded to the embedded thinned portions of the filamentary material, whereby the base layer is removed. The resultant unwoven or non-woven textile surface structure, therefore, incorporates the mat and the filamentary material with the thinned portions embedded in at least one side of the mat. Such mat may be formed of a foamed material, such as foamed plastic or foamed rubber.

BACKGROUND OF THE INVENTION

The present invention relates to an improved method of manufacturing unwoven or non-woven textile surface structures and to improved unwoven textile surface structure manufactured in accordance with the inventive method. The produced textile surface structures have multifarious utility and, for instance, are particularly suitable for use as carpets, upholstery materials, mattresses, anti-skid materials for floor coverings, as so-called zipper or burr fasteners, and can be produced inexpensively and attractively.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide an improved method for the manufacture of non-woven textile surface structures which enables the production thereof in a highly efficient and economical manner, resulting in an improved product having an attractive appearance, good wearing properties, and great functionality.

Still a further significant object of the present invention relates to the production of an improved unwoven textile surface structure which has a multiplicity of diverse uses, possesses extremely good durability, provides a firm bond between the filamentary material, such as staple fibers and continuous threads or strands, and the mat, has an extremely attractive appearance and is relatively inexpensive.

The inventive unwoven or non-woven textile surface structure is manifested by the feature that, at least on one side of a mat there is provided filamentary material, such as staple fibers and/or continuous threads or strands which, for instance, are undulate in appearance, that is wave or zig-zag shaped. The ends of the staple fibers and the crest portion of at least every alternative undulate portion of the continuous threads have thinned portions which are embedded in the mat.

According to the inventive method the staple fibers or the continuous threads or strands, or both, are deposited onto a foundation or base layer and temporarily secured thereto in such a manner that the individual fibers or the strand loops protrude from the aforesaid foundation or base layer. The free ends of the staple fibers or the protruding loops of the filamentary material are then provided with thickenings whereby the filamentary material is formed of a plastic material then thickening thereof is undertaken by application of heat and if such is formed of natural fibers then thickening proceeds by application of additional materials. The filamentary material which is still secured to the base layer and now has the thinned portions is then embedded in at least a portion of the surface of a mat which has not yet hardened. After firm attachment of the fibers or loops to the mat through hardening of the latter the foundation or base layer is detached from such fibers or loops.

In accordance with a preferred manifestation of the inventive unwoven textile surface structure the filamentary material, namely the staple fibers or the loops of continuous threads are additionally provided with thickened portions at the free ends or free loops which protrude from the mat.

When using staple fibers which are provided with thickened portions at their free ends such thickened portions can assume the function of the previously conventional selvage at the yarn ends.

Whereas a hand-knotted carpet there are still loose fibers in the knotted yarn, in the new and improved textile surface structure of the present invention all of the fiber ends can be provided with thickened portions, corresponding to the knots, so that it is possible to produce denser surfaces than by knotting. When using yarn consisting of a number of threads, the individual fibers are connected with one another by the thickened portions in such a manner that no fiber can escape from the yarn. If, instead of a staple fiber, a longer wave- or zig-zag shaped thread is employed then each wave or loop or bend protruding from the mat can be provided with a thickened portion. If these loops of the strands of fibers are left unopened then the thickened portions can form a strong surface and prevent any possible loss of threads. If the loops are cut then each pair of ends can be furnished with a thickened portion corresponding to a knot, which is not possible with woven or knotted textile surface structures. Furthermore, with the new and improved textile surface structure of the invention each individual fiber is secured to the mat independently of the other fibers, whereas with woven textile surface structures or articles the fibers of the yarn move relatively freely and fall out, and with a non-cut looped surface structure a great number of loops of the same thread are likely to be drawn out, cut and lost.

BRIEF DESCRIPTION OF THE DRAWING

It should be understood that the invention will now be further described with the aid of the individual figures of the accompanying drawing and several embodiments of the invention will be explained in detail. However, it is here pointed out that the figures themselves are merely schematic representations in which for the sake of clarity the spacing between the threads and the loops and the thickened portions thereof have been shown on an enlarged scale in relation to the length of the thread and the thickness of the mat. Accordingly, the invention will be better understood if the objects other than those hereinbefore referred to, will become apparent, when consideration is given to the following detailed description thereof. This description makes reference to the annexed drawing wherein:

FIG. 1 schematically illustrates a fragmentary portion of a so-called auxiliary mat or surface, use of which is
preferably made during the production of the inventive non-woven textile surface structure.

