United States Patent [19]

Reinhard

[11] **3,781,181**

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[54] **PROCESS FOR THE MANUFACTURE OF A CARPET WITH PILE THAT IS VERTICALLY LINED UP IN ROWS AND WITH RIBBON-SHAPED INTERLAYERS WHICH RUN THROUGH PART OF THE HEIGHT OF THE PILE AND ARE ATTACHED TO THE ROWS OF PILE**

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[51] **Int. Cl.** **B32b 31/12**

[58] **Field of Search** 156/72, 435

[56] **References Cited**

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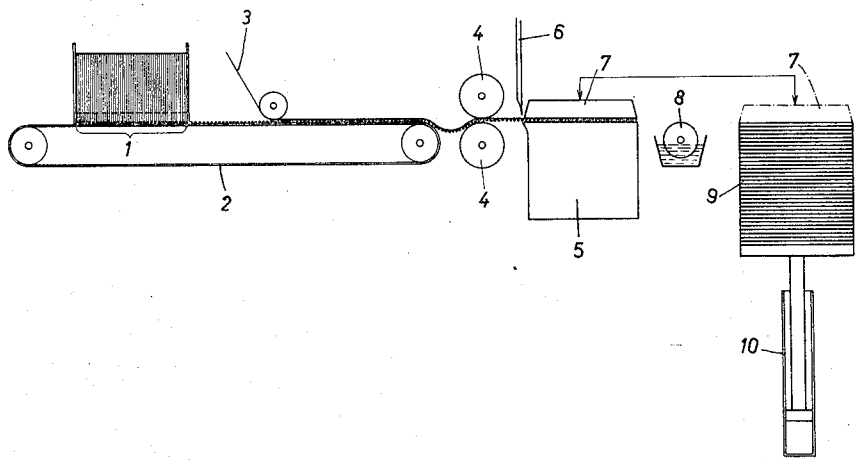
[57] **ABSTRACT**

A process for the manufacture of a carpet with pile that is vertically lined up in rows, and with ribbon-shaped interlayers which run through part of the height of the pile and are attached to the rows of pile.

