

Nov. 3, 1959

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TUFTED FABRIC WITH BIAS FABRIC BACKING
AND PROCESS FOR PRODUCING THE SAME
Filed May 27, 1957

2,910,762

Fig. 1.

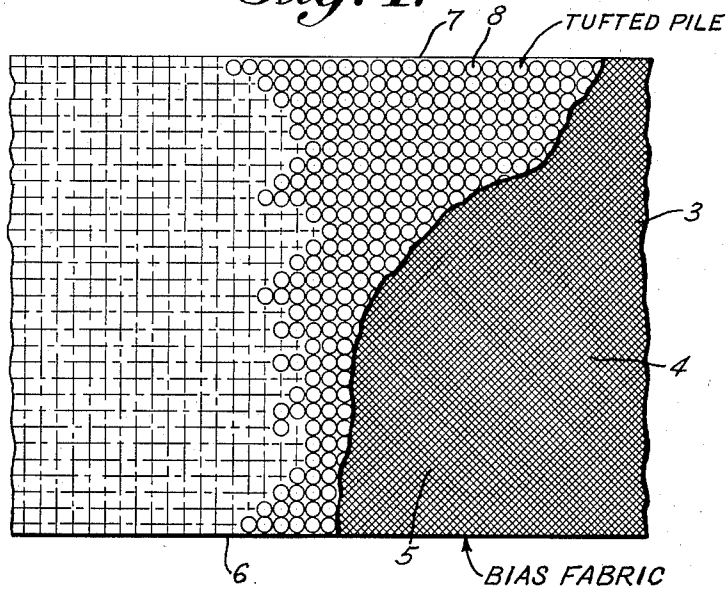
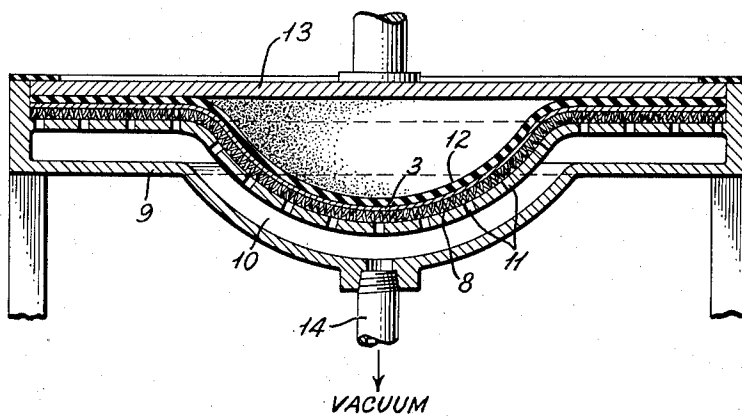


Fig. 2.



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TUFTED FABRIC WITH BIAS FABRIC BACKING AND PROCESS FOR PRODUCING THE SAME

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Application May 27, 1957, Serial No. 661,759

4 Claims. (Cl. 28—72)

The present invention relates to a tufted fabric having a bias fabric backing, and to a process for producing the same.

Large quantities of tufted fabrics are currently produced, primarily for use as floor coverings. In the production of such fabrics a woven backing fabric is passed through a multiple needle tufting machine which inserts pile loops through the backing fabric. The pile loops may be left uncut to provide loop pile or the loops may be cut to provide cut pile. Multiple needle tufting machines and their mode of operation are well-known in the art and need not be described here. One such machine is disclosed in United States Patent 2,335,487, issued November 30, 1943, to Cobble et al.

In the production of tufted fabrics the backing fabric is usually of woven material. The backing fabric is supplied in the form of a web in which the warp threads extend longitudinally and the filling threads extend transversely of the web. The web is fed longitudinally through the tufting machine and is tufted throughout substantially its entire width. This operation results in a tufted fabric in which the longitudinal rows of pile stitches are parallel to the warp threads of the backing fabric and in which the transverse rows of pile stitches are parallel to the filling threads of the backing fabric.