FIG. 2 is a fragmentary view schematically depicting an embodiment of the invention in which the mat is provided at one surface or side with filamentary material in the form of threads whose free ends are not provided with thickened portions and at the other side of such mat there is provided a base layer; and

FIG. 3 is a fragmentary view schematically depicting a different embodiment of the invention in which the mat is provided at one face or side with threads, the free ends of which are provided with thickened portions, and the mat at the other side has located the free crest portions of which are provided with thickened portions.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With attention now directed to the drawings, and by specifically referring to FIG. 1 it should be understood that during the production of the inventive textile surface structure there advantageously initially produced a so-called auxiliary surface or mat 10, 11. Such auxiliary surface or mat 10, 11 advantageously is composed of a flexible plastic or base layer 10, for instance formed of strong paper which is coated or otherwise provided at one side with a soluble adhesive layer 11. The filamentary material such as the fibers 12 are rigidly bonded at one respective end thereof with the adhesive layer 11, as shown. It is further evident by referring to FIG. 1, the fibers 12 are disposed practically vertical or perpendicular to the auxiliary mat 10, 11 and in this position can be provided at their respective free ends with the thickened portions 13 in a manner which will be more fully developed hereinafter.

FIG. 2 depicts an embodiment of the new and improved textile surface structure. Such incorporates a mat 26 formed of foamed rubber for instance, which is molded and flexibly bonded to a backing layer or foundation 27 formed, for instance, of jute, either natural or synthetic jute for example. At the opposite free surface of the rubber mat 26 there are inserted the fibers 22 of the type depicted in FIG. 1, these fibers 22 being rigidly anchored with their thickened portions 23 in the hardened rubber of the mat 26.

The embodiment of inventive textile surface structure depicted in FIG. 3 consists of a mat 30 of foamed polyurethane which is provided at its outer surface with relatively hard external or outer layers 31 and 32, as shown. These hard outer layers 31 and 32 are inherently formed during hardening of the foamed polyurethane mat 30. Now, it will be further recognized that in the upper outer layer 31 there are inserted a multiplicity of staple fibers 33 similar to the arrangement of FIG. 2 previously considered. Owing to the hardening of this outer layer 31 the thickened portions 34 of these staple fibers 33 are particularly firmly anchored. Further, in this embodiment the protruding free ends of the fibers 33 which project from the mat 30 are also provided with thickened portions 35. In the lower outer layer 32 the loops or bends of the continuous fiber threads 36 are firmly anchored by means of their thickened portions 37. In this case also the free bends or crest portions of the loops of the continuous undulate threads 36 are likewise provided with thickened portions 38.

As filamentary material or fibers it is possible to employ staple fibers, yard waste, wool knop, yet also yarns and threads. The short fibers are preferably parallelly aligned and disposed as nearly perpendicular or vertically as possible upon the foundation or base layer, whereas yarns and threads are either applied in a way-like or zigzag position, in other words in undulating form, on the foundation, that is to say the auxiliary mat 10, 11. Also, the fibers can be of animal, cotton or man-made origin.

The foundation or base layer 10 is preferably a hand which can be paid off a roll and then readily provided with an easily soluble adhesive layer 11 by the technique of dipping or coating or spraying. The short fibers, such as those indicated by reference numeral 12, are spread over the band-like foundation or base layer 10 provided with the adhesive layer 11 and when dropping in the air are aligned with known expediants, such as for instance electrostatic means, in such a manner that they come to rest in the desired position upon the base layer 16, namely at substantially right angles thereto. Such fibers adhere to such base layer 10 at one end. The threads or yarns are waved or plaited to impart to them the requisite undulatory configuration by means of conventional apparatus employed in the textile art and when deposited upon the latter layer or foundation 17 are fastened together by means of the joining waves or pleats. The freely protruding fiber ends or the freely protruding crest portions of the waves or pleats can then be furnished in a number of different ways with the desired thickened portions. With synthetic or man-made fibers this is most easily accomplished by application of heat. To this end, the base layer 10 covered with the fibers by means of the adhesive layer 11, depending upon the employed material, is moved past a heating plate or a flame, a temperature of which can be regulated such that the free ends or the waves or pleats of the fibers fuse into a thickened portion. With natural fibers, because they can be set or flamed by heat, the thickening operation is preferably undertaken by application of dye or a finishing or dressing agent.