3 Claims, 7 Drawing Figures



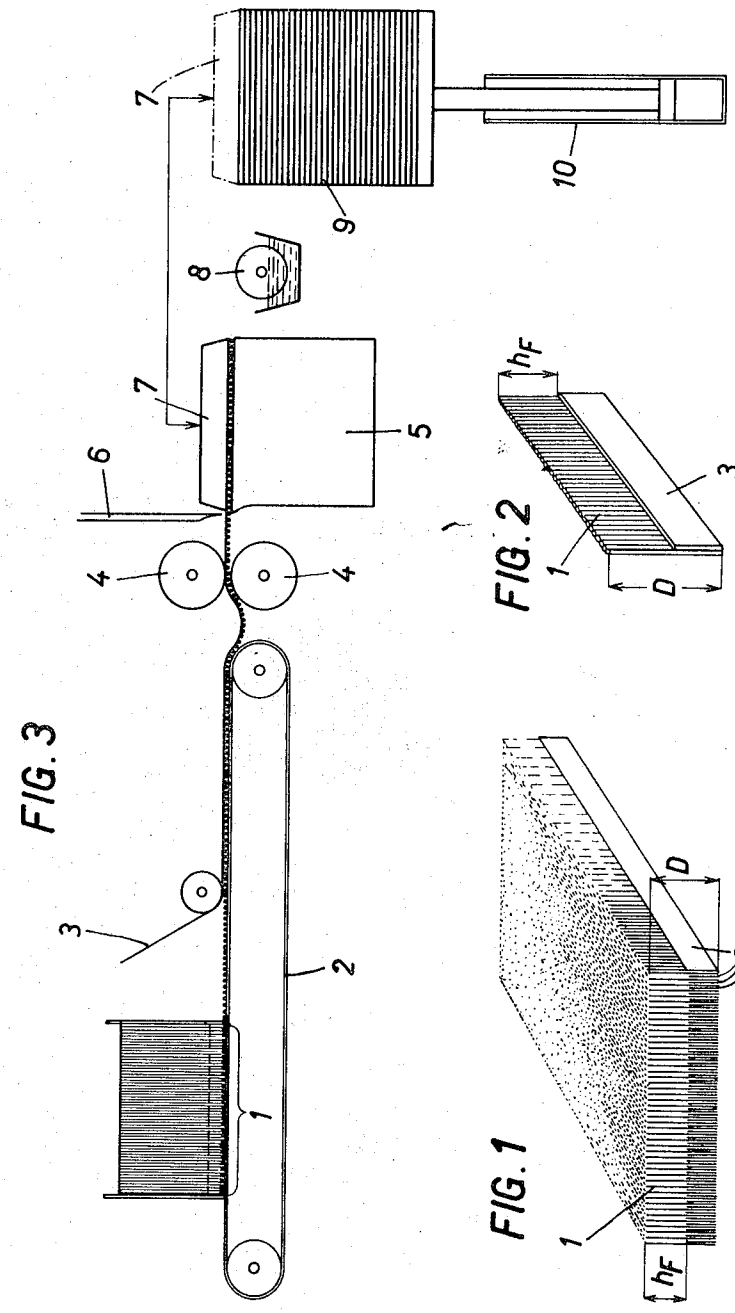


FIG. 3

FIG. 2

FIG. 1

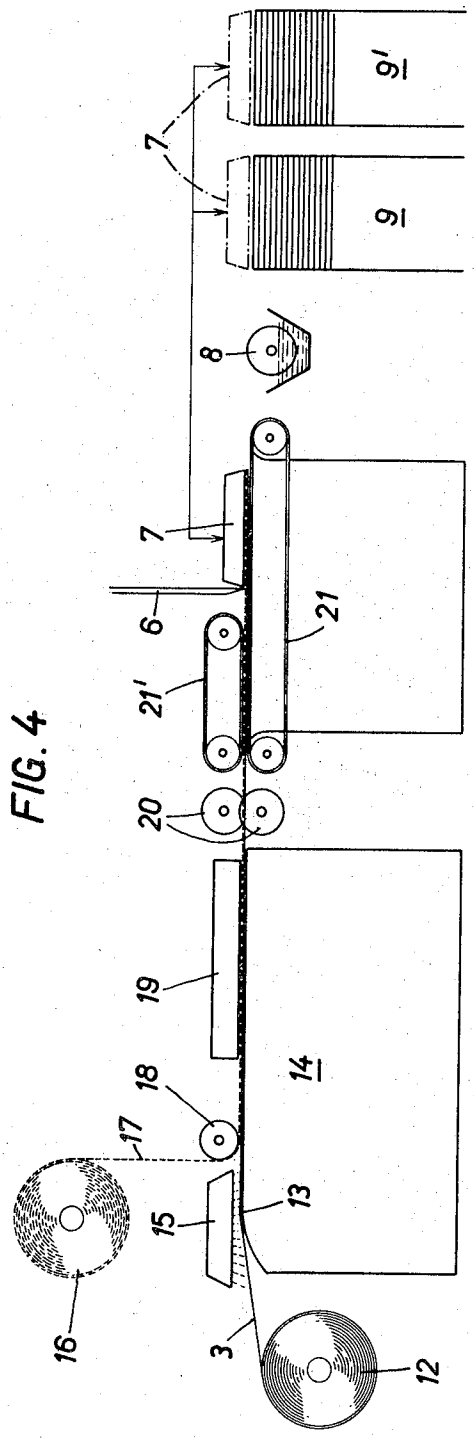


FIG. 4

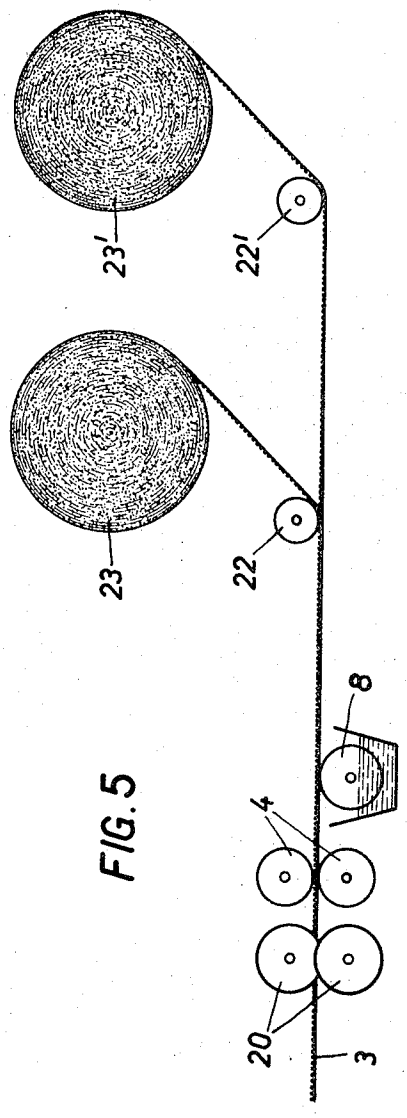


FIG. 5

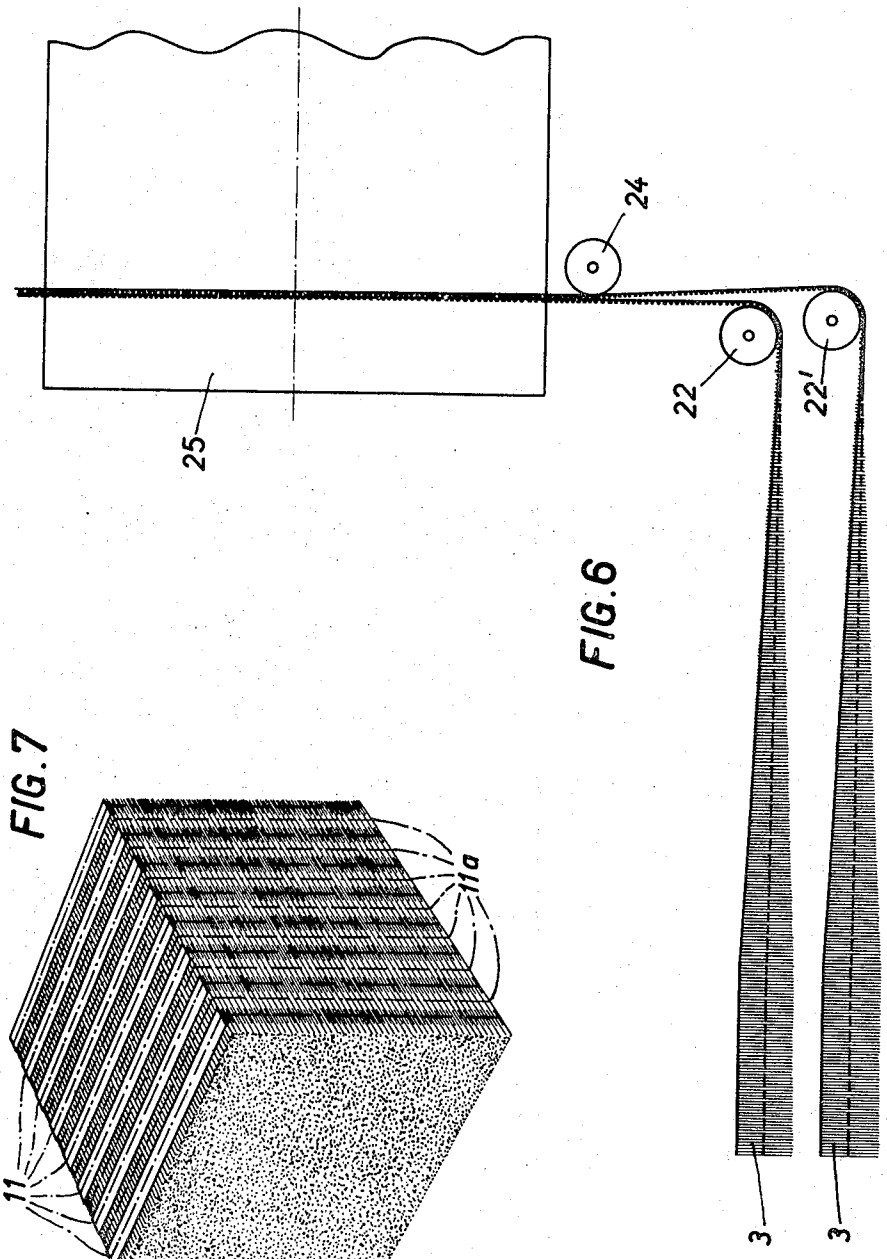


FIG. 6

FIG. 7

PROCESS FOR THE MANUFACTURE OF A CARPET WITH PILE THAT IS VERTICALLY LINED UP IN ROWS AND WITH RIBBON-SHAPED INTERLAYERS WHICH RUN THROUGH PART OF THE HEIGHT OF THE PILE AND ARE ATTACHED TO THE ROWS OF PILE

