Feb. 26, 1974 H. LOCHNER 3,794,553

VARICOLORED ORNAMENTALLY DESIGNED NEEDLED NON-WOVEN FABRICS

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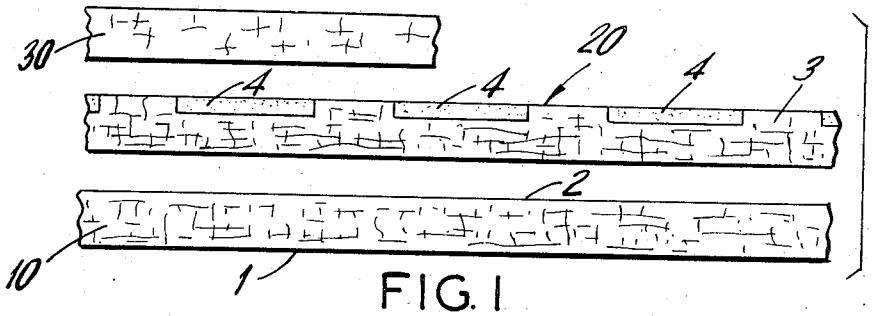


FIG. 1

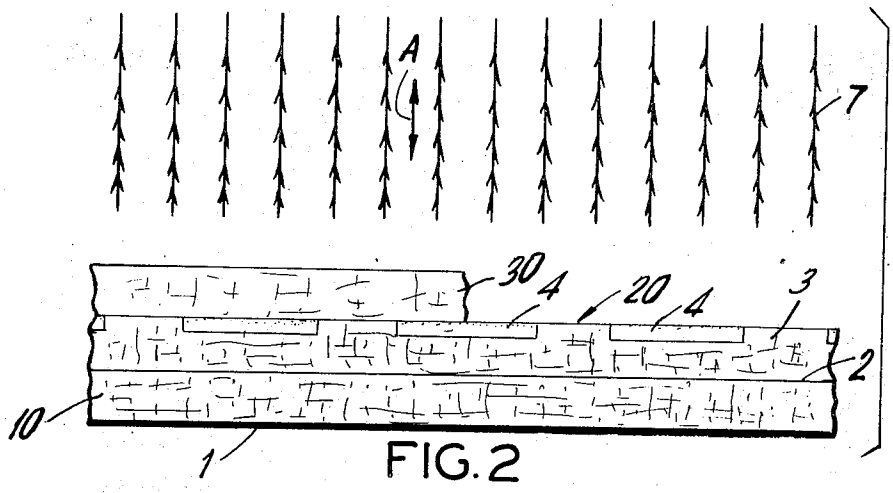


FIG. 2

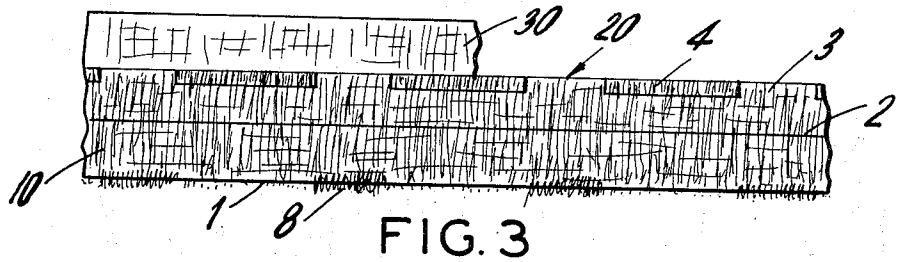


FIG. 3

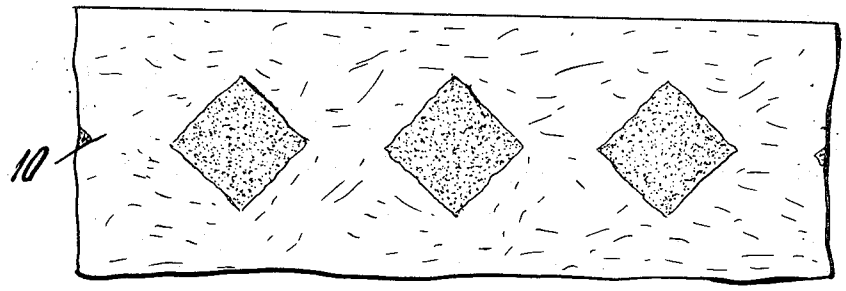


FIG. 4

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VARICOLORED ORNAMENTALLY DESIGNED NEEDLED NON-WOVEN FABRICS

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Continuation-in-part of application Ser. No. 3,976, Jan. 14, 1970, now Patent No. 3,705,064. This application Feb. 29, 1972, Ser. No. 230,368

Claims priority, application Germany, Jan. 15, 1969, P 19 01 753.9

Int. Cl. B32b 7/08, 7/14

U.S. Cl. 161—148 4 Claims

ABSTRACT OF THE DISCLOSURE

A needled, ornamentally patterned non-woven pile fabric is disclosed. The fabric comprises a first needled non-woven web having a face side and a rear side, said first needled web being of a single color or of blended color and a second needled non-woven web situated on the rear side of said first web and having a color contrasting from the color of said first web, said second web having glued areas and unglued areas with the contours of the glued areas corresponding to a desired pattern. The first and second non-woven webs are needled together with fibers of the unglued areas of said second web penetrating through said first web to form a pile on the face side of said first web while fibers of the glued areas of said second web are intermingled with fibers of said first web without substantial pile formation, whereby a pattern is formed on the face side of said first web.

CROSS-REFERENCE TO PRIOR APPLICATION

This is a continuation-in-part of copending application Ser. No. 2,976, filed Jan. 14, 1970 now U.S. Pat. No. 3,705,064.

FIELD OF INVENTION

The invention relates to needled, ornamentally patterned non-woven pile fabrics.

SUMMARY OF THE INVENTION

The manufacture of needled non-woven fabrics, which may be used e.g. as punched felt-floor coverings, is carried out by making webs of non-woven fabrics in a known manner, either by carding or aerodynamically, and reinforcing the webs mechanically on needle machines, and subsequently by additional treatment with binding agents. Chemical binders used are, preferably cross-linked polyacrylic esters, butadiene-acrylonitrile, butadiene-styrene, and similar compounds.