The fibers or loops of continuous threads provided with the thickened portions are then anchored by means of the latter in a mat which is preferably formed as a cushion layer. All expandable plastics or rubber, but also all expandable materials insofar as they are suitable to be processed in a tacky and liquid state and can be changed or transformed afterwards into a flexible or rigid state, are considered suitable materials for this mat. Polyurethane, polyvinylchloride (PVC), polyethylene, polystyrene and rubber are particularly suitable as expandable materials.

Now, in order to apply the fibers or loops provided with the thickened portions to the mat it is proposed in accordance with a preferred arrangement to pass the band-shaped auxiliary mat 10, 11 with the base layer 10 facing downwards beneath a nozzle which deposits a plastic foam, for instance foambale polyvinylchloride upon the thickened fiber ends. The thickness of the plastic foam can be regulated with the rate of speed of movement of the auxiliary mat 10, 11 and the discharge rate of plastic foam from the spray nozzle. The auxiliary mat 10, 11 laden with the plastic foam is then pulled through a suitable tunnel, the dimensions of which are selected in such a manner that the upper surface of the plastic foam is flatly smoothed and which is further heated in order to accelerate the hardening of the foam. Upon hardening of the plastic foam there appears a firm bond between the foam and the thickened fiber ends. The mat or surface structure is then treated with a soluble thinner or simply with steam, whereafter the foundation or base layer can be easily removed. The now free ends or the exposed waves or pleats, as the case may be, are then provided with thickened portions likewise preferably previously described either by the application of heat or by applying a suitable finishing or dressing agent for instance.

Further, in order to improve the strength of the thus formed surface structure it is possible to apply a backing layer, such as backing layer 27 of FIG. 2, to the surface of the mat which is opposite to the surface thereof covered with the fibers. The material for this backing layer 27 can be matched or accommodated to special requirements. It can be soft, flexible or rigid, perforated or breathable, water or air tight—depending upon requirements. Its surface can possess a special structure, for instance in order to reduce its tendency to slip. Preferred materials are jute, rubber, plastic foils and leather, but also wood, metal or glass could be employed.
During the production of a non-woven textile structure with a backing layer in accordance with the invention, the fibers which adhere to the base layer and have thickened fiber ends or waves directed towards the top are passed beneath a spray nozzle for plastic foam, and after the auxiliary mat is covered with a cushion layer in the manner described beforehand the material of the backing layer is applied. In accordance with a preferred embodiment of apparatus for carrying out the inventive method the auxiliary mat is rolled off a first roll and passed horizontally beneath a spray nozzle for plastic foam which is disposed thereabove. Above this auxiliary mat and beneath the spray nozzle as viewed in the direction of movement there is provided a second roll having the backing material which is rolled off and onto the layer of plastic foam. The auxiliary mat with the superimposed plastic foam layer and the further backing layer is then conducted through a suitable tunnel furnace which presses together the three sandwiched layers to the required thickness and, at the same time, accelerates the adhesive bonding of the layers and the hardening of the sprayed plastic foam. After hardening and cooling of the coated auxiliary mat the base layer still adhering to the fibers is pulled off after softening or dissolving the bonding agent. Further, the paper and the free fibers of the band or webs, as the case may be, can then also be provided with thickened portions in accordance with one of the above described techniques.

The invention will be further explained in conjunction with the following examples.

