April 9, 1963 R. T. CARD 3,084,645

METHOD AND APPARATUS FOR TUFTING CUT PILE AND LOOP PILE IN THE SAME ROW OF STITCHING

Original Filed March 10, 1960 3 Sheets-Sheet 1

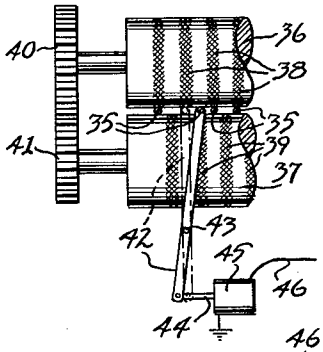

Fig. 2

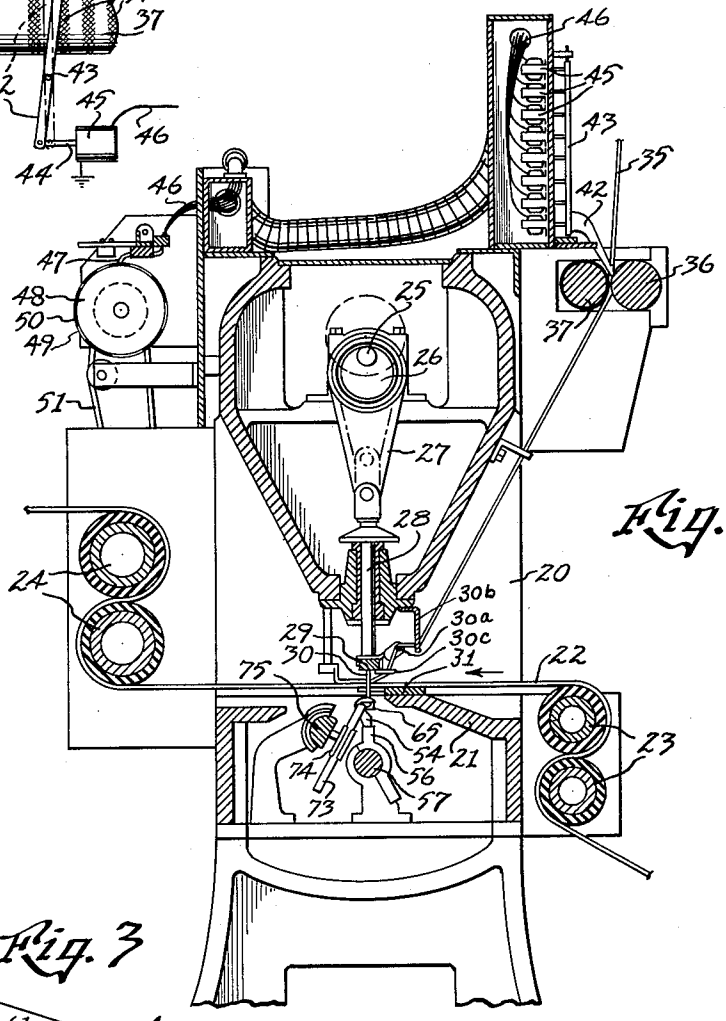

Fig. 1

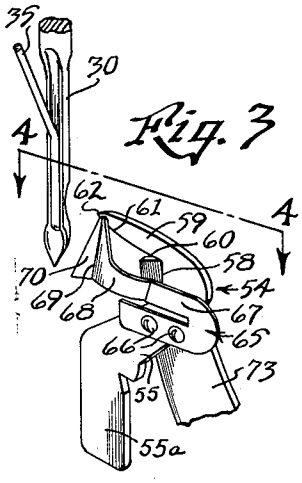

Fig. 3

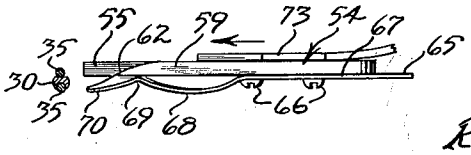

Fig. 4

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Original Filed March 10, 1960 3 Sheets-Sheet 2