All the known needled non-woven fabrics, which are preferably used as floor coverings, are monochromatic (single-colored) or, in case a mixture of differently colored fibers are fed to the machine producing the non-woven fabrics, they form blended fabrics. The blended type has found wide acceptance.

Attempts have been made to impart a colorful, patterned appearance to such needled non-woven fabrics by printing, an appearance that is customary in woven carpets or rugs. Special printing machines have been designed for that purpose, but they are very expensive and difficult to handle for technical reasons. The difficulty of printing the fabrics is due especially to the fact that the heavy fabrics which are mostly of considerable width have to be passed through the printing machine evenly and readly to repeat according to pattern. It is necessary to provide a uniform and deep penetration of the dye and a homogeneous distribution of the same in the fibrous web, since the evenness of the printing is otherwise impaired and leads to the incidence of considerable waste. Particular difficulties are encountered in the fixation of the dye. In spite of the high consumption of the dye per unit of area, only a small amount of dye should remain without having become fixed, because if this were the case, the fastness of the material during use, particularly the rubbing fastness would be decreased and any thickening agent remaining in the fabric would coarsen the feel.

A number of methods have been described and are in use in order to arrive at patterned fabrics without the use of the expensive printing processes. These methods make use of differently colored fibers, partly in combination with a certain needle technique. Reference is made here to German Gebrauchsmuster (Utility patents)

8 h, 7. 1,885,517 of Brevetex S.A. Fribourg (Switzerland),

8 h, 8. 1,936,525 of the firm Johann Borgers K. G., Bocholt,

8 h, 8. 1,977,417 of the firm Neodon-Werke Helmut Sallinger, 8908 Krumbach, and

8 h, 8. 1,978,642 of the firm Goertz, Clay & Co., 4050 Monchen-Gladbach-Neuwerk.

