

[54] **PILE CARPET AND A PROCESS FOR ITS MANUFACTURE**

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[30] **Foreign Application Priority Data**

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[58] **Field of Search** 161/62-67, 161/36, 88, 91, 150; 156/72, 91, 92, 93, 264, 270, 272, 306; 139/35, 408, 417, 407; 112/410, 42, 417, 429, 440; 26/2 R, 11, 11.4; 28/72 P, 72 CS, 74 P; 428/92, 95

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[57] **ABSTRACT**

A pile carpet having a pile of textile yarn perpendicular to a base. The base includes fabric strips abutting each other by their lateral edges and standing on edge on one of their edges. The pile comprises free, unbound ends of yarn running perpendicular to the base in the fabric strips with their free ends projecting beyond the other edges of the fabric strips.

The method of making the pile carpet includes cutting a fabric run, having warp threads in groups so spaced that the weft threads float between the warp thread groups, into fabric strips each provided with adjoining domains extending over each one's entire length, the warp threads being tied off by weft threads extending freely from the tied-off domain towards an edge of the fabric strips, placing the fabric strips on edge, and adhesively bonding the lateral areas of the fabric strips so that the tied-off domains will result in the base and the free weft threads in the pile of the carpet.

6 Claims, 3 Drawing Figures

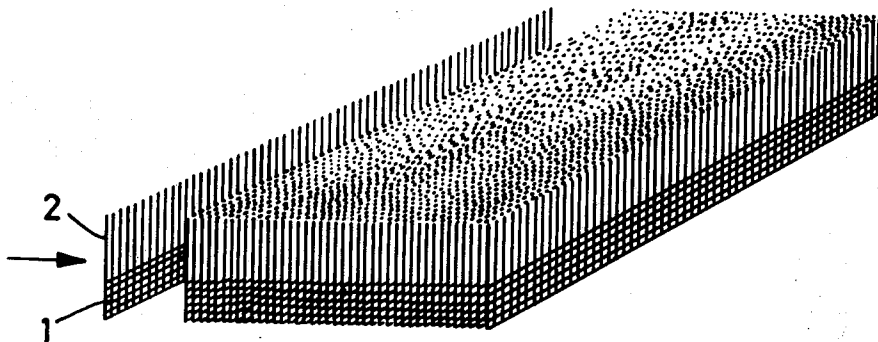


FIG. 1

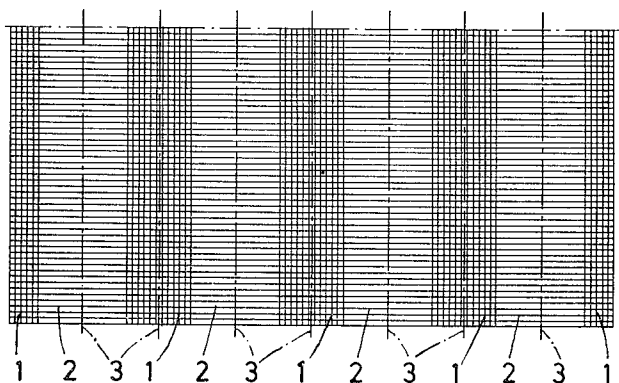


FIG. 2

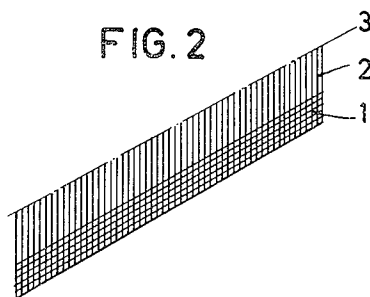
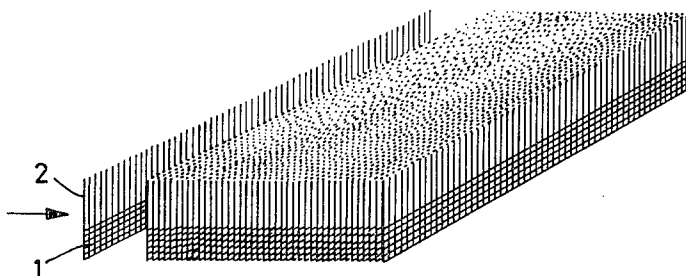


FIG. 3



PILE CARPET AND A PROCESS FOR ITS MANUFACTURE

The present invention relates to a pile carpet having a pile of textile yarn perpendicular to the base and to a manufacturing process for such carpet.