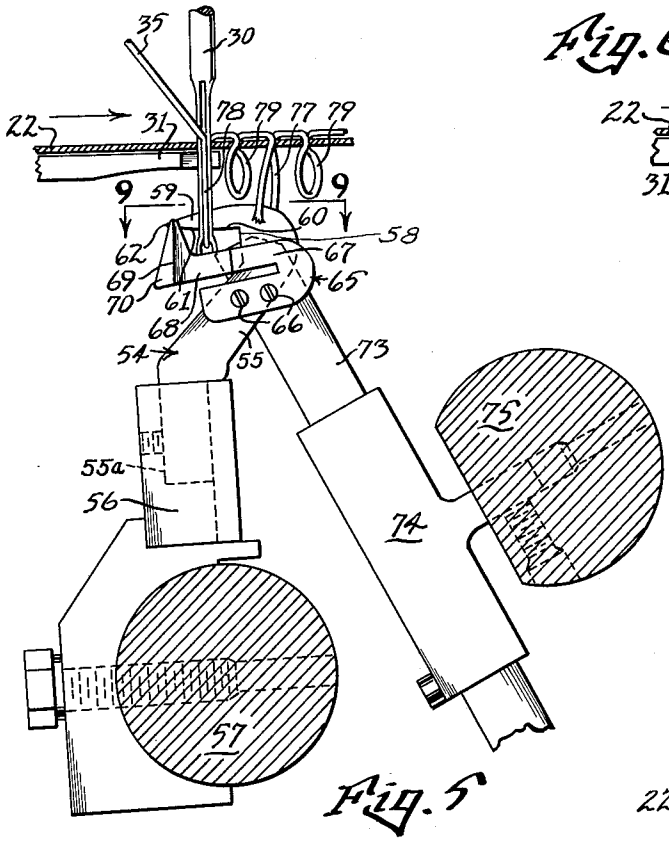

Fig. 5

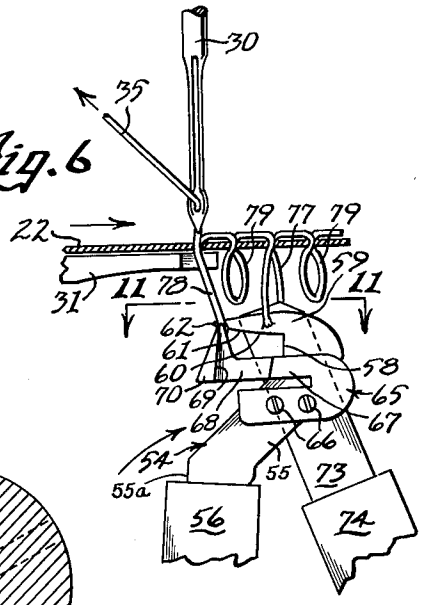

Fig. 6

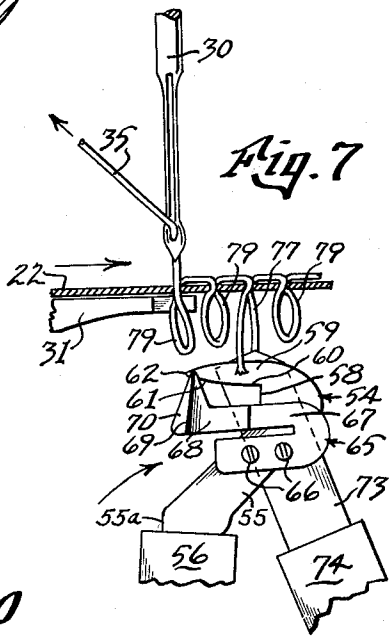

Fig. 7

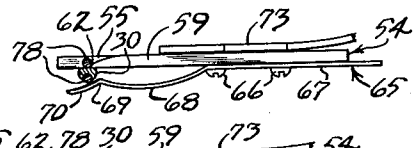

Fig. 8

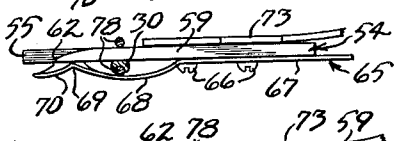

Fig. 9

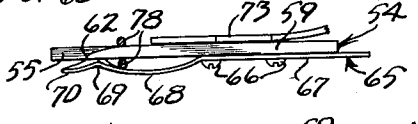

Fig. 10

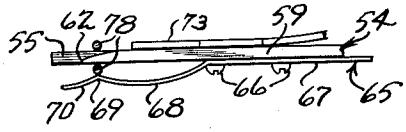

Fig. 11

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April 9, 1963 R. T. CARD 3,084,645