**EXAMPLE I**

In the manufacture of a carpet a dilute or thin water soluble adhesive or glue is uniformly applied to the surface of a paper web with the aid of an appropriate distributing roll. Thereafter, the paper web is continuously passed through a first apparatus in which five millimeter long fibers formed of polypropylene are dropped from above onto the paper web and in known manner are electrostatically charged so that they come to rest in standing position upon the adhesively coated paper web under the action of an electric field. The fibers are very densely arranged, there being on the average twenty-five fibers per square millimeter. Then, the paper web passes beneath several infrared heaters which very quickly dry the adhesive or glue. After traversing the drying zone the band or web passes beneath a series of heating rods arranged transversely to the direction of movement and which have terminal sharp edges pointing downwards. These heating rods possess a temperature of about 170° C. The spacing between the lower sharp edges of the heating rods and the paper web is regulated such that the free tips of the fibers contact the edges of the rods. Since the melting temperature of the polypropylene fibers is about 170° C., these fibers when touching the heated rods are provided with small thickened portions at the tips thereof. The thus produced auxiliary mat is then wound onto a roller at the discharge end of this first machine or apparatus.

During a further processing operation a jute web of about one meter width is unwound from a roll onto a moving endless carrier band and deposited thereon and conveyed by such carrier band over a horizontal table. Above this table there is mounted a container or vessel containing polyvinylchloride (PVC). The container has a discharge opening which extends across the total width of the table. A PVC-layer is then deposited from this container onto the moving web of jute and such PVC layer has a width which almost corresponds to the width of the jute web. The speed of travel and the quantity of polyvinylchloride discharged from the container per unit of time is regulated in such a manner that a five millimeter thick layer appears. In the vicinity of the container and in the direction movement of the band there is located a roll with the rolled up auxiliary mat, the axis of which is disposed transverse to the direction of movement of the band. Now, the auxiliary mat is paid off the roll at a speed which corresponds to the speed of travel or advance of the band with the PVC-layer. The base layer of the thus paid off auxiliary mat faces towards the top and is placed in this position onto the PVC-layer of the band and pressed thereagainst with the aid of a roller which is disposed transverse to the direction of movement. As a result, the fiber ends provided with the thickened portions penetrate the surface of the PVC-layer about 0.06 to 4 millimeters.

The three superimposed or sandwiched layers consisting of the jute backing layer, the layer of polyvinylchloride, and the auxiliary mat, are then passed through a drying zone heated to about 140° C. As a result, the polyvinylchloride is hardened owing to the action of the heat and at the same time is adhesively bonded with the thickened fiber ends at its upper surface and with the jute backing layer at its undersurface. After passing through the oven the mat covered with the two layers—at the upper surface of which there is still disposed the original paper foundation—is delivered to a third machine in which the uppermost situated paper layer is sprayed with hot steam. This hot steam quickly penetrates through the paper band between the paper and the fibers is loosened. The paper web is then taken up by a roller which is disposed above the transport or conveyor belt so that the fibers once again project out of the mat with their free ends. In a manner completely similar to the operation undertaken at the previously considered first machine the mat is now passed beneath a series of heating bars or rods arranged transverse to the direction of feed and the temperature of which is high enough so that the fiber ends contacting such heating rods are fused into small thickened portions.

The textile surface structure which has been fabricated in the described manner can now be cut into carpets of any desired size without thereby adversely affecting the strength of the jute backing layer or the elasticity brought about by the intermediate layer of polyvinylchloride or the bond between the individual fibers and the plastic material. The thickened portions located at the tips or ends of the fibers impart to the carpet a dense and compact appearance.

**EXAMPLE II**

In order to produce a mattress, just as with the previously described Example I, here also a paper web coated with a liquid adhesive is covered with closely arranged yarn. The yarn is twisted of three doublings and deposited in zig-zag shaped layers onto the paper web, whereby alternately one crimped or bent location of the undulate yarn is applied to the paper web and the next crimped or bent location protrudes freely towards the top and the subsequent crimped location is again in bearing relation upon the paper web, and so forth. The zig-zag layer is about three millimeters in height. The paper web with the deposited yarn is then passed beneath a heating zone heated by infrared lamps or equivalent structure. Here, the adhesive material dries so that the yarn is firmly bonded to the foundation or paper web. After passing through this heating zone the paper web is pulled beneath a roller out of the surface of which there flows a suitable finishing or dressing agent which is applied to the free edges or crests of the yarn. This auxiliary mat having water soluble dressing deposits at the free yarn edges is then conducted through a heating zone in which the applied dressing material dries at the yarn. The paper web is rolled up upon a roller at the discharge end of this machine.