While it is true that all the above methods lead to patterned fabrics, it should be noted that either the possibility of designing patterns lies within narrow limits, or the methods are hard to carry out in a continuous operation on an industrial scale. This is true especially of the German Gebrauchsmuster 8 h, 7. 1,885,517 of Brevetex S.A. Fribourg (Switzerland) which consists essentially of applying the prefabricated flat pattern on the layer of the fabric in a certain arrangement, being then attached to the layer by the needle process. The flat patterns are prefabricated by cutting out or punching out from flat materials, which should be reinforced or needled before being cut or punched out for acquiring better stability; another method for accomplishing this is to apply a coating of drying adhesive to one side of the material.

Although that method affords—at least theoretically—considerable possibilities of providing patterns of the type of ornamental designs, the method is difficult to carry out in practice and is of limited applicability since the punching operations require a preparatory reinforcement of the material, as mentioned in the specification of the utility patent. The evenness of the punching and the removal of the punched pieces to the spot of attachment involves technical difficulties, not to mention the high loss of waste material accumulating in the punching process. Where punched pieces are used, there is the further disadvantage that there will be differences in height and thickness in the finished product of the non-woven fabric, which are undesirable and will reduce the wear of the product so made.

It is the object of the present invention to provide patterned non-woven fabrics which are free of the above-mentioned shortcomings.

It is another object of the invention to provide patterned non-woven fabrics without having to resort to a printing process having the above-mentioned drawbacks, while accomplishing the production of ornamental designs similar to those obtained by printing.

It is yet another object to provide patterned ornamental non-woven fabrics without causing waste of material.

Other objects and advantages will become apparent from the following detailed description.

While all the known methods for making patterned materials operate either with partial application of differently colored fibers, or by partial needling of varicolored non-woven fabrics, the process of the invention is distinguished from the known techniques by using, preferably without carrier fabric, a single-colored web of a needled, non-woven fabric onto which is applied, by needling, another web of non-woven fabric of a different color. In carrying out this method glue is applied

to the second web preparing those areas or spots which, in accordance with the desired patterns, are not to be needled, the glue being applied superficially to such an extent and to such depth that the needles penetrating the fabric at these glued places will not catch fibers with their hooks, or will only catch the fibers in a reduced number, and carry them to the rear surface of the non-woven fabric lying beneath. The gluing of the web to be needled (patterning web) corresponds in this method to the art of printing with dyes, inasmuch as it is possible to reduce in a regulated flow, the passage of the fibers to the other side, or to stop it entirely, in the gued places, as compared to those that have no reinforcing glue applied thereto, depending on the amount of glue applied.

It is thus possible to effect, with the process according to the invention, delicately graded patterning of any description, just as by printing, with fine shading of colors and with the single exception that there has to be a minimum size of contours between the different colors, since there are limits to the distinctness between contours depending on the thickness of the needle in each individual case. However, the sharpness of contours which cannot be accomplished by this technique spells an advantage from an esthetic point of view and permits to obtain effects of a softness which cannot be accomplished by the arts of printing and weaving. The effects of the patterning in the process of the invention are dependent on several factors, viz. on the type of needles used, the frequency at which a certain area is needled, the depth of penetration of the needles, the speed at which needling is carried out, also on the selection of the adhesive and the thickness and density of the film of adhesive applied in the surface gluing.

It was a surprising discovery to observe that with the film-forming glue application the needles entering the non-woven fabric will push apart the fibers at the spot of entry, probably caused by the resilience of the film-forming substance, so that the smooth part of the needle first forms an open channel where no fibers are carried along by the hook of the needles. A condition necessary for the effect is that the diameter of the needles used should not be substantially different in front of and behind the notch.