METHOD AND APPARATUS FOR TUFTING CUT PILE AND LOOP PILE IN THE SAME ROW OF STITCHING

Original Filed March 10, 1960 3 Sheets-Sheet 3

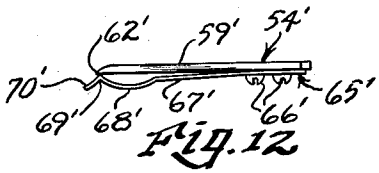


Fig. 12

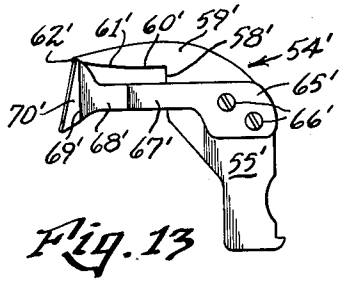


Fig. 13

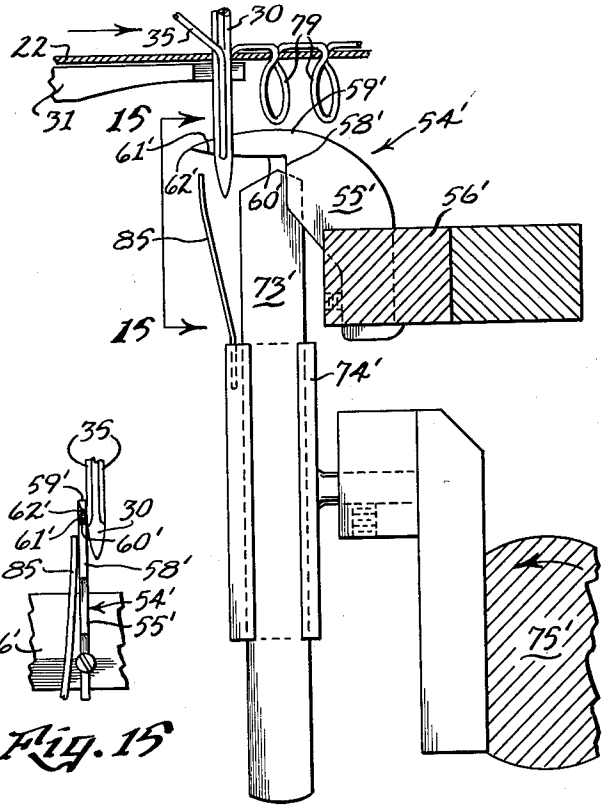


Fig. 14

Fig. 15

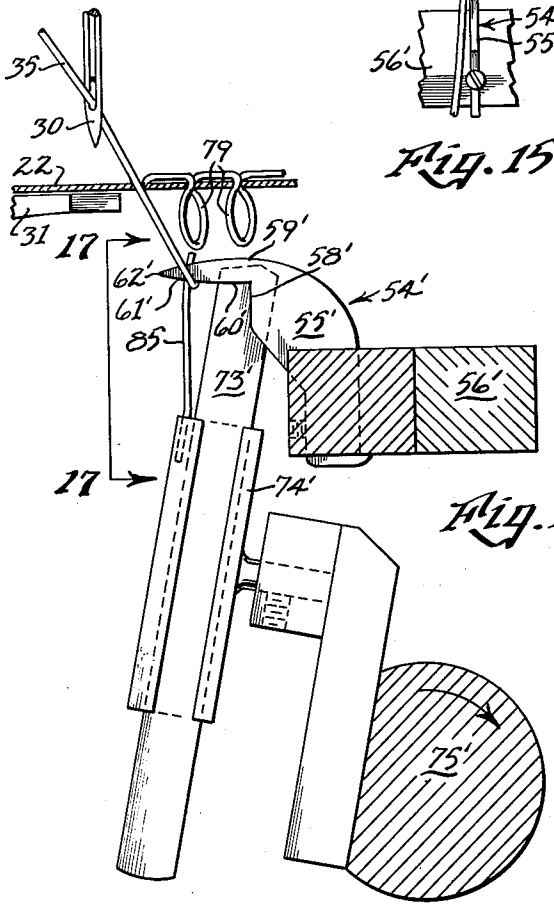
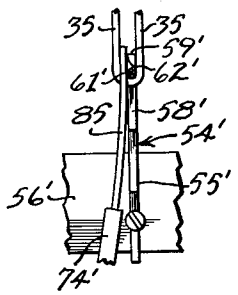


Fig. 16

Fig. 17



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United States Patent Office

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Patented Apr. 9, 1963

3,084,645

METHOD AND APPARATUS FOR TUFTING CUT PILE AND LOOP PILE IN THE SAME ROW OF STITCHING

Roy T. Card, Chattanooga, Tenn., assignor, by mesne assignments, to Singer-Cobble, Inc., a corporation of Delaware

Continuation of application Ser. No. 14,034, Mar. 10, 1960. This application July 26, 1962, Ser. No. 217,233

17 Claims. (Cl. 112—79)

This application is a continuation of application Serial No. 14,034, filed March 10, 1960, now abandoned.