At the inlet side of the second machine a first roll of the auxiliary mat is paid off and with the dressed yarn edges oriented towards the top. The thus unwound auxiliary mat is guided over a horizontal conveyor. A container is arranged above this conveyor from which there is delivered a polyurethane foam treated with a
hardener onto the throughpassing fiber mat disposed thereon. The thickness of the layer of polyurethane foam amounts to about 15 centimeters. Immediately behind the container for the polyurethane foam, as viewed in the direction of movement of the mat, and above the mat there is located a second roller carrying an auxiliary mat. This is wound off the roller with the paper base layer towards the top and placed onto the foam layer. With the aid of a roller which is disposed transverse to the direction of movement the auxiliary mat is pressed tightly onto and against the layer of polyurethane foam.

The material consisting of three layers is then pulled through a chamber which is at a temperature of about 80°C, and the upper part of which is movable and presses against the three layers during such time as the polyurethane is undergoing an accelerated polymerization owing to the increased temperature. As a result, the dressed crest portions or curves of the zig-zag shaped disposed yarn are pressed some tenths of a millimeter into the plastic foam and firmly anchored therein. After the foam has hardened the material is conducted through a chamber in which hot steam is blown from the bottom and from the top onto the outer paper web. This hot steam quickly penetrates through the paper web. Consequently, the adhesive material by means of which the yarn adheres to the paper web is softened, whereas one roller which is arranged above and one below the transport or conveyor belt remove the paper webs.

The plastic foam mat which is now only covered at both faces or sides with the zig-zag shaped deposited yarn then travels beneath a second dressing or finishing roller which applies appropriate water soluble dressing droplets onto the upper crest portions or bent locations of the upwardly disposed yarn undulations. The deposited droplets are subsequently immediately hardened by heat radiation. During further progression through this machine the mat is turned in screw-like fashion 180° so that the previous underside is facing towards the top and the pleats or undulatory portions of the yarn are also folded and dressing and dried in the manner previously considered. The plastic foam layer provided with the pleated yarn layers on both sides is then cut into mattresses of the desired size.

Textile surface structures which are manufactured in the previously described manner possess the advantage that the skin forming at the surface of the plastic foam layer not only acts in a non-disturbing manner, rather can be furthermore employed in a usable manner. More precisely, on the one hand the skin reinforces the mechanical anchorage of the thickened portion of the fiber ends and, on the other hand, this skin aids in increasing the strength of the textile surface structure as well as its dimensional stability.

In the production of thick plastic foam layers which are entirely covered with fibers or loops it is possible to regulate the apparatus in such a manner that the plastic foam layer applied to the lower auxiliary mat is narrower than the auxiliary mat by about double the provided thickness of the layer. Now, when the foam layer is sprayed onto the central region of the fiber mat the unoccupied selvedges or marginal portions which remain free at each side of the auxiliary mat are just that width which is necessary to cover the sides of the foam layer. Hence, after applying the upper auxiliary mat which naturally only has the width of the plastic foam layer, the latter can be enclosed at all sides by the auxiliary mat and after removing the base layer is covered with fibers or loops.

Although with the previous description of the thickened portions provided at the ends of the fibers or loops it was suggested that such be fabricated by using the heat of heating rods, it would also be possible to produce such thickened portions by utilizing the direct action of an open flame and with appropriate selection of the fiber materials. Naturally, it is also possible, in contrast to the described embodiments, to construct or shape the mat as a mold and to produce in this manner upholstered articles or structures provided with fibers or loops in the previously considered manner, as such for instance are used in the automobile and upholstered furniture industries. In this case there is advantageously employed a thermoplastic foil for the base layer which can be processed and is water or steam soluble, deep drawn and shaped to the desired form. After such thermoplastic foil has had the fibers or loops bonded thereto it is placed into a suitable receiving mold in which the cushion or upholstery foam is produced.

It should also be understood that the term "filamentary material" and any equivalent expression as employed herein is used in its broader sense to encompass any type of fiber material or fiber type which can be utilized in the practice of the invention, such as the staple fibers or the continuous strands or threads for instance, but in its specific sense refers to filamentary materials such as flock or undulate threads.