Pile carpets with piles consisting of textile yarns that are normal to the base have long been known. Due to their better quality, which also makes them the more expensive carpets, they represent the most widespread kind of carpet. Many basically different methods are known for the manufacture of such carpets. Probably the most expensive manufacturing method for carpets with piles normal to the floor is the manual kind of manufacture as still occurs today in the East, wherein the pile yarn is tied into knots with a yarn warp in the carpet base. The same manufacturing principle as regards machine production also is being used, resulting in such a quality that only an expert may distinguish between handmade and machine made kinds of oriental rugs. However, large investment in machinery is required for machine production of knotted carpets and the possible production capacity is fairly small.

The long known and large-scale manufacturing processes of woven pile carpets do allow good carpet quality at higher productivity and therefore provide a more economical process. But the productivity of the special weaving machines is restricted and may not be arbitrarily increased.

Tufted carpets represent another technological advance with respect to production rates. In these, the pile yarn normal to the base fabric is made to pass through the latter by the use of hollow needles. The reverse side of such carpets will be usually coated so as to fasten the pile yarns.

Even higher productivity may be achieved with respect to needle felt carpet, wherein a tangled web is pierced from the reverse side by the use of barbed needles in such a manner that part of the fibers from the horizontal binding are torn therefrom and are pushed out above the web's surface thereby resulting in a pile perpendicular to the base. This kind of needle felt carpet must be provided with a back coating for fixation. They are economical but are not comparable as regards quality with woven or knotted carpets.

Further processes aiming in particular for higher productivity and economic competition are for instance described in the German Pat. specification No. 579,482 and in the British Pat. specification No. 472,707. Their starting points are yarn warps or fibrous webs which, in the form of strips, are placed one on top of the other while intermediate layers are being inserted, or else are placed in a zig-zag around the intermediate layers. The pile so obtained then will be adhesively coated with a base layer on both sides and, after removal of the intermediate layers between the two base layers, will be cut parallel to the base layers' planes in such a manner that two carpets are obtained. Carpets so manufactured suffer from the essential drawback that the adhesive binding between the base layer and pile material is limited to a fairly small cross-section, so that in spite of relatively high expenditures and low production capacity the quality of the carpets so obtained will only moderately meet requirements.

A process for the manufacture of pile carpets and other pile products is described in German Pat. specification No. 1,071,040, wherein layers of the pile form-

ing material are embedded in a kind of parallel layered arrangement with the layers one above the other and in a setting medium, so that a block will result which will be split up into plates by cuts made transversely to the layers, these plates being attached to back coatings and the setting medium then being removed from the pile. In a manner similar to that used in the two previously mentioned processes, the bonding between the pile material and the base layer in this instance occurs for a small cross-section of the pile forming materials which are perpendicular to the plate cutting surface. Further, this process does not allow continuous operation and it is relatively slow. Block formation requires placing the layers individually one on top of the other, the setting medium requires drying after block formation and prior to plate cutting, and the block forming mold allows filling only after the entire supply in it has been cut into plates. A sequence of operations must be followed which not only is time-consuming, but also necessitates working in fits and starts.

British Pat. specification No. 589,908 describes the manufacture of a pile carpet made of fabric strips glued on a support. The strips are obtained by cutting a length of fabric, the warp yarn of which is consolidated into bands that are spaced from one another and are distributed over the width of the fabric web in such an array that the weft yarn floats between warp bands. The cutting lines strictly lie within the strips of the floating weft yarns, whereas the woven strips will be formed in the interlacing range of the weft and warp yarns. The side surfaces of the strips are placed one against another and are fastened by adhesives or by stitching and the like on the support. The free weft yarns, which are perpendicular to the support on account of the longitudinal folding of the fabric strip, therefore form the carpet pile, the thickness of which may be controlled by the spacings between the individual fabric strips running one along the other. This process is quite cumbersome and requires much labor, while simultaneously allowing manufacturing only one carpet at a time.