When the superficial gluing is so applied that it forms pores, so that a network is formed instead of a continuous film of glue, there occurs a passing through of the fiber at those places, where pores are still present, whereas no fiber is carried along where the needle meets a closed film of glue. Such a weaker gluing which is porous, permits to achieve a graded color pattern. A similar effect may be obtained by a screen-like area gluing, where, depending on the size of the screen openings, the depth of the coloring may be determined.

Of the suitable adhesives to be used for the surface gluing in the process of the invention, best results are obtained with gluten glues of medium viscosity and gelling stability; however, it is also possible to use any one of the synthetic adhesives provided they are binders having comparatively high melting points, with the exception of thermoplasts which are not suited for this process.

The particular usefulness of the gluten glues is probably due to the films they form which are of optimum low thermoplasticity. The marked heat development in the needles, especially when their operation is of high frequency, necessitates a low thermoplasticity of the binder in order to obtain the effect of stable channel formation.

In those areas or spots where no film of glue covers the surface of the non-woven fabric to be needled, the needles pull the fibers of the patterning web through and cause pattern formation.

In the following the invention will be more fully described in two examples but it should be understood that these are given by way of illustration only, and not by way of limitation and that many changes in the details may be made without departing from the spirit of the invention.

Example 1

In a known manner, but without carrier web, we first prepare a non-woven fabric of single-colored black polypropylene staple fiber by needling together several layers of non-woven fabric having a fiber length of 90 mm., a fiber weight of 14 den. and a width of 210 cm.; the weight of the fabric is 200 grams per square meter.

After having passed the needling machine, where it is mechanically reinforced as described, the non-woven propylene fiber web is subjected to glue application according to the desired pattern, in a suitable gluing apparatus, adhesive being applied at the areas to be glued so that it will penetrate into the web to a depth corresponding to about 50% of the web thickness, whereby the web will be glued at the said areas to the corresponding depth.

The fabric web which has now been glued in accordance with the desired pattern, is subsequently passed through a channel dryer and after drying is needled together with a second prefabricated web of non-woven fabric of 210 cm. width; the second web consists of several layers of light red polypropylene staple fibers having a length of 90 mm. and a fiber weight of 14 den.

The needles used in the needling process are so designed that they have in front of and behind the notches diameters which are either the same or differ only slightly; the depth to which the needles penetrate the fabric is so adjusted that in the areas free of glue, the fibers of the patterning web pass through to the surface of the lower fabric web, whereas at the impregnated places only an internal bonding of the two webs will occur.

Then, a third prefabricated fabric web, likewise of 210 cm. width and of the same fiber material and the same color as the lower web, is attached by needling. In that case, too, the depth to which the needles penetrate, is so adjusted that the three webs become closely connected however, without the fibers being passed through to the surface of the patterned lower web.

The back of the base of the carpet or rug is now bright red in solid color, whereas the front is patterned bright red and dark red corresponding to the prepared pattern.

The base of the carpet consisting of three webs of non-woven fabrics, which are at first only mechanically reinforced are now reinforced by chemical binders, either by impregnation through immersion in tubs, or by padding or doctoring (with squeegee) on the back side, by foam application or by a combined process of impregnation and padding. For binders, the above-mentioned dispersions of synthetics are used.

For maintaining the pile formed by the chemical reinforcement or bonding according to the invention, it is desirable to use, in the operation of reinforcing by chemical binders, such agents which will not cause a flattening of the pile. It is advantageous to use the process disclosed in the Swiss Pat. 422696.

Example 2

The first stages of the process are as described in Example 1 until two webs of non-woven fabrics have been combined by mechanical needling any by reinforcing through gluing.