This invention relates to a method and apparatus for selectively forming cut pile and loop pile in the same row of stitching in a tufted fabric, and more particularly to the novel construction and positioning of a hook in a tufting machine for carrying out such a method.

Heretofore, in making tufted fabrics, several methods have been employed for patterning the fabric by an arrangement of cut pile and loop pile in the fabric, for example, by carving or by providing a pattern controlled loop engaging finger associated with a cut pile hook for selectively removing loops off the hook before they are cut and thereby forming loop pile. None of these however have been commercially satisfactory in that they are uneconomical, or are complicated and troublesome in operation. Accordingly, the object of this invention is to provide a simple and reliable mechanism for forming tufted fabrics having a patterned arrangement of cut pile and loop pile.

Another object of this invention is to provide in a tufting machine a hook adapted to point in the direction opposite the fabric feed and having a resilient finger or a spring clip associated with the hook to prevent any loops from slipping off the free end of the hook until the yarn is backdrawn.

A further object of this invention is to provide a multiple needle tufting machine having an improved mechanism for producing in a tufted fabric an unlimited variety of patterned arrangements of cut pile and loop pile.

In accordance with this invention, there has been provided in a tufting machine a hook and cooperating knife arranged normally to form cut pile, together with means for selectively backdrawing the yarn to pull selected loops off the free end of the hook before they are cut by the knife in order to form loop pile. The means for selectively backdrawing the yarn comprises a pattern controlled yarn feeding mechanism which feeds to the needles upon each stitch an amount of yarn that is either adequate or inadequate to accommodate the yarn requirements of the system, whereby, when there is an inadequate amount of yarn fed to accommodate the yarn requirements of the system, the yarn will be tensioned, causing the loop to be pulled off the hook. To permit the loops to slip off the hook when the yarn is backdrawn, the hook is formed with a bill having a smooth bottom edge, and to insure that the loops will not accidentally slip off the hook unless and until the yarn is backdrawn, there is provided a resilient finger or a spring clip associated with the hook.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the drawings, wherein:

FIG. 1 is a vertical sectional view transversely of a multiple needle tufting machine made in accordance with this invention;

FIG. 2 is a fragmentary schematic top plan view of the pattern control mechanism;

FIG. 3 is a perspective view of a preferred form of the hook and needle in an operative position preparatory to forming a loop;

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 3;

FIG. 5 is an enlarged vertical sectional view looking in the opposite direction from FIG. 1 disclosing a second operative position of the hook relative to the needle;

FIG. 6 is a fragmentary view similar to FIG. 5 disclosing a third operative position of the hook relative to the needle and wherein the loop is being backdrawn from the hook;

FIG. 7 is a view similar to FIG. 6 disclosing a fourth operative position of the hook relative to the needle and wherein the loop has been backdrawn from the hook;

FIG. 8 is a view similar to FIG. 4 disclosing the needle spreading the spring clip away from the hook as the hook enters the loop of yarn on the needle;

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 5;

FIG. 10 is a view similar to FIG. 9 with the needle in raised position;

FIG. 11 is a sectional view taken along line 11—11 of FIG. 6;

FIG. 12 is a view similar to FIG. 4 of a slightly modified form of hook;

FIG. 13 is a side elevational view of FIG. 12;

FIG. 14 is a side elevational view of another modified form of hook and loop retaining means in loop forming position;

FIG. 15 is a sectional view taken along the line 15—15 of FIG. 14;

FIG. 16 is a view similar to FIG. 14 disclosing the hook in cutting position; and

FIG. 17 is a sectional view taken along the line 17—17 of FIG. 16.

Referring now to the drawings in more detail, FIG. 1 discloses in cross section a multiple needle tufting machine comprising a frame or housing **20** having a bedplate **21** adapted to support the base fabric **22** which is fed through the machine from the front to the rear by means of fabric feed rolls **23** and **24**. The needle drive means comprises a horizontal rotary shaft **25**, which may be driven by any suitable power means, not shown. Intermediate its ends, the shaft **25** is provided with a plurality of eccentrics **26** operatively associated with connecting rods **27** to reciprocate vertically the push rods **28** and needle bar **29**. The needle bar **29** supports a plurality of aligned needles **30** adapted to penetrate the fabric **22**. A slotted needle plate **31** is mounted on top of the bedplate **21** to support the base fabric **22** while the needles **30** reciprocate therethrough.