Swiss Pat. specification No. 377,773 describes a process for the manufacture of a felt carpet with felt strips running parallel to a support to which the strips are glued, wherein strips are cut in a direction perpendicular to the prevailing fiber direction, these strips being arrayed one against another and so glued to the support by one of the free cutting edges that the main fiber direction of the strips will be perpendicular to the support. This Swiss patent, therefore, refers to a felt carpet with felt in the entire cross-section and without free pile. The process described therein discloses no teaching making it evident to the expert as to how to make a carpet of higher quality, and, where desired, one of an arbitrary pattern that would consist of free yarn pile.

German Pat. specification No. 830,042 describes a process for the manufacture of carpets wherein textile strips are placed on edge and compressed into bales, the latter then being arrayed themselves on edge and densely packed one against the other. The bales are then provided with a base layer at one of the two free surfaces or are glued to a support. This process too is complex and costly in labor, while permitting the manufacture of only one carpet at a time. Furthermore, the pattern variability is limited. If a free standing pile is desired, further treatment must be applied to the free surface of the carpet so manufactured.

French disclosed application No. 2,044,778 describes a process for the manufacture of pile carpets which are reproducibly patterned, a length of fabric being made the weft yarn of which will provide the carpet pile the weft yarns being fastened by only few warp yarns. The fabric so obtained will then be folded in a zig-zag in such a manner that a block is achieved with lateral surfaces consisting of the end surfaces of the weft yarns. One of those lateral surfaces then is glued to a support with a slice of the desired pile height then being cut off the block. This process is extremely complicated and difficult to carry out. Complex equipment is required for making the block by folding the fabric and for fixing the block. Furthermore, auxiliary equipment is needed for the patterning of the weft yarn. The process cannot be continuous on account of cutting the block into individual slices and gluing these slices to a base layer. Furthermore, carpets so manufactured suffer from the drawback already mentioned, to wit, that the adhesive bonding between the base layer and the weft yarn forming the pile is restricted to the relatively small cross-section of this yarn.

A carpet is described in Swiss Pat. specification No. 401,892, wherein the pile stands in rows perpendicularly to the plane of the carpet, the individual pile rows being firmly connected to one another by intermediate band like layers extending from the base of the pile over part of the pile height and being glued on both sides to the neighboring pile rows. On account of the adhesive bonding of those intermediate layers with part of the pile height of the carpet, the latter achieves extraordinary cohesion and such stability that any additional measure for strengthening, such as backside coating and the like, is superfluous. This Swiss patent specification also describes a process for making a carpet such that spaced, parallel, transverse strips, forming the intermediate layers, are glued on a continuously moving fibrous web which then will be divided into individual elements by means of cuts in the longitudinal axes of these transverse strips. The remaining free surfaces of the intermediate layers are then coated with adhesive and the individual elements are so placed one on top of the other that the intermediate layers will be located one above another and will be glued to the pile of the next element. As previously explained, the structure so achieved will then be cut in the center plane parallel to both outer surfaces, two carpets thus being obtained, the back sides of which each will be formed by one of the outer surfaces. The process described in this patent allows carpets of outstanding quality to be manufactured but suffers from the drawback of limited productivity on account of the application of the transverse strips. Staying within tight tolerances as regards the spacings between individual transverse strips requires complex equipment, the output of which determines productivity which cannot be arbitrarily increased.

An essential improvement of the above described pattern is found in Swiss Pat. specification No. 521,114, which discloses the manufacture of carpets made in the same manner and with the same quality but also achieves the advantages of a productivity that is many times higher as well as the feasibility of patterning the pile rows transverse to the band like intermediate layers, by using, for instance, a Jacquard attachment. The improvement of the last mentioned Swiss patent's process with respect to Swiss Pat. specification No. 401,892 essentially consists of a reversal of the

operational principle. In lieu of the continuous, roll like supply of the fibrous web forming the pile, and in lieu of bonding of the parallel, transverse strips of the intermediate layers, the band like intermediate layer material is fed continuously and is bonded to a layer of textile fiber material forming the pile. This procedure allows the simultaneous feeding of the band like intermediate layer material in several, parallel, spaced intermediate layers. After combining all such continuously supplied intermediate layers forming in their spaced arrangement one fabric width with the textile fiber material, an endless fabric band structure will be thus achieved. This structure may be divided into individual strips by cuts in the longitudinal axes of the intermediate layer bands and parallel thereto in the region of the textile fiber material located between the individual bands, the textile fiber material being snug with one of the longitudinal edges of the band like material in those strips and projecting beyond the other longitudinal edge. Because of the described feasibility of simultaneously manufacturing an arbitrary number of such strips, which may be arrayed and interbonded in various ways so as to form a carpet, in the manner described in the patent specification, there is a multiple increase of productivity without in any way adversely affecting the quality of the carpets so made.

