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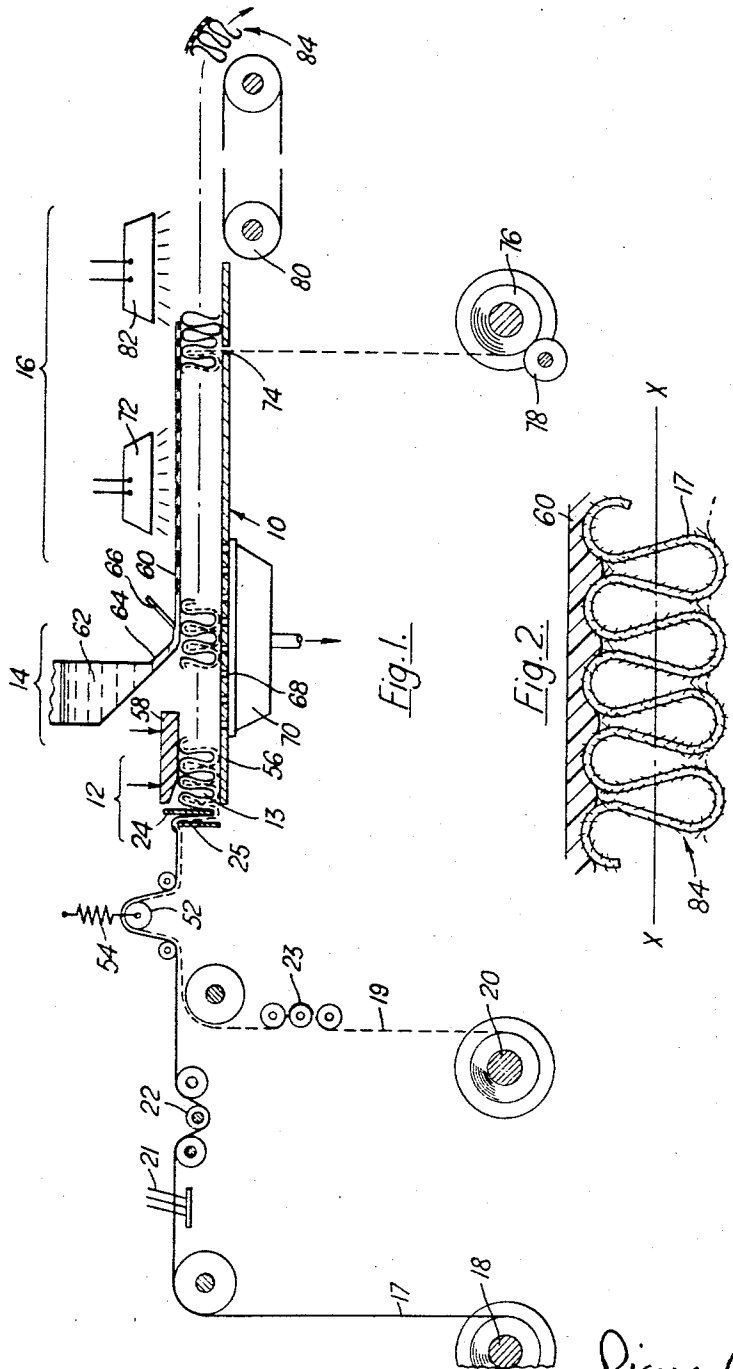
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3,411,966