The present invention relates to a process for the continuous manufacture of a carpet wherein a ribbon-shaped material in crosswise direction is attached to a layer of textile fiber material in such a manner that the textile fiber material is even with one lengthwise edge of the ribbon-shaped material and reaches beyond the other lengthwise edge; after this, sections of the obtained structure are lined up in rows and joined together in such a way that a carpet is formed whose pile rises from the textile fiber material in rows vertical to the surface of the carpet and whose coherence is obtained through the use of interlayers of ribbon-shaped material which start at the base and extend over a part of the height of the pile, and are connected with the neighboring rows of pile.

In well-known carpets of similar type that have been manufactured by machine, in which the pile is constituted by upright section of yarn bonded to a foundation, the area in which each section of yarn is bonded to the foundation is limited, thus impairing the durability of the carpet. Such products are obtained, for example, according to processes described in the German Pat. No. 579,482 and in the British Pat. No. 472,407. According to the German patent, transverse bands are cut from a long piece of fiber fleece and, with the aid of separating bands, they are arranged together in rows with the cut edges facing outward. After that, the resulting stack is bonded at one or both of the surfaces formed by the cut edges facing outward to a piece of fabric that serves as backing and the separating bands are removed. In the case of ambilateral bonding to a piece of fabric, the resulting product must be cut in the middle plane between and parallel to both pieces of fabric. According to the above mentioned British patent, a long piece of fiber material of a flock of parallelly arranged yarn is folded in a zig-zag pattern by means of insertion of separating bands and both folding edges are also bonded to a piece of fabric. The cutting after removal of the interlayers takes place as described before. In both cases, the results are products in which the bonding of the fabric of the backing to the pile material is limited to a relatively small cross-section.

In Swiss Pat. No. 401,892, a carpet is described whose pile stands in rows vertical to the surface of the carpet, while the individual rows of pile are firmly joined together by interlayers in the shape of small ribbons, which reach from the base through part of the height of the pile and are bonded on both sides to neighboring rows of pile. Through the bonding of these interlayers to part of the height of the pile of the carpet, the carpet receives extraordinary coherence and such stability that any additional strengthening measures, such as backing and the like, become superfluous. In the above mentioned Swiss patent letter, there is also a description of a process for the manufacture of such a carpet. In this process, parallel, transverse bands of the interlayer material are bonded at intervals onto a continuously moving piece of a textile fiber product, and the resulting product is divided into individual elements by means of cuts along the longitudinal axis of these transverse bands, whereupon the areas of the interlayer material remaining uncovered are provided with bonding and the individual elements are stacked over one another in such a manner that the interlayer bands are placed over one another and bonded to the pile of the next element. The thus obtained product is then, as described before, cut at the middle plane parallelly to both outer surfaces, through which two carpets are obtained whose backs are each formed by one of the outer surfaces. The process described in the Swiss patent enables the manufacture of carpets of outstanding quality, yet it has the drawback that the capacity of production is limited, due to the bonding of transverse bands of interlayer material. The exact observance of intervals between the individual transverse bands requires a complicated device whose working speed, which is the factor that determines production, cannot be increased at will.

It is the object of the present invention to create a process for the manufacture of carpets that do not evidence the drawbacks of carpets in which the upright pile is merely bonded onto the backing, at its cross section area and which, compared to the process described in the aforementioned Swiss patent, can be carried out with considerably increased capacity of production.

According to the present invention, these objects are accomplished by attaching the ribbon-shaped material as a continuous ribbon to layers of textile fiber material.

In one embodiment of the present invention, the ribbon-shaped material in the form of various continuous ribbons that are carried at intervals parallel to one another is attached to a layer of textile fiber material which runs through several ribbons; the resulting piece is divided transversally into sections of equal length, and these sections are stacked up on top of one another and joined in the area of the ribbons in such a manner that the ribbons form interlayers placed over one another that are joined on both sides, each with one layer of the textile fiber material; after that, the resulting stack is cut, in turn, along the longitudinal axis of the rows of superimposed ribbons and parallelly to this axis in the area of the textile fiber material that lies between the rows of ribbons.