A yarn **35** is supplied to each needle **30** by any convenient type of yarn feed mechanism which may be controlled to feed individual yarns selectively at various speeds to the needles. By way of illustration, the pattern control mechanism which is the subject matter of the United States patent of J. L. Card, No. 2,935,037, May 3, 1960, is disclosed in FIGS. 1 and 2 for supplying the yarn **35** at slow and fast speeds. This pattern control mechanism comprises a pair of closely spaced parallel feed rolls **36** and **37**, each feed roll having respectively uniformly spaced circular yarn-gripping bands **38** and **39** made of frictional material, each band being adapted to engage and feed a yarn at the peripheral speed of the roll on which the band is located. The yarn gripping bands **38** on the roll **36** are staggered with respect to the yarn gripping bands **39** on the feed roll **37** in order that any yarn **35** passing between the rolls will be engaged either by a band **38** or a band **39** and permitted to slip on the surface of the opposite roll. Each feed roll **36** or **37** is driven at a different speed from

the other feed roll. Although either feed roll 36 or 37 may be positively driven from a suitable power source, not shown, the large gear 40 fixed to the shaft of the feed roll 36 and meshing with the smaller gear 41 fixed to the shaft of the feed roll 37 will cause the rear feed roll 37 to rotate at a faster speed than the front feed roll 36. Thus, a yarn 35 engaging a front feed roll band 38 will be fed at a slower rate than a yarn 35 engaging a rear feed roll band 39.

Mounted above the yarn feed rolls 36 and 37 is a yarn shifting finger 42 pivoted on a vertical spindle 43 and adapted to shift yarns longitudinally of the rolls 36 and 37 to permit a pair of adjacent yarn gripping bands 38 and 39 alternately to grip the yarn 35 carried by the corresponding finger 42. The opposite end of the shifting finger 42 is pivotally connected to the armature 44 of a solenoid 45, to permit pivotal movements of the finger upon energization or de-energization of the solenoid 45. Each solenoid 45 is individually controlled through an electrical lead 46 connected to a pattern drum finger 47. Each finger 47 is adapted to engage the surface of a rotating pattern drum 48 when the finger 47 rides in a slot 49 of a pattern sheet 50 to close the electrical circuit between a power source, not shown, and the respective solenoid 45. When the pattern finger 47 rides on the surface of the pattern sheet 50, electrical contact is broken so that the solenoid 45 will become de-energized and the shifting finger will be permitted to return to its original position. The pattern drum 48 is rotated by means of a belt 51 which is connected to a suitable driving source, not shown. As best disclosed in FIG. 2, the yarn shifting finger 42, disclosed in solid lines, maintains its corresponding yarn 35 in contact with a yarn gripping band 39 of the fast feed roll 37 when the pattern drum finger 47 engages the solid surface of the pattern sheet 50 to inactivate the solenoid 45. When the pattern finger 47 engages a slot 49 to close the electrical circuit to the solenoid 45, the armature 44 is drawn in, causing the yarn shifting finger 42 to pivot 50 to the dashed line position and move its corresponding yarn 35 to engage the adjacent yarn gripping band 38 of the slower yarn feed roll 36. A yarn-jerker 30*a* is carried by the needle bar 29 and operates to engage the lead of the yarn 35 between a stationary yarn guide 30*b* on the frame of the machine and a yarn guide 30*c* carried by the needle bar 29. On the down stroke of the needle bar 29 as the needles 30 penetrate the fabric 22, the yarn-jerker 30*a* functions to release yarn, while on the upstroke of the needle bar 29 as the needles 30 are withdrawn from the fabric, the yarn-jerker functions to take up yarn. Thus, when the amount of yarn fed upon any stitch by the yarn feed mechanism is not adequate to accommodate the take up action of the yarn-jerker, and since the supply lead of the yarn is in effect anchored by the yarn feed rolls 36 and 37, the yarn-jerker will tension the yarn and will thereby withdraw yarn from the work. This action of withdrawing yarn from the work is herein referred to as backdrawing.

The tufting machine and elements thus far described are old in the art.