While there is shown and described present preferred embodiments of the invention, and further while there has been described a number of preferred embodiments for practicing the inventive method, it is to be distinctly understood, however, that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. Method for the production of a non-woven textile surface structure comprising the steps of: temporarily bonding filamentary material comprising flock or undulate threads to a base layer with a portion of the filamentary material protruding from said base layer, then thickening at least a part of said protruding portion of the filamentary material while supported by said base layer, embedding the protruding thickened portions of the filamentary material in a foambale mat, foaming and firmly bonding the mat to the embedded thickened portions of the filamentary material, then removing the base layer.

2. Method for the production of a non-woven textile surface structure as defined in claim 1 wherein the filamentary material is formed of staple fibers.

3. Method for the production of a non-woven textile surface structure as defined in claim 2 wherein the staple fibers are provided with the thickened portions at their respective free ends.

4. Method for the production of a non-woven textile surface structure as defined in claim 1 wherein the filamentary material is formed of continuous undulate threads.

5. Method for the production of a non-woven textile surface structure as defined in claim 4, wherein the crest region of each protruding portion of the continuous undulate threads is provided with a respective thickened portion.

6. Method for the production of a non-woven textile surface structure as defined in claim 1, further including crening of the protruding portion of the filamentary material is undertaken through application of heat when such filamentary material is formed of plastic material.

7. Method for the production of a non-woven textile surface structure as defined in claim 1, wherein thickening of the protruding portion of the filamentary material is undertaken through application of any of a solution of a synthetic resin, an enamet dye, or a finishing or dressing agent when such filamentary material is formed from natural fibers.

8. Method for the production of a non-woven textile surface structure as defined in claim 1, further including the step of thickening at least a part of the filamentary material which is exposed after removal of the base layer.
9. Method for the production of a non-woven textile surface structure as defined in claim 1, including the step of employing a thermoplastic foil as the base layer.

10. Method for the production of a non-woven textile surface structure as defined in claim 1, wherein foamy plastic is employed as the foamy mat material.

11. Method for the production of a non-woven textile surface structure as defined in claim 1, including the step of using foamy rubber as the foamy mat material.

12. Method for the production of a non-woven textile surface structure as defined in claim 1, including the step of providing the foamed mat at least at one side thereof with an additional harder outer layer in which the protruding thickened portions of the filamentary material are embedded.

13. Method for the production of a non-woven textile surface structure as defined in claim 12, including the step of forming the foamed mat from foamy polyurethane.

14. An unwoven textile surface structure comprising a foamed mat, filamentary material comprising flock or undulate threads having thickened portions embedded in at least one side of the mat, and said flock or undulate threads extending only partially into said mat.

15. An unwoven textile surface structure as defined in claim 14, wherein said filamentary material is formed of staple fibers, said thickened portions being located at the region of the embedded ends of said staple fibers.

16. An unwoven textile surface structure as defined in claim 14, wherein said filamentary material is formed of continuous undulate threads, said thickened portions being located at the crest of the undulations which are embedded in the mat.

17. An unwoven textile surface structure as defined in claim 14, wherein said embedded filamentary material has free portions protruding out of said mat, at least a portion of said protruding free portions of said filamentary material also being provided with thickened portions.

18. An unwoven textile surface structure as defined in claim 14, wherein the material of the foamed mat is foamed plastic.

19. An unwoven textile surface structure as defined in claim 14, wherein the material of the foamed mat is foamed rubber.

20. An unwoven textile surface structure as defined in claim 14, wherein said foamed mat possesses at least at one side thereof an additional harder layer in which the thickened portions of said filamentary material are embedded.

21. An unwoven textile surface structure as defined in claim 20, wherein the mat of foamed material is formed of foamed polyurethane.

22. An unwoven textile surface structure as defined in claim 14, wherein a backing layer is provided at the mat at one side thereof opposite the side in which the thickened portions of the filamentary material are embedded.

23. An unwoven textile surface structure as defined in claim 22, wherein said backing layer is formed of jute.

24. An unwoven textile surface structure as defined in claim 23, wherein said jute is natural jute.

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