In another embodiment, the ribbon-shaped material, in the form of various continuous ribbons that are carried parallel at intervals from one another, is attached to a layer of the textile fiber material which extends over several ribbons, and the resulting piece is divided into lengthwise bands by means of cutting along the longitudinal axis of the ribbons and of cutting the textile fiber material in the area of the interval between the individual ribbons.

In the process of this invention, yarn can be used as the textile fiber material. The yarn, in the form of a layer of parallel yarn ends, is carried in repeats that run at right angles to the lengthwise direction of the ribbons and is joined with them, for example by utilizing a Jacquard dobby for any desired pattern.

In the process of this invention, the textile fiber material also can, in the form of a long piece of preferably carded fiber fleece, be fed in the same direction of movement of the ribbons and be attached to them.

The lengthwise bands obtained in the manner described above can be rolled up into a round disk and joined in such a manner that the ribbon runs spirally through the disk from the center of the disk outward

and is conneced on both sides with each one layer of the textile fiber material.

The lengthwise bands obtained in the manner described above can, however, be also turned 90° from their horizontal position towards a vertical position in such a way that the ribbon is on the bottom end of the vertically placed textile material; afterwards the individual bands, standing parallel alongside one another, are rolled up in this position around the circumference of a revolving drum, and are joined together in such a manner that each ribbon is attached on both sides to one layer each of the textile fiber material.

In yet another embodiment, however, the entire piece, consisting of the lengthwise bands obtained in the manner described above, can be divided into sections of equal length, and the resulting sections of lengthwise bands can be stacked up continuously and joined together in such a way that the ribbons are placed over one another and each ribbon is attached on both sides to one layer of textile fiber material each.

Preferably, the layer of textile fiber material should consist of a long piece of parallel, contiguous yarn ends that may consist of identical or different materials and can be dyed the same or different colors. By means of switching a Jacquard dobby, it is also possible to pattern each repeat of parallel yarn ends at will.

Many different types of materials can be used as ribbon-shaped material for the interlayers, as for instance weaves, fabrics, nonwovens, or ribbons cut from foil or extruded from rubber, synthetics, or foam, or even ribbon-shaped bands of wood or raw material of wood fiber.

The ambilateral joining of the ribbon-shaped interlayers between individual rows of pile standing on edge in the finished carpet can, for instance, be produced by bonding, thermal welding or heat sealing. It is, for example, also possible to extrude the continuous ribbons which serve as interlayers directly from a thermoplastic, synthetic material, in which case the joining with the layers of textile fiber material can take place by means of simple compressing above the softening temperature of the synthetic material.

According to the process of this invention it is possible to manufacture carpets of high quality with a capacity of production unknown up until now. The capacity of production varies depending on height of pile, number of the yarn, and thickness of the interlayer used. At an efficiency of approximately 70 percent, the attainable production amounts to an average of 275 square meters per hour; and one must consider the extraordinarily small personnel requirement of five people, as compared to the normal weaving process with a personnel requirement of about 110 people for the same production.

A further advantage of the process of this invention resides in the small requirement of room for its execution.

According to the process of this invention, it is also possible, by means of utilization of yarn as textile fiber material, and of a Jacquard dobby for its feeding, to manufacture carpets with patterns ranging from the simplest to the most complicated oriental patterns.

According to one of the already described embodiments, it is easily possible to manufacture round carpets of any diameter, a feature of ever increasing significance in commerce.

In carpets manufactured according to the present process, resistance to cutting of the carpet as well as wear-resistance of the pile is obtained in the course of the process, so that any additional follow-up treatment becomes superfluous.

Further advantages of the present process are, that in the utilization of yarn the textile fiber material yarns of any quality, yarn number, dye, and fiber material can be used. In the use of fiber fleece, oriented as well as random fiber fleece of any filament or rayon fiber can be used and it is even possible to utilize weaves, fabrics, or nonwovens as textile fiber material.

Carpets manufactured according to the present process evidence superior insulating action for temperature as well as for humidity and in view of their good insulation of stepping sounds, they make foundation floors superfluous in new buildings. Further, the carpets are easily moved and the tiles made from it are of stable form, which means that their corners and edges do not turn up. When a floor surface is covered with such tiles, their peripheries are no longer visible after they have been installed. When yarn is used as the a textile fiber material, the pile of the resulting carpets is vertical to the surface of the carpet, through which the elasticity and the durability of the carpet are heightened and the cleaning of the carpet becomes easier.