This invention is concerned with the formation of cut pile and loop pile in the same row of stitching by normally forming cut pile on a hook somewhat resembling a conventional cut pile hook, and selectively backdrawing yarn from the hook before the loop can be fed far enough along the hook to be cut by the knife. In order to carry out this invention effectively, a hook 54 of novel construction is employed. The hook 54 comprises a shank 55 having a mounting portion 55*a* which is inserted in a reciprocable hook bar 56 mounted transversely of the machine on a shaft 57 adapted to be reciprocated by mechanism, not shown, in a conventional manner. The shank 55 extends upwardly at an angle from the mounting portion 55*a*. From the upper end

of the shank 55 there extends a bill 59 that defines with the shank a throat 58. The bill 59 extends in the direction of stitching and in the opposite direction of fabric feed. The bottom edge 60 of the bill 59 extends from the throat 58 substantially normal to the axis of the shank 55 for about two-thirds the length of the bill, at which point the bottom portion 61 of the bill 59 slopes upward toward the top edge to form therewith a sharp point 62 at the free end of the hook 54.

Secured to one side of the hook 54 is a resilient finger or spring clip 65 having one end fixed to the body portion 55*a* of the shank 55 by any convenient means, such as screws or pins 66. The finger or clip 65 extends substantially parallel to and spaced below the bill 59 in a substantially straight portion 67. The clip 65 then bends outwardly away from the hook 54 into a gradual arcuate portion 68 which curves back in to engage the pointed end 62 by means of a straight creased portion 69. The spring clip 65 has an end portion 70 that flares outwardly away from the hook 54 and the creased portion 69 at such an angle as to engage and guide the needle 30 between the bill 59 and the spring clip 65 when the hook 54 moves toward engagement with a loop carried through the base fabric 22 by the needle 30.

Mounted on the opposite side of the hook 54 from the spring clip 65 is a knife 73 supported in a conventional manner by a knife holder 74 mounted on the reciprocable knife shaft 75. The knife shaft 75 may be reciprocably rotated by any conventional drive means not shown. The knife 73 is adapted to reciprocate and cooperate with the bill 59 and throat 58 in the same manner as a conventional knife and cut pile hook to produce cut pile 77 in the yarn 35.

The operation of the invention is best disclosed in FIGS. 1–11. With the tufting machine in operation, the fabric feed rolls 23 and 24, the main drive shaft 25, the yarn feed rolls 36 and 37, and the pattern drum 48 are simultaneously rotated, and the hook shaft 57 and knife shaft 75 are simultaneously reciprocated to cooperate with each other in synchronous relationship. As each needle 30 is pushed down through the base fabric 22, the hook 54 and the knife 73 are retracted to their extreme rearward positions, substantially shown in FIG. 7. When the needle 30 descends to its lowermost position, carrying the yarn 35 through the base fabric 22, the hook 54 begins its movement toward the front of the machine in the direction opposite the fabric feed, as best disclosed in FIGS. 3 and 4. Continued forward movement of the hook 54 will cause the flared portion 70 to engage and be moved outwardly by the needle 30, so that the hook bill 59 may pass between the needle 30 and one leg of the yarn loop 78, as best disclosed in FIG. 8. As the bill 59 continues its forward passage through the loop 78, the needle 30 enters the curved portion 68 of the spring clip 65, which returns to its original position with the creased portion 69 resting against the bill 59 and with clearance between the needle 30 and the curved portion 68, as best disclosed in FIGS. 5 and 9. While the hook 54 is momentarily in its forwardmost position, the needle 30 will move upward to become disengaged from the bill 59, with the creased portion 69 still engaging the bill 59 to prevent the loop 78 from normally slipping over the pointed end 62 when the hook 54 reciprocates toward its rearmost position. During this operation, the yarn 35 is normally being fed to the needle 30 by its corresponding yarn gripping band 39 on the fast feed roll 37. Upon subsequent stitches, these loops 78 will be fed toward the throat 58 by virtue of the feeding of the fabric 22 where the loops 78 will be cut by the knife 73 to form cut pile 77.

When it is desired to form uncut loops 79 in a row of stitching, the pattern finger 47 will engage a notch 49 in the pattern sheet 50 to close the electrical circuit, thereby energizing the solenoid 45 to cause the armature

44 and yarn shifting finger 42 to assume the dashed line position of FIG. 2 and to shift the yarn 35 from the yarn gripping band 39 to the adjacent yarn gripping band 38 of the slow-speed feed roll 36. When the yarn 35 is controlled by the slow-speed feed roll 36, the yarn 35 will be backdrawn from the loop 78, which is still held on the bill 59 by the spring clip 65. The backdrawing of the yarn 35 provides sufficient tension to draw the loop 78 toward the pointed end 62 and force the creased portion 69 to separate from the bill 59, as disclosed in FIGS. 6 and 11, and thereby permit the loop to escape between the bill 59 and the flexed spring clip 65 to be entirely removed from the hook 54 and form the short uncut loop 79, as best disclosed in FIG. 7. Continued rearward movement of the hook 54 will also provide additional tension in the yarn 35 to assist in removing the loop 79, although this invention contemplates backdrawing yarn from a stationary hook if desired to remove an uncut loop from the hook. The strength of the spring clip 65 is pre-selected to flex only when forced by a backdrawn loop 78 or by the needle 30. Thus, selective feeding of the yarn 35 at different speeds by means of the pattern control mechanism will cause the formation of long cut pile 77 and short uncut or loop pile 79 in the same row of stitching. Selective speed control of a plurality of yarns 35 in a multiple needle tufting machine will create any desired pattern of contrasting high cut pile and low loop pile, as determined by the pattern formed in the pattern sheet 50.

FIGS. 12–13 disclose a slightly modified form of hook 54^1 and spring clip 65^1. Although the shank 55^1 is of a different configuration from the shank 55 in order to set the hook 54^1 in a hook bar 56^1, such as that disclosed in FIGS. 14 and 16, having a different relative location from the needle 30 from that of the hook bar 56, the throat 58^1, bill 59^1, and the portions of the bill 60^1, 61^1, and 62^1 are still the same configuration as their corresponding parts 58–62. The spring clip or finger 65^1 is substantially straight throughout its length and secured to the shank 55^1 by means of the screws 66^1 in order to obtain the same relative spring pressure as the corresponding spring clip 65. The portions 67^1, 68^1, 69^1, and 70^1 are of the same configuration as their corresponding parts 67–70. Moreover, the modified hook 54^1 and spring clip 65^1 function the same as the hook 54 and spring clip 65.

FIGS. 14–17 disclose another modified form of the invention in which the hook 54^1 mounted in the hook bar 56^1 is adapted to cooperate with a spring finger 85 mounted on the knife holder 74^1. The hook bar 56^1, the hook 54^1, the knife shaft 75^1, knife holder 74^1, and the knife 73^1 are so mounted with respect to each other that the hook bar 56^1 and the knife shaft 75^1 may be simultaneously reciprocated in a manner similar to the hook bar 56 and the knife shaft 75 so that the knife 73^1 will cooperate with the closed end of the bill 59^1 to sever loops thereon. The spring finger 85 extends upward, spaced forward of the knife 73^1. The end of the finger 85 is adapted to remain spaced from the pointed end 62^1 in order to permit the bill 59^1 to pick up loops carried by the needle 30 as best disclosed in FIG. 14. When the needle 30 is raised and the hook 54^1 reciprocated away from the needle toward the rear of the machine, the rotation of the knife shaft 75^1 in a clockwise direction swings the finger 85 upwardly and rearwardly across and in contact with the bill 59^1 to close the free end of the hook and prevent any loops formed thereon from being removed from the free end of the hook when the yarn 35 is fed at the fast rate by the yarn roll 37, as best disclosed in FIG. 16. However, when the yarn 35 is backdrawn by engaging the slow feed roll 36, sufficient tension is developed in the loop held by the hook 54^1 to overcome the tension in the spring finger 85 and permit the loop to be withdrawn between the hook bill 59^1 and the finger 85 to be completely removed from the hook 54^1 to form an uncut loop 79. Otherwise, the modified form of the invention disclosed in FIGS. 14–17 functions in the same manner as the elements disclosed in FIGS. 1–13.

It is also possible to employ a spring clip similar to 65 and 65^1 adapted to be positively separated from engagement with the hook 54 or 54^1, respectively, by means of a movable or stationary cam mechanism. The camming operation would be timed to occur just previous to the hook crosing the needle 30 to permit the bill 59 or 59^1 to engage the loop.

It is also within the scope of this invention to use any type of pattern control mechanism or yarn feed mechanism which may be selectively operated to feed individual yarns at a normal fast rate and a slow enough rate to backdraw the yarn to release loops from the free end of the hook.

The modifications disclosed in FIGS. 1–13 are preferred over the modifications disclosed in FIGS. 14–17 because there is no relative movement between the spring clip 65 or 65^1 and the hook 54 or 54^1, nor is any special timing required.

It can also be appreciated that a conventional multiple needle tufting machine having cut pile hooks and cooperating knives for forming cut pile fabrics may be converted into the above described machine for forming selective areas of cut pile and loop pile according to any predetermined pattern, by merely exchanging the conventional cut pile hooks for the hooks 54 and spring clips 65 of this invention and by adding any conventional pattern control mechanism for feeding yarns at different speeds.