Textile yarn is used for the manufacture of the best quality achievable according to the processes described above where the pile may be patterned. This requires laying the pile yarn in the form of a bond of yarns, by means of a gripper in repeats, transversely across the intermediate layer bands being supplied in spaced parallel relationship. The yarn warp being amenable to Jacquard to attachment control if a particular pattern is desired. A preferred embodiment of the process suffers from the drawback that the intermediate layer bands no longer may be moved on continuously, but must be moved step wise, and must be advanced each time by the width of the deposited yarn warp. The step wise advance, the gripper device required for gripping and depositing the yarn warp, the parallel feeding of the individual intermediate layer bands and possibly the patterning by a Jacquard attachment do however require high expenditures for equipment and high precision in the devices used for this purpose.

The present invention addresses the task of providing a high-quality carpet in which the upright standing pile is not only bonded to the back side at the cross-sectional surface of the pile and, which requires no back side coating of any kind, but in which the pile consists of carpet yarn of any desired fibers or fiber mixtures, whereby the carpet may be patterned, and may be manufactured with high productivity while maintaining the desired quality.

The object of the invention is a pile carpet having a pile perpendicular to a base and including textile yarn wherein the base comprises woven fabric strips abutting each other by their lateral areas and being connected to one another, said strips standing upright on edge on one of their edges, and wherein the pile comprises free, unbound ends of said yarn running perpendicularly to said base in said fabric strips, said free ends projecting beyond the other edges of said fabric strips.

In one embodiment, the fabric strips of the carpet of the invention are connected to one another within the region of the fabric by an adhesive.

In another embodiment, the fabric strips contain synthetic, thermo-weldable textile fibers and are

bonded to one another within the region of the fabric by thermo-welding.

Another object of the present invention consists of manufacturing a pile carpet having a pile layer perpendicular to a base and including textile yarn and in which the base comprises woven fabric strips abutting each other by their lateral areas and being connected to one another, said strips standing on edge on one of their edges, and wherein the pile layer comprises free, unbound ends of said yarn running perpendicularly to said base in said fabric strips, said free ends projecting beyond the other edges of said fabric strips, comprising the steps of cutting a fabric web; having warp threads in groups so spaced that the weft threads float between said warp thread groups, in the warp direction into strips including a part of woven fabric and a part of unbound free ends of weft threads extending over each strip's entire length, placing said strips upright on edge, and bonding the lateral areas of the woven parts of said strips so that the woven parts will result in the base and the free weft threads in the pile of the carpet.

The endless strips obtained following cutting of the fabric web in the process of the invention in principle are similar in construction to the strips described in the above-mentioned Swiss Pat. specification No.; however, they may be obtained in a far simpler manner from yarn alone and no longer necessitate a complex procedure with intermediate layer bands. An essential advantage of the process of the invention consists of the feasibility of using any kind of loom for the manufacture of the fabric web. A further advantage consists of the ability to pattern the weft yarn in the loom forming the pile of the carpet. Hence, the pile may be patterned, while the warp yarn consolidated into bands may consist of any yarn material of appropriate mechanical strength. It will be evident to the expert that when making use of modern pick change looms not only the fiber material of the weft yarn but also the patterning may be modified in repeats, depending on the loom being used. Since more than one loom is operated by the same weaver in modern weaving mills, the cost in labor with respect to productivity is reduced to a minimum.

When making use of a Jacquard attachment for patterning the pile forming weft yarn in the process corresponding to that described in the pertinent embodiment of the Swiss Pat. specification No. 521,114, a more or less large creel for the supply spools will be required, depending on the number of different colors being used and/or kinds of yarns. At the break of such a yarn or when an empty spool is not replaced, there will be a fault in the weaving pattern until correction is made which, as a practical matter, cannot be remedied. Corrective procedures that are used consist of inserting a new yarn or repairing the broken one; however, both require stopping the entire production facility. Therefore, the creel requires constant monitoring. Furthermore, it takes up much volume. Another advantage in the process of the invention consists of simplifying the patterning system of the weft yarn, in particular when pick change automation is being used. The same simplification also applies to the replacement of supply spools.