Preferably, carpeting or tiles made of it manufactured according to the present process are bonded to the foundation when they are being laid, at which occasion the base of the pile is additionally bonded on its cross section area.

In the drawings, corresponding components are provided with the same reference numbers. The illustrations are:

FIG. 1, a diagram of a perspective view of a carpet manufactured according to the present process;

FIG. 2, a diagram of a perspective view of a single ribbon, serving as an interlayer, which is attached on one side to a row of pile made from yarn;

FIG. 3, a diagram of an embodiment of the present process;

FIG. 4, a diagram of another embodiment of the present process;

FIG. 5 and 6 represent different embodiments for the creation of carpets out of endless ribbons, attached on one side to a row of pile or sections thereof, as represented in FIG. 2;

FIG. 7 shows a block obtained according to FIG. 3 and the cutting places required by it for the manufacture of single carpets.

In the following examples, different embodiments of the present process will be explained, taking into consideration the drawings.

EXAMPLE 1

With reference to FIG. 3, a layer of parallel yarn ends is taken off a warp beam or spools and put down, in the form of a simple layer of parallel yarns forming a right angle across the entire width of a conveyor belt whose surface is coated with a contact bond, pressed down and cut off in the desired width. This process is continuously synchronized with the motion of the conveyor belt, so that a continuous piece of transversally arranged sections of yarn running parallel to one another is obtained on the conveyor belt. Onto this piece of yarn sections ribbons 3 of any desired interlayer material which run parallel at intervals to one another in the

direction of the movement of the conveyor belt are continually applied and firmly attached to the layer of yarn by means of bonding, thermal welding or heat sealing. This product is removed from the conveyor belt by means of a pair of take-up rollers 4 and fed to the cutting table 5 where the cross blade 6 cuts it into sections of equal lengths. These sections are taken by transportation device 7 and carried over a segmented squeezing roller 8, by means of which the layer of yarn is supplied with bonding only on those parts that face the interlayer ribbons 3. Thereupon the sections provided with bonding are stacked up in a stacking box 9 by means of the transportation device 7, in such a manner that each band of a section that has been provided with bonding comes to rest on the interlayer ribbons 3 of the section under it. The thus produced stack is constantly pressed together, for example by means of a hydraulic device 10. For hardening of the bonding, the stacking box can, if necessary, be heated in an appropriate manner. In this way, an endless stack is obtained, as represented in FIG. 7; this stack, as is indicated in FIG. 7, is either divided continuously into individual carpets through cutting at the cutting places 11 and 11a, or is removed from the stacking box after reaching a certain volume, and can be cut in the same manner elsewhere.

This embodiment is also practicable when instead of the flock of yarns 1 a different piece of textile material, as for example a fiber fleece, fabric, weave, or nonwoven is used.

EXAMPLE 2

With reference to FIG. 4, interlayer ribbons 3 made of a thermoplastic synthetic material are removed from the supply roll 12 and at parallel intervals from one another, forming a piece, are fed across the table 14 and heated there by means of an infrared irradiator 15 to a temperature above its softening point. The surface 13 of the table is coated with "teflon," in order to avoid sticking of the softened ribbons. In front of the supply roll 16 a flat piece of fiber fleece 17 is pulled across a propelled roll 18, whose pressure can be regulated, and is applied to the entire width of the piece of softened ribbons, and attached to these through the thrust of compression. In the cooling zone 19 the resulting product is cooled and solidified. This piece is now sliced by a row of circular blades into continuous lengthwise bands along the lengthwise axis of the interlayer ribbons as well as within range of the intervals between these ribbons. These lengthwise bands are kept together in ribbon-shape by the conveyor belts 21 and 21' and transported onto the transverse blade 6 that divides the individual lengthwise bands into sections of equal length. Similarly to the manner described in example 1, these sections are now fed through the transportation device 7, over the segmented squeezing roller 8, which supplies the back of the interlayer ribbons with bonding. Differently from the form of execution described in example 1, however, the sections of lengthwise bands are now individually stacked up in different stacking boxes in such a manner, that each back of one interlayer ribbon that has been supplied with bonding comes to rest on the row of pile of the lower band without an interlayer ribbon. The compressing and hardening of the bonding takes place in the individual stacking boxes, as described in example 1.