There are certain potential fields of use for which conventional tufted fabrics have not heretofore been considered suitable or in which the cost of adapting such fabrics to those fields has been excessive. There have been limitations on the use of conventional tufted fabrics, for example as furniture or automobile upholstery material. These limitations have been due in large part to the inability of the tufted fabrics to stretch to conform neatly to the contour of the furniture or seats being upholstered. Another potential field of utility for which tufted fabrics have heretofore been unsuitable is in automobile floor coverings. The floors of many modern automobiles have raised ridges or protuberances of irregular contour for the purpose of enabling the floor of the automobile to be positioned lower on the chassis. Attempts to use tufted fabrics as floor coverings for such automobiles has necessitated cutting and sewing the fabrics to conform to the automobile floors. This has involved an undesirable item of cost. The limitations on the stretching of conventional tufted fabrics has heretofore prevented the lamination of such fabrics to foam rubber seat cushions and backs because the conventional tufted fabrics could not adapt themselves neatly to the irregular contours of the foam rubber.

One of the primary objects of the present invention is to provide a tufted fabric which is capable of being stretched substantially, either in a direction parallel to the longitudinal rows of pile stitches or in a direction parallel to the transverse rows of pile stitches, or in both such directions.

Another object of the invention is to provide a tufted fabric which is capable of efficient use as an upholstery

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fabric and which will readily conform to the irregular contour of the article being upholstered.

Still another object of the invention is to provide a tufted fabric which can be laminated with a sheet of rubber or other curable plastic material, which laminated product can be molded to irregular shapes and which will retain its irregular shape after curing of the rubber or other plastic sheet.

A further object of the invention is to provide a tufted fabric floor covering which conforms to the irregular three dimensional contour of floors such as automobile floors.

The invention will be better understood from the following description which has reference to the accompanying drawing wherein:

Figure 1 is a more or less diagrammatic top plan view of a bias fabric backing showing tufted pile on a portion thereof; and

Figure 2 is a vertical sectional view of a vacuum mold in which is positioned a tufted pile fabric of the present invention laminated with a curable rubber or other plastic sheet.

The backing fabric utilized in the present invention is preferably originally woven in tubular form. One suitable apparatus for producing the tubular fabric is disclosed in United States Patent 2,517,021, issued August 1, 1950, to Samuel P. Parker. The tubular fabric is then cut along a helical line by means of a bias cutting machine. One bias cutting machine suitable for this purpose is disclosed in United States Patent 2,644,522, issued July 7, 1953, to Samuel P. Parker and Roscoe Lee Thompson. The bias cutting machine is preferably arranged to make the cut of the tubular fabric along a line which extends at a forty-five degree angle to both the warp and the filling threads. The resulting bias fabric is in the form of a web having parallel side edges. The warp and the filling threads extend at angles of forty-five degrees to the side edges of the web. The bias fabric web can be rolled on a beam or roll and fed longitudinally through a conventional multiple needle tufting machine to form tufted pile.

The term "tufted pile elements" as used herein means pile which has been formed in a tufting operation, irrespective of whether the loops remain uncut to provide loop pile or whether the loops have been cut to provide cut pile.

In the drawing the bias fabric backing is designated by the reference numeral 3 and has warp threads 4 and filling threads 5 which extend at forty-five degree angles to the side edges 6 and 7 of the backing. As the bias fabric backing is fed through a multiple needle tufting machine (such as that disclosed in the aforesaid Patent Number 2,335,487), there are formed longitudinal rows of pile loops 8. Corresponding loops in each longitudinal row are also aligned transversely of the fabric. The pile loops may remain uncut to provide a loop pile fabric or the loops may be cut to provide a cut pile fabric.

The tufted pile fabric illustrated in Figure 1 and described above is capable of being stretched both longitudinally and transversely and is therefore suitable for many of the uses heretofore discussed. Such fabric is particularly suitable as an upholstery material or for laminating to form rubber seat cushions and backs. The rear face of the tufted pile fabric may be given a coating of latex, if desired.

Figure 2 illustrates one suitable procedure for laminating the tufted pile fabric of the present invention with rubber or other curable plastic material to form a contoured laminate which conforms to irregular surfaces such as automobile floors. The tufted pile fabric is placed on the lower platen of a conventional vacuum

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mold 9 with the pile surface of the fabric facing the vacuum chamber 10, which is provided with openings 11 adjacent the pile surface of the fabric. A relatively thick sheet 12 of uncured rubber or other curable plastic material is positioned in the mold against the back of the bias fabric backing 3. The edges of the laminate are then clamped by conventional means such as an upper platen 13. Air is withdrawn from the vacuum chamber 10 through a conduit 14 by means of a vacuum pump, not shown. Reduction in pressure in the vacuum chamber 10 beneath the laminate will cause the central portion of the laminate to be drawn from approximately the dotted line position shown in Figure 2 to the full line position shown in that figure. The tufted fabric is able to assume this three dimensional contour because of the fact that the bias fabric backing can stretch both longitudinally and transversely. The rubber or other curable plastic sheet 12 is cured to assume a permanent "set" while the laminate is in the full line position illustrated in Figure 2. It is preferable to give the back surface of the bias fabric backing 3 a light coating of suitable adhesive before placing it in the mold to increase the strength of the bond between the bias fabric backing and the plastic sheet 12. Upon removal from the mold the permanent "set" of the sheet 12 will cause the laminate to retain the configuration shown.