The principle of the present invention is illustrated below with reference to the drawings.

FIG. 1 is a top view of a fabric web for the manufacture of the carpet of the invention.

FIG. 2 illustrates a fabric strip obtained by cutting the fabric web of FIG. 1,

FIG. 3 shows a schematic representation of abutting fabric strips of FIG. 2 connected to one another in the process of making a carpet according to the invention.

Warp bands 1 in the fabric web of FIG. 1 may be of synthetic, multi-filament yarns. The weft yarn 2 is carpet yarn which, according to the desired quality of carpet, may be uniform or varied, of one color or of patterned coloring, of uniform or varied titer, and of synthetic or natural fibers and/or a mixture of such fibers.

The fabric web may be stored at the take-off end of the loom and be cut in a known manner at any desired time, for example, by circular knives appropriately spaced from one another and arrayed along a common axis, into continuous strips along cutting lines 3. A strip so obtained is shown in FIG. 2.

The strips obtained then may be arrayed one against the other in a known manner and as schematically shown in FIG. 3, a formation being obtained, one surface of which consists of the cut edges of the individual fabric strips arrayed one against another, the other surface of which consists of the free, unbound weft yarn ends projecting beyond the other edges of the fabric strips. The dimensions of the carpet so achieved may be varied, the length depending on that of the individual fabric strips, the width of the thickness and number of fabric strips arrayed against each other and connected to one another, the thickness of the reverse side of the carpet depending on the width of the part of the woven fabric of the individual strips, and the pile height depending on the length of the free, unbound weft yarn ends projecting beyond the edge of the fabric strips.

It is not necessary at all to cut the fabric web in the middle of the floating weft bands or in the longitudinal axis of the parts of woven fabric. By laterally shifting the cutting lines within these domains, various strips may very easily be cut from a single fabric web for the subsequent manufacture of various carpets of different backing layer and/or pile layer thicknesses.

The connection of the abutting strips may be effected in any manner, for instance by means of glue. When making use of warp and/or weft yarns consisting of, in part or in whole, thermo-weldable synthetic fibers, the bonding of the fabric strips may also be achieved by thermo-welding. Another possibility is the purely mechanical connection of the strips, for instance, by means of staples or by sewing.

Various methods are known for abutting and connecting the strips of FIG. 2, which are achieved by cutting a fabric web as in FIG. 1, so as to make the carpet described. In the previously mentioned Swiss Pat. specification No. 521,114, one will find several preferred embodiments.

What is claimed is:

1. A pile carpet having a pile perpendicular to a base and including textile yarn wherein the base comprises woven fabric strips abutting each other by their lateral areas and being connected to one another, said strips standing upright on edge on one of their edges, and wherein the pile comprises free, unbound ends of said yarn running perpendicularly to said base in said fabric strips, said free ends projecting beyond the other edges of said fabric strips.

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2. A carpet according to claim 1 wherein said fabric strips are connected to one another within the region of a fabric by an adhesive.

3. A carpet according to claim 1 wherein said fabric strips contain synthetic, thermo-welding textile fibers, and said fabric strips are connected to one another within the region of a fabric by thermo-welding.

4. A process for manufacturing a pile carpet having a pile layer perpendicular to a base and including textile yarn and in which the base comprises woven fabric strips abutting each other by their lateral areas and being connected to one another, said strips standing upright on edge on one of their edges, and wherein the pile layer comprises free, unbound ends of said yarn running perpendicularly to said base in said fabric strips, said free ends projecting beyond the other edges

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of said fabric strips, comprising the steps of cutting a fabric web, having warp threads in groups so spaced that the weft threads float between said warp thread groups, in the warp direction into strips including a part of woven fabric and a part of unbound free ends of weft threads extending over each strip's entire length, placing said strips upright on edge, and bonding the lateral areas of the woven parts of said strips so that the woven parts will result in the base and the free ends of weft threads in the pile of the carpet.

5. A process for manufacturing according to claim 4 wherein the step of bonding comprises thermo-welding.

6. A process for manufacturing according to claim 4 wherein the step of bonding comprises adhesively bonding said lateral edges.

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