METHOD OF MAKING A PILE FABRIC

Filed June 21, 1965

2 Sheets-Sheet 1



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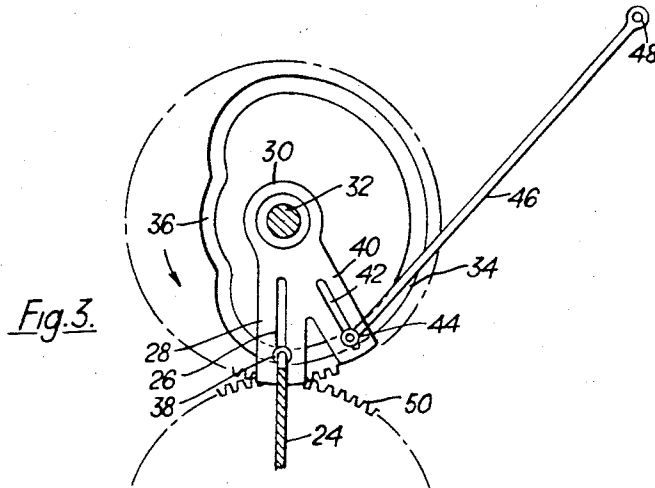
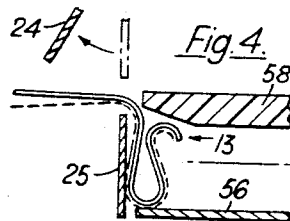
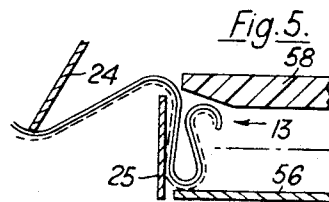
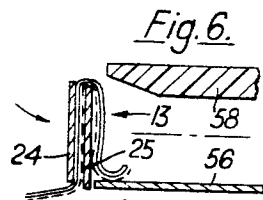
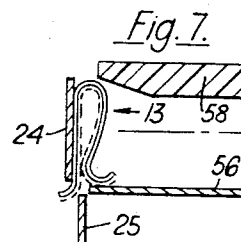
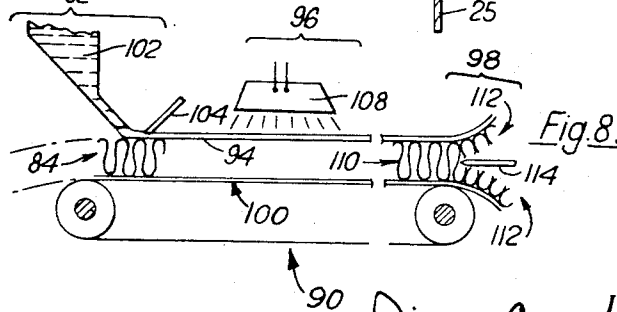
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METHOD OF MAKING A PILE FABRIC

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1

3,411,966

METHOD OF MAKING A PILE FABRIC

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18 Claims. (Cl. 156—72)

ABSTRACT OF THE DISCLOSURE

This invention relates to the manufacture of a pile fabric in which a series of parallel threads and a continuous flexible interliner are superimposed and pleated together so as to produce a pleated pile in which the interliner is interleaved. Then a backing is applied to the pile on the side remote from the interliner; and the pleated threads are fixed in place by this backing after which the interliner is removed.

This invention relates to the manufacture of pile fabrics such as carpets, chenilles and velvets.

In one previously proposed method of manufacturing pile fabrics the tops of the loops on each side of a pleated warp of pile threads are bonded to suitable backings which may be coatings of a liquid elastomeric material which is then cured or polymerised to harden the backing, and subsequently the pleated warp is cut between the two backings along a parallel to them to produce two separate pile fabrics.

Such a method of manufacture has considerable economic attractions, but its potentialities have not previously been realised in practice because of the difficulties of obtaining a finished pile of commercially acceptable firmness and density. Thus it is difficult to apply sufficient pressure to the pleated warp to push the pleats close enough together without causing them to ride over one another so that the warp puckers and cannot easily be bonded to the backings.

In accordance with the invention there is provided a method of making a pile fabric which comprises pleating a continuous series of substantially parallel threads together with a continuous flexible interliner and applying to the pleated sheet a backing which fixes the pleats while leaving the interliner free for removal.

The improved method of manufacture in accordance with the invention eliminates or at least reduces the danger of the pleats riding over one another or of the warp puckering so that a pleated pile is provided to which the backing can readily be bonded.

The interliner having served its purpose of holding the pleats in position can be removed once the pleats are fixed by the backing. After the interliner has been removed another backing can be applied to the side of the pile remote from the first applied backing and then the pile can be cut between the two backings in a plane parallel to them to produce two separate pile fabrics.

The backing applied to the pleated pile may for example be a textile fabric coated with an adhesive but is preferably a liquid coating of an elastomeric material such as rubber latex or solution or a synthetic plastics material which is then cured or hardened in situ to give an elastomeric backing. The preferred backing is a coating of a polyvinyl chloride paste, often otherwise known as polyvinyl chloride plastisol, because this is very quickly and simply cured by heating, such polyvinyl chloride pastes generally comprising a liquid mixture of a polyvinyl chloride resin, a plasticizer, stabilizers and pigments.

The material of the interliner may be chosen from a large number of materials, but best results seem to be

2

given by a material which has a comparatively rough and non-glossy surface for gripping the threads. An example of such material which has given excellent results in practice is news-print paper and this also has the advantage of being comparatively cheap. Other materials which have been found to be suitable include polyvinyl chloride, polypropylene or polyethylene sheets, cellophane, leather cloth and other coated fabrics, and non-woven fabrics.

After pleating of the warp it is subjected to compression in the warp direction in order to push two pleats close together and to push the pleated warp through the machine to a position in which the backing is applied. While the pleated warp is contained between parallel spaced guides rucking or "ballooning" up or down of the pleated warp is prevented, but in order to apply the backing one of these guides must be terminated and then there is considerable chance of the pleated warp rucking or "ballooning" up or down. In accordance with a preferred embodiment of the invention the chance of this happening is minimized by resting the side of the pile remote from that to which the backing is to be applied on a perforated support through which suction is applied so as to hold the interliner and pleated warp against the support.

One special advantage of pile fabrics made in accordance with the invention is that both the pile and the backing can be made from synthetic materials, such as nylon for the pile and polyvinyl chloride for the backing, with the result that no part of the fabric is susceptible to rotting when exposed to excessive dampness or humidity.

A preferred embodiment of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIGURE 1 is an elevation illustrating steps in the production of pile fabric;

FIGURE 2 is a section through a partially completed pile fabric;

FIGURE 3 is a diagram illustrating the actuation of the blades for pleating the warp threads and interliner;

FIGURES 4 to 7 show consecutive steps in the operation of the pleating blades; and

FIGURE 8 is an elevation illustrating further steps in the production of the pile fabric.

The apparatus 10 shown in FIGURE 1 for producing a pile fabric comprises a pleating section 12 in which a pleated pile 13 is formed, a coating section 14 in which one side of the pleated pile is given a backing, and a curing section 16 in which the applied backing is hardened.

To the pleating section 12 are fed a sheet of parallel threads 17 from a roll 18 and a continuous interliner sheet 19 of news-print paper from a roll 20. The threads 17 are fed through a comb 21 and tension rollers 22 and the sheet 19 is fed through tensioning rollers 23. Upper and lower pleater blades 24 and 25, respectively, are arranged to pleat the threads 17 and the sheet 19 so as to produce the pleated pile 13 in which is interleaved the sheet 19.

The operation and actuation of the blades 24 and 25 are shown in FIGURES 3 to 7. As shown in FIGURE 3 one end of the upper blade 24 is guided in a guide channel 26 formed in an arm 28 extending from a bushing 30 rotatably mounted on a rod 32. Also mounted on the rod 32 is a driven cam wheel 34 in one face of which has been cut a cam groove 36. A cam follower 38 is fixed to the blade 24 is guided in this cam groove. The other end of the blade is moved in a similar manner. During one rotation of the wheel 34 the blade is lifted for a short time and then lowered again.

The bushing 30 has another arm 40 extending from it at an angle to the arm 28 and this arm has a channel 42 in it. Another cam follower 44 is guided in this channel 42 and in the groove 36 and is mounted on one end of an arm 46, the other end of which is pivoted at 48 to the apparatus

10. As the wheel 34 is rotated once the follower 44 causes the bushing 30 and the arms 28 and 40 to be rotated around the rod 32 from an upright position and back to an upright position and the angle between the arms 28 and 40 is chosen so that the blade 24 is first lifted, then rotated from an upright position, lowered and finally rotated back to an upright position.

The lower blade 25 is actuated in a similar manner from a cam wheel 50 having gear teeth meshing with corresponding teeth on the wheel 34 so that the wheels 50 and 34 rotate at the same speed but in opposite directions and so that, when the wheel 34 is in the position shown in FIGURE 1 the wheel 50 is in a position rotated through 180° from the position of the wheel 34.

FIGURES 4 to 7 show steps in the pleating of the threads 17 and sheet 19. Initially the blades are overlapped having just formed one pleat with the cam-follower 38 just about to leave the semi-circular part of the cam groove 36 (FIGURE 3) whereas the cam-follower controlling the blade 25 has just entered the corresponding part of the cam groove in the wheel 50.

During the first half revolution of the wheels 34 and 50, the blade 25 remains stationary while the cam follower controlling it traverses the length of the semi-circular part of the cam-groove in the wheel 50. At the same time, the upper blade 24 is first moved upward clear of the blade 25 to the position shown in broken lines in FIGURE 4 and then moved to the left to the position shown in full lines in FIGURE 4.

Next the blade is moved downwardly and outwardly to the position shown in FIGURE 5 and in this position the blade contacts the threads and starts to form a pleat. The blade is then rocked to the upright position shown in FIGURE 6 and a pleat is formed by sandwiching the threads and sheet between the two blades. The inherent resilience and slight backlash in the actuating mechanism is sufficient to enable the withdrawal of each blade to be delayed until the actuating mechanism has completed its movement for forming a fresh pleat and sandwiching the freshly formed pleat between the two blades.

During the next half revolution of the wheels 34 and 50, the blade 24 remains stationary and the blade 25 is withdrawn to the position shown in FIGURE 7 and then the blade 25 forms another pleat by an action similar to that by which the blade 24 formed the previous pleat. This cycle is repeated so as continually to form the pile 13.

To accommodate the jerking motion imparted to the threads and sheet by the pleating blades a roller 52 movable against the action of a spring 54 is provided so as to smooth out this motion.

The pleater blades force the pile 13 as it is formed from left to right as shown in FIGURE 1 and initially the pile is contained between a base plate 56 and an upper plate 58 which is pressed downwardly onto the pile by, for example, weights so as to force the pleats more together. Preferably the plate 58 is of transparent material such as "Perspex" so that the machine operator can check the formation of the pile.

The pile 13 passes from between the plates 56 and 58 to the coating section 14. There a coating 60 of a polyvinyl chloride paste is applied to the upper side of the pile. The paste is held in a reservoir 62 and runs onto the top surface of the pile along an inclined outlet 64. The thickness of the coating 60 is maintained substantially constant by means of a doctor knife 66 which spreads the paste evenly over the pile so that the upper loops of the pleated threads become embedded in the coating as shown in FIGURE 2.

In order to allow the coating 60 to be applied to the top of the pile, the pile cannot be contained and guided between the plates 56 and 58. Therefore, to minimise the danger of the pleated pile rucking or "ballooning" up while the coating is being applied and before this has hardened the base plate 56 is perforated at 68 along the

coating section and suction is applied through the perforations from a manifold 70 connected to a suction pump (not shown).

After applying the backing, the coated pile moves to the right as shown in FIGURE 1 and passes under an infra-red heater 72 which partially cures the polyvinyl chloride paste so that the pile is sufficiently firmly embedded in position in the coating 60 to allow the sheet 19 to be removed. This sheet is removed through a gap 74 in the base plate 56 and wound onto a roll 76 by means of a drive roller 78. If required the sheet 19 can be reused or alternatively it can be thrown away.

The coated pile is taken up on a conveyor 80 on which it travels under further infra-red heaters 82 which complete the cure of the polyvinyl chloride paste and cause the pile to be permanently held in the cured coating 60. After cooling the coated pile is wound on a roll (not shown).

The coated pile 84 which has been produced is shown in FIGURE 2 in which it can be seen that the threads 17 are pleated and tops of the loops of the threads are embedded in the coating 60. The coated pile can be used in the form shown in FIGURE 2 as a pile fabric but normally another coating will be applied to the bottoms of the loops of the threads as shown in dotted lines on FIGURE 2 and then the pile will be cut along the line X—X of FIGURE 2 to give two pile fabrics.

FIGURE 8 shows an apparatus 90 for producing two pile fabrics from the coated pile 84 shown in FIGURE 2. The apparatus comprises a section 92 in which another coating 94 of polyvinyl chloride paste is applied to the coated pile 84, a curing section 96 in which this coating 94 is hardened and a splitting section 98 in which the pile is cut to give two pile fabrics. It will be noted that an interliner sheet is not necessary during the application of the second coating since the first coating holds the pile in place.

The coated pile is delivered from a roll (not shown) coated face downwards onto a conveyor 100 and it travels from left to right as shown in FIGURE 8. The coating 94 is applied in a similar manner as was the coating 60, the paste being applied to the pile from a reservoir 102 and being spread evenly by a doctor knife 104.

The coating 94 is then cured or hardened by passing under infra-red heaters 108. A coated pile 110 has then made both faces of which have been coated.

After the coating 94 has cooled the coated pile 110 is split into two pile fabrics 112 by a knife 114.

The pile fabrics 112 will normally be trimmed along their edges so as to give the finished fabric. They will then be coiled upon rolls and are to be sold for use.

If desired the coated pile 84 can be given its second coating in the apparatus 10 shown in FIGURE 1, the pleating blades being temporarily removed. After coating, the pile 110 so produced can be split into two pile fabrics 112 on a separate machine.

I claim:

1. A method of making a pile fabric which comprises the steps of superimposing a series of substantially parallel threads on a continuous flexible interliner, pleating together said threads and said interliner to give a pleated pile sheet incorporating said interliner, applying to the pleated sheet on the side remote from the interliner, a backing for fixing the pleats in the backing while leaving said interliner free for removal, hardening said backing, and then removing the said interliner.

2. A method as claimed in claim 1, in which the flexible interliner is news-print paper.

3. A method as claimed in claim 1, in which after the threads have been fixed in place the said interliner is removed and a further backing is applied to the pile on the side remote from the first backing.

4. A method as claimed in claim 3, in which the pile is cut between the two backings along a plane parallel to them so as to give two pile fabrics.

5. A method as claimed in claim 3, in which each backing comprises a liquid coating of a polyvinyl chloride plastisol which is then cured by heat.

6. A method as claimed in claim 1, in which the backing comprises a coating of a liquid material which is then cured or hardened to give an elastomeric material.

7. A method as claimed in claim 6, in which the interliner is removed after the first applied backing has been partially cured or hardened.

8. A method as claimed in claim 6, in which the backing comprises a liquid coating of a polyvinyl chloride plastisol which is then cured by heat.

9. A method as claimed in claim 1, in which in order to assist holding the pleated threads while the backing is applied to the pile, suction is applied to the side of the pile remote from that to which the backing is to be applied.

10. A method as claimed in claim 9, in which the suction is applied through a perforated plate upon which the pile is resting.

11. A method as claimed in claim 9, in which the backing comprises a liquid coating of a polyvinyl chloride plastisol which is then cured by heat.

12. A method as claimed in claim 1, in which the series of parallel threads and the interliner are pleated by the action of a pair of pleater blades.

13. A method as claimed in claim 12, in which each blade is initially in an upright position, one blade is moved outwardly away from the pile in an upright position, is pivoted away from the upright, is moved towards the threads and interliner while still pivoted away from the upright, and is then pivoted back to an upright position so as to sandwich the threads and interliner between the blades and form a new pleat, similar motions then being executed by the other blade.

14. A method of making a pile fabric comprising the steps of:

(a) superimposing a series of continuous substantially parallel threads onto a continuous flexible interliner,

(b) pleating said threads and said interliner together so as to give a horizontally extending zig-zagged pile with said interliner interleaved within said pleated threads,

(c) applying to the upper surface of said pile, on the side remote from the interliner, a hardening liquid backing for fixing said pleated threads while leaving the said interliner face free for removal,

(d) hardening said backing so as to fix said pleated threads, and

(e) removing said interliner from said pleated pile and thus producing said pile fabric.

15. A method as claimed in claim 14 in which the said backing is a polyvinyl chloride plastisol which is hardenable by heat.

16. A method as claimed in claim 14 in which said interliner is news-print paper.

17. A method as claimed in claim 14 in which said backing is hardened sufficiently to fix said pleated threads, then said interliner is removed, and finally the hardening of said backing is completed.

18. A method as claimed in claim 14 in which after the zig-zag pile has been formed and before said backing has been hardened to fix said pleated threads, suction is applied to the underside of said pile so as to assist in maintaining said interliner and consequently said pile in its horizontally extending state.

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