Then, with the use of reversible glues, e.g. gluten glues, vegetable glues, or polyvinyl alcohol, for gluing to obtain patterning, the procedure described can be so changed that instead of covering the patterning web by a third web, only the two first mentioned webs, i.e. the lower web and the patterning web may be mechanically combined by needling and then fed into a temperature-controlled water bath, where during passage of the combined web the reversible glue dissolves and becomes evenly distributed throughout the entire web of non-woven fabrics. After the

excess of the glue solution has been squeezed off, a mixture of e.g. 80 parts of an acrylic resin and 20 parts of urea-formaldehyde resin are applied by foaming on both sides, so as to penetrate the web, to be dried thereafter according to Swiss Pat. 422,696. In that manner, the gluten glue, which was used as an auxiliary agent for bringing about the desired pattern, and which was used in the amount of 75 grams per square meter, may be used as an additional binder in the impregnation bath whereby the usual amount of binder may be reduced and some saving accomplished.

While in the foregoing examples the manufacture of two-colored patterns has been described, which may, of course, contain highly shaded hues in these colors, it is also within the concept of the invention, to obtain more than two basic colors by using other patterning webs with different colors ready for repeat according to pattern.

It is, moreover, possible to use fibers, especially for the patterning fabric, which differ in length and thickness from the fibers of the bottom fabric and the covering fabric. Additional effects can be obtained in this manner.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawing and descriptive matter in which there is illustrated and descirbed a preferred embodiment of the invention.

In the drawing:

FIG. 1 is an exploded view of the three webs constituting the fabric;

FIG. 2 shows the three webs in superimposed position prior to the needling operation and also indicates the needles used in the needling operation;

FIG. 3 is a cross-sectional view through the finished needled fabric structure; and

FIG. 4 is a front elevational view corresponding to FIG. 3 showing the patterned fabric structure.

Turning now to FIG. 1, a first web **10** of non-woven needled fabric is shown. The fabric **10** has a face side **1** and a rear side **2** and is of a single color or of blended color.

The second web, generally indicated by reference numeral **20**, is of a color contrasting from the color of web **10** and comprises unglued portions **3** and glued portions **4**. It will be noted that the contours of the glued portions **4** correspond to a predetermined pattern. A third fabric **30** may be superimposed on the second fabric **20**.

In forming the desired fabric structure, the web **20** is placed on the rear side **2** of the web **10**, whereupon the web **30** is placed on the rear side of web **20**, as shown in FIG. 2. The superimposed webs are then needled by the needles **7**, as indicated in FIG. 2, the arrow A indicating the reciprocating movement of the needles. Of course, a larger number of needles may be used. During the needling operation fibers of the unglued areas **3** of the second web **20** penetrate through the body of the first web **10** and form the pile **8** on the face side **1** of the web **10**. By contrast, during the needling substantially no pile is formed by the fibers of the glued areas **4** of the web **20**. In this manner, a pattern such as shown in FIG. 4 may be obtained.

As previously indicated, the third web **30** is attached to the second web **20** by needling. The depth to which the needles penetrate is so adjusted that the three webs become closely connected, however, without the fibers being passed through to the surface of the patterned lower web.

What is claimed is:

1. A needled, ornamentally patterned non-woven pile fabric, comprising a first needled non-woven web having a face side and a rear side, said first needled web being of a single color or of blended color and a second needled non-woven web situated on the rear side of said first web and having a color contrasting from the color of said first web, said second web having glued areas and unglued areas with the contours of the glued areas corresponding to a desired pattern, said first and second non-woven webs being needled together with fibers of the unglued areas of said second web penetrating through said first web to form a pile on the face side of said first web while fibers of the glued areas of said second web are intermingled with fibers of said first web without substantial pile formation, whereby a pattern is formed on the face side of said first web.

2. A fabric as claimed in claim **1**, further comprising a third non-woven web superimposed on said second web, said third web being connected to said first and second webs by needling.

3. A fabric as claimed in claim **1**, wherein said second web is glued so that the glued areas form a grid-like pattern.

4. A fabric as claimed in claim **1**, wherein the glue of said glued areas penetrates to about one half of the thickness of said second web.

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