Also in this embodiment it is, of course, possible to use, instead of the long piece of fiber fleece 17, a fabric, weave, or nonwoven, or to feed a flock of yarns as described in example 1. Instead of the thermal welding of the interlayer ribbons with the textile fiber material by means of an infrared irradiator 15, a bonding process can readily be employed in which only the infrared irradiator 15 would have to be substituted by a device for the application of a bonding. In this case, the cooling zone 19 would be substituted by a heating zone.

The advantage of this embodiment as opposed to that in example 1 is that the cutting of the block as the last step of treatment is eliminated and various endless carpet pieces are continuously obtained, whose quantity is determined by the number of lengthwise bands produced by the circular blades and whose width is determined by the length of the sections of these lengthwise bands.

In FIG. 5 an embodiment is represented in which a structure made from textile material attached unilaterally to interlayer ribbons obtained as described in example 2 and cut by the circular blades 20 into endless lengthwise bands is carried by means of the pair of take-up rollers 4 over a segmented squeezing roller 8, which supplies the back of the interlayer ribbons with bonding. Then the lengthwise bands are fed individually over the guide rollers 22, 22' and rolled up in the shape of round disks, so that the back of the interlayer ribbons which has been provided with bonding is attached to the remaining free side of the following pile row in the next cycle.

In this manner various round carpets of any desired diameter can be manufactured simultaneously; their quantity depends on the number of lengthwise bands produced by means of the circular blades.

FIG. 6 shows a further embodiment, in which the lengthwise bands obtained in the manner described respecting FIG. 5, whose interlayer ribbons have been supplied with bonding on their free back by the segmented squeezing roller 8, are detoured individually by the guide rollers 22, 22' and simultaneously turned 90° from their horizontal position into a vertical position in such a manner that their interlayer ribbons reach from the base upward. The individual ribbons, whose number again in this case depends on the number of bands produced by the circular blades 20, are now rolled up, standing parallel side by side, under the pressure of roll 24 onto the surface of the propelled drum 25. The drum's surface can be heated for the hardening of the bonding. After the desired winding width is reached, the rolling up process is interrupted and the ends of the bands are cut off. Through axial cutting of the rolled up layer, a carpet is obtained whose length and width are determined by the diameter of the drum and the winding width.

The total thickness of the carpet, represented in FIG. 1 and 2 by "D", can be varied by choice of the width of the used interlayer ribbons 3 and the intervals between the individual ribbons. It is possible to obtain carpets of different pile lengths h_F in the same work process, both in the cutting of the block contained in example 1 as well as in the cutting by means of circular blades as described in example 2, by not cutting the textile fiber material in the area of the interval between individual interlayer ribbons along the middle line.

I claim:

1. A process for the continuous manufacture of a carpet comprising

a. conveying several continuous ribbons in the direction of the longitudinal axis of said ribbons, said ribbons being transversely displaced from each other and parallel to the longitudinal axis of each other,

b. attaching one side of a layer of textile fiber material to a flat side of each of said several continuous ribbons,

c. cutting said ribbons along their longitudinal axis to form a first lengthwise edge of each of said several continuous ribbons,

d. cutting said textile fiber material in the area of the interval between individual ribbons in the lengthwise direction parallel to the longitudinal axis of said ribbons so that the ends of said textile fiber material so formed extend beyond the second lengthwise edge of each of said several continuous ribbons,

e. cutting each of said several continuous ribbons having said textile fiber material attached thereto along a transverse axis thereof at intervals to form sections thereof, and

f. stacking the thus obtained sections with said first lengthwise edge appearing on one side of the stack, joining said sections together by joining the second flat side of each of said several continuous ribbons to the adjacent layer of textile fiber material in the adjacent section in said stack to form a carpet.

2. Process according to claim 1, wherein said textile fiber material is yarn and is attached to said ribbons in layers of parallel yarn ends perpendicular to the lengthwise direction of the ribbons.

3. Process according to claim 1, wherein said textile fiber material is a fibrous web and is continuously fed onto said ribbons in the same direction of the movement as the ribbons.

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