By properly selecting the contour of the mold 9 it is possible to produce a laminated floor covering which conforms to the irregular contour of a floor such as an automobile floor.

The degree of stretch which is obtainable in the fabric of the present invention can be controlled by selection of the bias angle on which the fabric is cut and by selection of the number of warp and filling threads per inch. The size of the pile yarn, the number of stitches of pile yarn per inch and the gauge of the tufted carpet do not appear to have any appreciable effect on the stretch of the fabric.

The following table gives the details of a suitable cotton fabric backing construction, both in the woven tubular form and after being cut on the bias at an angle of forty-five degrees:

	Tubular	Bias
Weight per sq. yd.-----ounces--	10.73	5.37
Width-----inches--	67½	90
Warps ends per inch-----	52	26
Fillings ends per inch-----	48	24
Warp yarn-----s./l--	8½	8½
Filling yarn-----s./l--	6½	6½

The bias fabric having the details set forth in the foregoing table was tufted as described above and the tufted fabric was found to have a stretch of 48.33% at break lengthwise of the fabric and a stretch of 66.67% at break transversely of the fabric. These values for stretch were ascertained by using the standard 4" x 6" grab test method.

The amount of stretch lengthwise of the tufted fabric can be increased by running the bias fabric backing through the tufting machine under very light tension. This light tension on the fabric backing as it passes through the tufting machine can be obtained in a variety

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of ways. The cloth roll stand carrying the roll of backing fabric may be provided with a positively driven let-off motion similar to the positive let-off motion which controls the amount of tension in the warp yarns supplied to a conventional loom. Alternatively, the backing fabric may be run from the supply roll into a scray where it will be free of tension and from which it can be pulled through the tufting machine by the take-up roller for the tufted fabric.

The bias fabric backing may be produced from fibers other than cotton. Blends of fibers may be used.

Having thus described my invention, I claim:

1. A method for producing a tufted fabric having longitudinal and transverse stretch which comprises inserting a plurality of pile yarns through a web of plain woven backing fabric in which the warp and filling threads extend at acute angles to the parallel side edges of the web, the section of said plurality of pile yarns being from one face of the web and along a first line extending transversely of said web at acute angles to said warp and filling threads to form a first transversely extending row of tufted pile elements on the opposite face of said web, repeatedly inserting said plurality of pile yarns through said web from said one face thereof along lines parallel to and longitudinally spaced from said first line to form additional transversely extending rows of tufted pile elements on said opposite face of said web, forming corresponding tufted pile elements in each transversely extending row from the same pile yarn, and aligning said corresponding tufted pile elements in longitudinal rows extending at acute angles to said warp and filling threads.

2. A tufted fabric having longitudinal and transverse stretch which comprises a plurality of pile yarns extending through a web of plain woven backing fabric in which the warp and filling threads extend at acute angles to the parallel side edges of the web, said plurality of pile yarns extending through the web from one face thereof along a first line extending transversely of said web at acute angles to said warp and filling threads to provide a first transversely extending row of tufted pile elements on the opposite face of said web, said plurality of pile yarns extending repeatedly through said web from said one face thereof along transversely extending lines parallel to and longitudinally spaced from said first line to provide additional longitudinally spaced and transversely extending rows of tufted pile elements on said opposite face of said web, the corresponding pile elements in each transversely extending row being aligned in longitudinal rows extending at acute angles to said warp and filling threads.

3. A tufted fabric as defined in claim 2 in which said tufted pile elements are in the form of pile loops.

4. A tufted fabric as defined in claim 2 in which said tufted pile elements are in the form of cut pile.

References Cited in the file of this patent

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,910,762

November 3, 1959

Amos U. Priester, Jr.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 18, for "the section of" read -- the insertion of --.

Signed and sealed this 12th day of April 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents