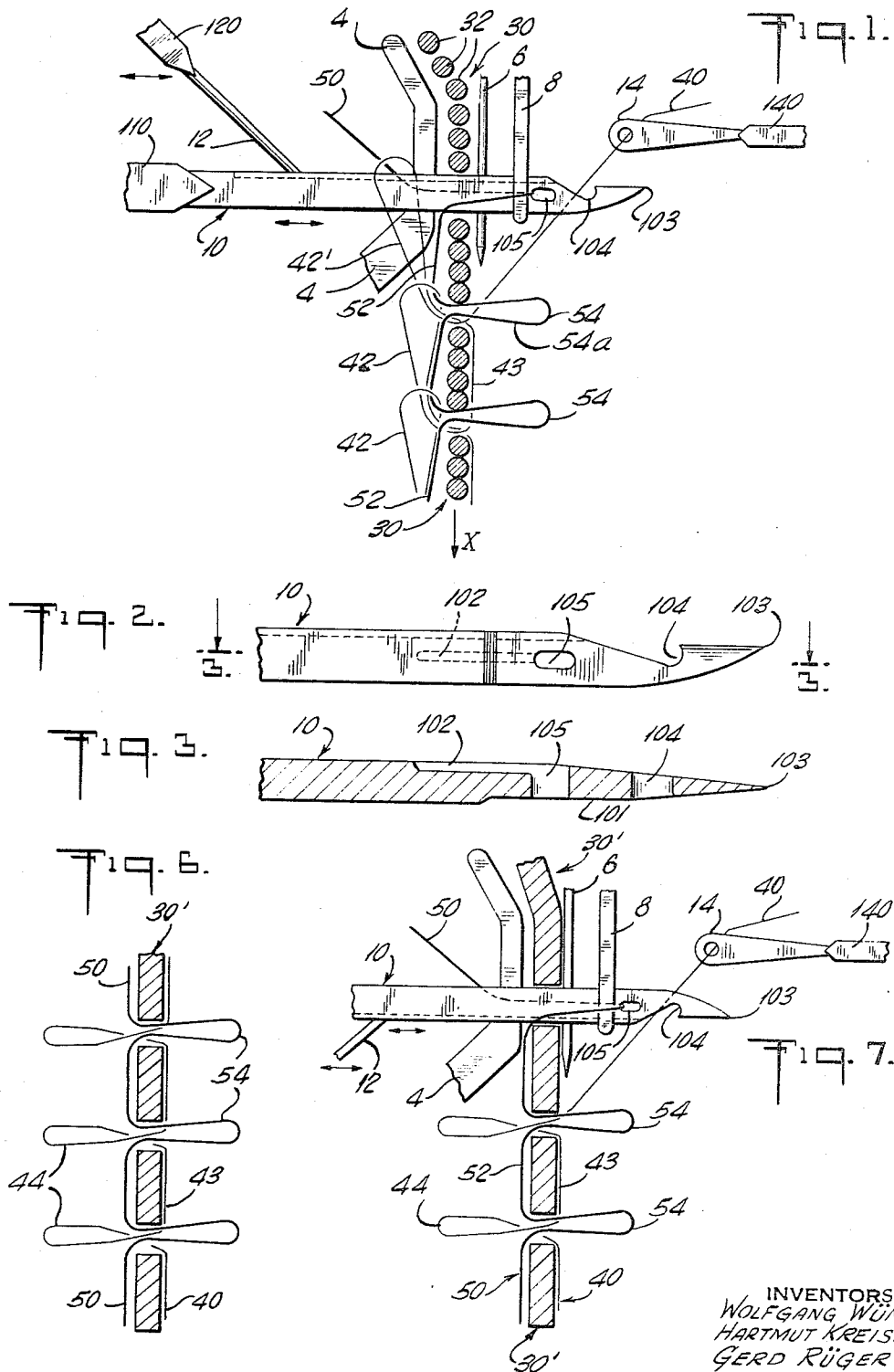


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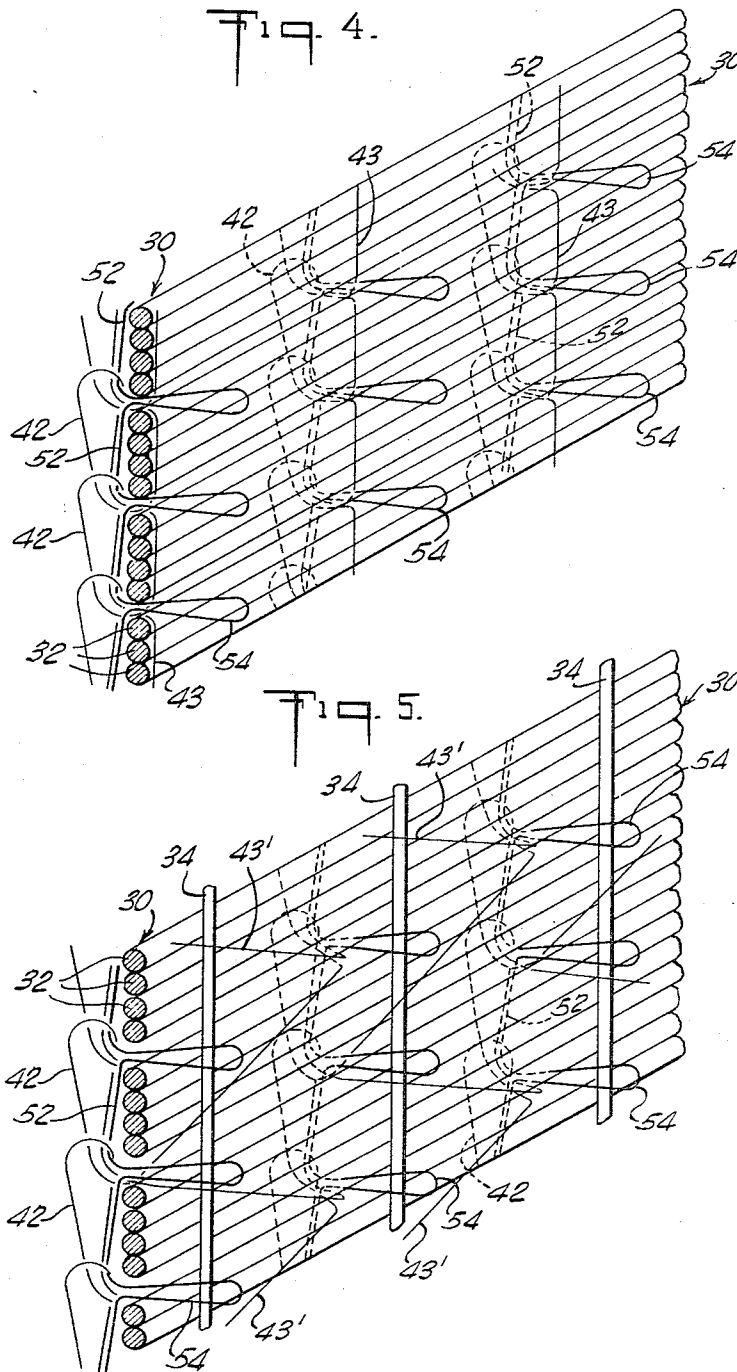
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KNITTING MACHINES FOR THE PRODUCTION OF PILE FABRICS

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3 Sheets-Sheet 2



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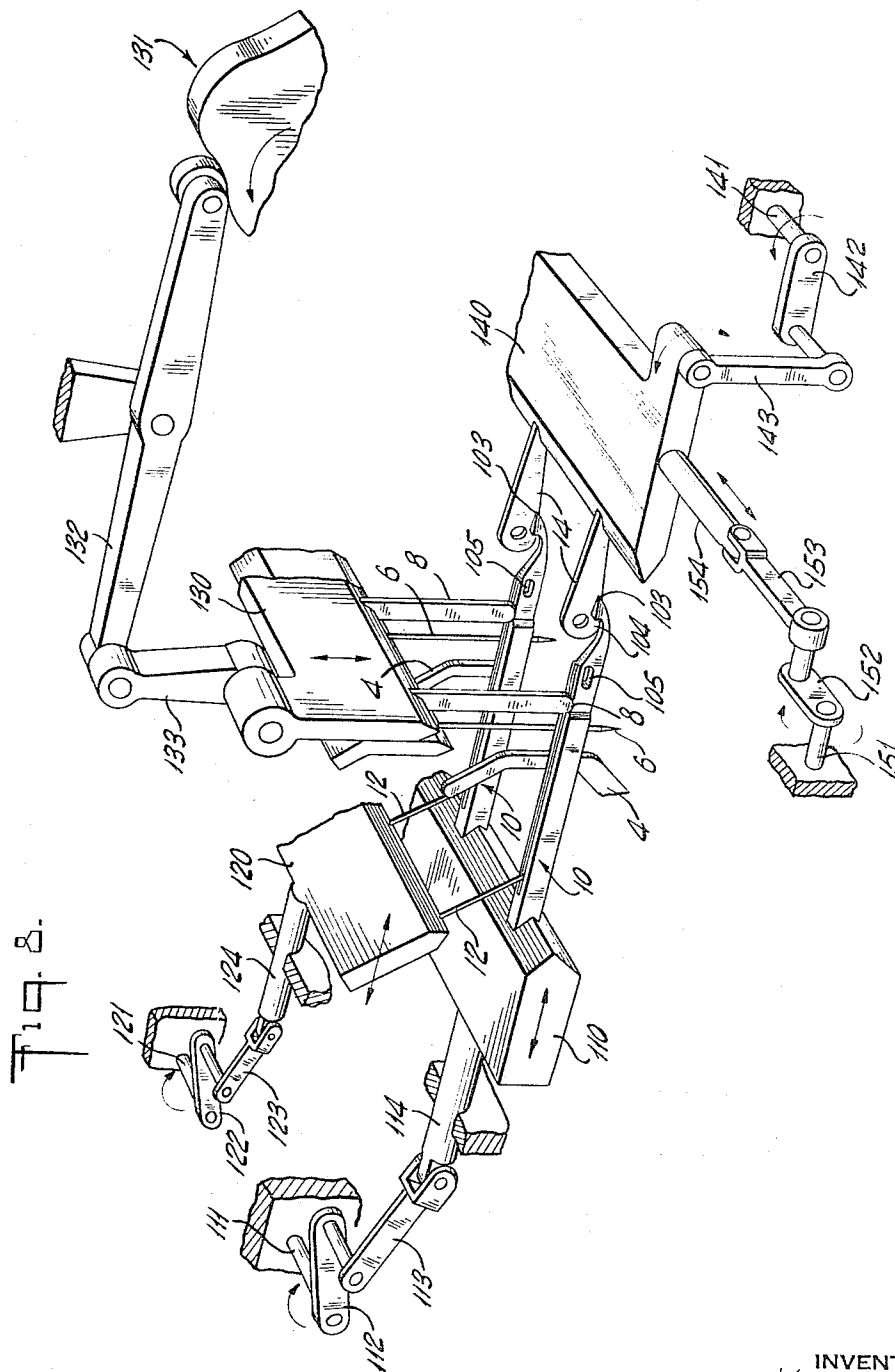
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3 Sheets-Sheet 3



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KNITTING MACHINES FOR THE PRODUCTION OF PILE FABRICS

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The present invention relates to novel pile fabrics and to machines for the production thereof. More particularly, it relates to a machine provided with eye needles, the pile warp threads being guided through the eyes, holders being provided which hold the pile loops that are formed into needle loops as they are drawn into the backing or base fabric.

On the known machines called "Tufter" only one thread chain can be worked with the needles, and this is the pile thread chain. The pile fabric made on this machine, therefore, consists only of the foundation or base fabric and of the warp threads forming the pile cover.

As opposed to this known art, the present invention serves the purpose of using the eye needles for simultaneously introducing a second thread chain which is an expedient that is most advantageous in several respects. With this invention, for instance, it is possible to tie the plush loops to the base with the second thread system. This possibility can be exploited when the loops are drawn into a fabric base made of a finished material. If, however, the base is made out of filling yarns or threads which are connected by wales including a plurality of stitches, the second thread system can be used to tie the plush loops and to fill the function of interlacing the filling threads.

It is known to tie every needle loop, constituting a pile or plush loop, to the base fabric by means of a second thread. In this case, the machine has to be equipped with an additional eye needle for the second thread, and further provided with a separate hook or latch needle for said additional eye needle, so that each pile thread position includes a total of three needles.

The present invention also affords the opportunity to form a second pile cover, consisting also of needle loops, on the back side of the fabric, by means of the second thread chain. Heretofore this was not possible as long as eye needles were used for pulling in the actual pile chain threads. It is already known to use hook needles for making pile covers onto a base fabric. In this case, a second pile cover can still not be formed from pile loops consisting of needle loops.

There are bobbin embroidery machines which have needles provided with two eyes and, therefore, can be used for two warp threads. However, these two threads are used alternately. Especially with these needles it is not possible to draw into the base or backing two loops in opposite directions.

It is the object of the invention to provide a novel pile fabric and a machine for the production thereof, incorporating novel features which avoid the drawbacks and inadequacies of hitherto known installations.

It is another object of the invention to provide a pile fabric machine adapted to apply a second warp thread, the loops formed thereby being drawn into the base in a direction opposite to the loops of the first or regular warp thread.

According to one of the important features of the present invention, needles are used which have hooks in front of their eyes, a guide bar being provided for applying second warp threads into these hooks.

According to another feature, the needle hooks may be turned away from, or alternately face, the fabric take-

up end of the machine. In the latter case, the loops formed by the second thread chain are knocked off on the back side of the base fabric in order to make a second pile cover.

Yet another novel feature of the invention contemplates the turning of the needles by about 180° about their axes, whereby pile loops and interconnecting runs of thread may be formed from the second warp thread.

The invention contemplates the making of loops on the reverse side of the base fabric which are tied in as independent chain or wale stitches. The same loops may, alternately, form a tricot binding on the reverse side.

Other objects and advantages of the invention will be appreciated and more fully understood with reference to the following detailed description, when considered with the accompanying drawings, wherein

FIG. 1 is a somewhat schematic cross-sectional view of the pile thread looping section of the inventive machine;

FIG. 2 is a side view of a notched and grooved needle, partly broken away, as used in the mechanism shown in FIG. 1;

FIG. 3 is a cross section taken along line 3—3 of FIG. 2;

FIG. 4 is a partly sectional perspective view of a first pile or plush fabric made according to the invention, the second thread system forming chain stitches in simple wales;

FIG. 5 is a view, similar to that of FIG. 4, of another inventive pile fabric, the second thread system forming tricot stitches;

FIG. 6 is a cross-sectional view of a third variant of a double-sided novel plush fabric according to the invention;

FIG. 7 is a sectional view, similar to that of FIG. 1, of a modification of the inventive machine, for making the double plush fabric according to FIG. 6; and

FIG. 8 is a somewhat schematic perspective view incorporating elements of FIG. 1 and showing the operating elements for the major machine parts of the pile thread looping section.

FIG. 1 shows a machine for making the novel pile fabrics according to the invention, while FIGS. 2 and 3 show the needle used therein. Although some machine elements have been omitted for the sake of clarity, the operation will be clear from the following description.

The machine partly shown in FIG. 1 is equipped with reciprocating needles 10, to be described in detail hereunder, a stationary knockover comb 4, retaining pins 6 for preventing movement of the base fabric when the needles pass therethrough, loop holders 8 and a guide unit bar 140 for a plurality of thread guides 14. The loop holders 8 are movable at right angles with respect to the direction of reciprocation of needles 10. The loop holders are also adapted to perform a movement in the direction of reciprocation of the needles in order to determine the length of the pile loops.

The pile loop threading section illustrated in FIG. 1 also comprises a closing wire 12 adjacent to each needle 10. In a conventional manner, there is one thread guide 14 for each needle 10. The needles are attached to a common bar 110, while the loop holders 8 and closing wires 12 have respective common actuating bars 130 and 120, to be described later in detail, together with the guide unit bar 140, with reference to FIG. 8.

It is advisable to provide a notch 101 in each needle 10 on the side where the loop holders 8 are active, as shown in FIG. 3. On the other side of the needles, it is recommended to apply grooves 102 for guiding the pile-warp threads when near the base fabric, as will be explained later. As shown in FIGS. 2 and 3, the free ends of the needles are pointed at 103; the needles are

equipped with hooks 104 and eyes 105 somewhat behind the hooks. The hooks open opposite the direction of the cloth take-up (arrow X), as shown in FIG. 1.

A foundation or base fabric 30 is schematically shown in section. The fabric is advanced through the machine in the direction of arrow X by conventional means (not illustrated). The fabric 30 may be a finished material, made in a preceding operation, e.g. a woven backing. In the machine embodiment of FIG. 1, and the plush fabrics illustrated in FIGS. 4 and 5, a plurality of weft-wise filling threads 32 are shown. In an alternative plush fabric, loose warp threads 34 may be added to the threads 32 (see FIG. 5). A pile warp 50 is led through the needle eyes 105 while a second warp thread 40 is led through guides 14 for being placed into the needle hooks 104.

The needles are preferably compound needles. The wire 12 closes the needle hook 104 when the needle is withdrawn through the base fabric 30 by means known in the art.

Each pile warp 50 forms needle loops which are drawn from the back of the fabric 30 to its front, on effect of the reciprocation of needles 10, so as to form plush or pile loops 54 (see right-hand side of FIG. 1). The length of these loops 54 is determined by the afore-mentioned parallel movement of the loop holders 8. Each warp thread 40, on the other hand, forms second needle loops 42 and sinker loops 43 on the front side of the fabric 30. The closing wire 12 closes hook 104 of each needle 10 so that comb 4 knocks off each last needle loop 42' over the just formed loop 42 of the second thread 40.

With reference to FIG. 8, it should be noted that needle bar 110 is driven by a rotating shaft 111 having thereon cranks 112, the latter being connected with bolts 114 by way of intermediate members 113. Bolts 114 are rigid with bar 110 and are guided for axial movement in the machine frame.

Bar 120 for closing wires 12 is driven by another rotating shaft 121 having cranks 122 connected therewith, the latter being connected with bolts 124 by way of intermediate members 123. Again, bolts 124 are rigid with bar 120 and are axially guided in the frame.

Bar 130, provided for loop holders 8, is driven by way of at least one cam disc 131 by the intermediary of a fixedly supported double-armed lever 132 and an intermediate member 133.

Finally, common bar 140 of thread guides 14 is reciprocated along its longitudinal axis and is pivoted about studs 154 attached to the ends of bar 140. The pivoting is accomplished by means of a shaft 141 by way of intermediate members 143 and cranks 142. The axial movement of bar 140, on the other hand, is accomplished by way of another shaft designated 151 having a crank 152 and an intermediate member 153 attached thereto, the latter being connected to one of the studs 154.

The operation of the thread looping section is as follows: While the needles 10 are in their foremost position, as shown in FIG. 1, the base fabric 30 being retained by the pins of comb 6, the guide unit bar 140 feeds them with the second warp thread 40 by way of the individual guides 14. Owing to the orientation of needle hooks 104, each thread guide feeds its thread only onto a single needle (chain stitch), the second warp thread 40 being thus worked in simple chain wales, as seen in FIGS. 1 and 4.

The needles 10 then retract so that the needle loops forming the plush loops 54 expand, as on a sewing machine. The loop holders 8, actuated by the elements just described, reach from above into these needle loops.

During the described process, and unlike the pile loops 54, the loops of the thread forming the needle loops 42 are drawn from the front to the back of the base fabric 30. The threads of the second group 40 then interlace the filling threads in case the latter are guided to the looping section of the machine by a system of two

conveyors, as has been disclosed in U.S. Patent 3,030,786 (now under reissue proceedings) of H. Mauersberger, entitled "Textile Material and Manufacture." The threads 40 of the second system have the main function of tying the plush loops 54 to the base fabric 30; this also occurs if the base is a woven material, as will be explained with reference to FIGS. 6 and 7. The tying of the loops 54 is accomplished by way of their shanks 54a gripping the heads of the needle loops 42, caused by the drawing in of the two needle loops in opposite directions.

FIG. 4 shows the pile fabric made with the machine according to FIG. 1, the second thread system forming chain stitches in simple chain wales, as shown at 42, 43.

As seen in FIG. 5, the second warp thread 40 can also form tricot stitches by feeding this thread alternately to two adjoining needles 10. The result is a fabric as shown wherein transversal thread portions or sinker loops 43' between adjoining wales can serve for tying loose warp threads 34 to the base fabric 30.

As mentioned above, the pile thread looping section of the machine may be set up according to FIG. 7 wherein the hooks 104 of the needles 10 open in the direction of fabric take-up, that is in the direction of arrow (FIG. 1). The arrangement of the co-operating elements is as shown in the illustration which does not need further explanation. In FIG. 7 some elements, like bars 110, 120, have been omitted for the sake of clarity.

In this embodiment, also the second thread system 40 can be drawn into the base fabric 30' in the form of pile loops 44. The hooks 104 in this case act like the eyes 105 of the needles 10 and the last drawn-in needle loops formed by warp threads 40 fall off the hooks 104 when the needles are in their rearward or retracted position. The closing wires 12, of course, have to be retracted. This construction of course precludes any tie-in warp chains to lock the pile loops to the base.

This set-up creates a double-sided plush material as illustrated in FIG. 6. On the right-hand side of the pre-woven fabric 30', the pile cover is formed by the plush loops 54 of the pile warp 50, while on the left-hand side, a second pile cover is constituted by the plush loops 43 of the second warp thread 40. This double-sided material can be made only when using a solid fabric as a base, as illustrated.

The foregoing disclosure relates only to a preferred embodiment of the invention, which is intended to include all changes and modifications of the examples described within the scope of the invention as set forth in the appended claims.

We claim:

1. In a machine for producing pile fabrics from a foundation and at least two thread chains, and having therein a plurality of reciprocable needles positioned for piercing the back side of said foundation and a plurality of thread guides positioned on the front side of said foundation, the improvement comprising eye needles having hooks therein between the eye and the point of the needle, means for reciprocating said needles to draw a loop from one thread chain from said back side to said front side, means for applying another thread chain into said hooks to draw a loop from said front side to said back side, and means to form pile loops at least from one of said thread chains on reciprocation of said needles.

2. In a machine for producing pile fabrics the improvement according to claim 1, wherein said hooks face away from the direction in which said foundation is advanced, whereby said other thread chain is formed into longitudinal wales.

3. In a machine for producing pile fabrics, the improvement according to claim 1, wherein said hooks face in the direction in which said foundation is advanced, whereby said other thread chain is formed into pile loops on the side of said foundation opposite to that where said one thread chain is formed into pile loops.

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