It will be apparent to those skilled in the art that various changes may be made in the invention, without departing from the spirit and the scope thereof, and therefore the invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

Having thus set forth the nature of this invention, what is claimed herein is:

1. In a tufting machine, means for feeding a base fabric in one direction, a yarn-carrying needle to penetrate the base fabric and form loops therein, means to reciprocate the needle, means for feeding yarn to said needle, a reciprocatory hook to enter the loops in succession and facing in a direction opposite to the direction of fabric feed, the feeding of the fabric moving the loops upon the hook toward its closed side, means for reciprocating said hook, a knife for cooperating with said hook to sever loops thereon when said hook has been moved away from said needle in the direction of fabric feed, means for reciprocating said knife, a spring clip fixed to said hook, said clip having a free end biased against said hook near its free end to permit the passage of a loop between the free ends of said hook and said clip when sufficient tension is exerted upon said loops, and means for selectively backdrawing yarn to pull loops from the free end of said hook when said hook reciprocates in the direction of fabric feed.

2. The invention according to claim 1 in which the free end of said spring clip is flared outwardly from said hook and is on the opposite side of the hook from said knife, said flared portion being adapted to guide said needle in its lowermost position between said spring clip and said hook as said hook reciprocates toward said needle.

3. The invention according to claim 1 in which said hook has a pointed bill the lower portion of which slopes upwardly to permit said backdrawn loops to slide off the free end of said hook when said hook reciprocates in the direction of fabric feed.

4. A method of tufting cut pile and loop pile in the same row of stitching comprising supporting a base fabric, stitching a yarn to form a row of successive yarn loops on one side of said fabric, supporting upon said one side of said fabric a hook, relatively moving the hook so that its free end enters the loops in succession, closing the

free end of said hook with yieldable means normally to prevent the withdrawal of loops from said hook, severing a selected loop upon the hook to produce cut pile and backdrawing yarn from another selected loop on said hook with sufficient tension to cause said other selected loop to move said yieldable means to open the free end of said hook and permit said other loop to withdraw from the free end of said hook to produce an uncut loop.

5. A method of tufting cut pile and loop pile in the same row of stitching comprising supporting and feeding a base fabric in one direction, stitching a yarn continuously through said base fabric as said fabric moves to form a row of successive yarn loops on one side of said fabric, supporting upon said side of said fabric a reciprocatory hook having a free end pointing in the direction opposite the fabric feed so that said free end enters the loops in succession, closing the free end of said hook with yieldable means normally to prevent the withdrawal of loops from said hook, severing a selected loop upon the hook to produce cut pile and backdrawing yarn from another selected loop on said hook with sufficient tension to cause said other selected loop to move said yieldable means to open the free end of said hook and permit said other loop to withdraw from the free end of said hook to produce an uncut loop.

6. In a tufting machine, means for supporting a base fabric, means for stitching a yarn continuously through said base fabric to form loops therein, a hook having a free end to enter the loops in succession and a closed end, means for relatively moving said loops upon said hook toward its closed end, yieldable means for engaging the free end of said hook normally to prevent the withdrawal of loops therefrom, and means for backdrawing said yarn to pull a loop with sufficient tension to cause said loop to force said yieldable means away from said free end to permit said loop to be withdrawn from the free end of said hook.

7. In a tufting machine, means for supporting a base fabric, means for stitching a yarn continuously through said base fabric to form loops therein, a hook having a free end to enter the loops in succession and a closed end, means for relatively moving said loops upon said hook toward its closed end, yieldable means for engaging the free end of said hook normally to prevent the withdrawal of loops therefrom, means cooperating with the closed end of said hook to sever selected loops thereon, and means for selectively backdrawing said yarn with sufficient tension from another loop to cause said other loop to force said yieldable means away from said free end to permit said other loop to be withdrawn from the free end of said hook to form an uncut loop.

8. The invention according to claim 7 in which means are provided for feeding said fabric in the direction of the closed end of said hook.

9. The invention according to claim 6 in which said yieldable means comprises a resilient finger biased toward engagement with the free end of said hook, the yarn tension provided by said backdrawing means being sufficien to separate said finger from said hook.

10. The invention according to claim 9 in which said finger is secured to said hook.

11. The invention according to claim 9 in which said severing means comprises a knife and means for reciprocating said knife to cooperate with said hook, said yieldable finger being mounted on said knife and adapted to engage the free end of said hook when said loops are being cut and to separate from said free end when the loops are not being cut.

12. The invention according to claim 6 in which the undersurface of said free end slopes upward in the direction of the free end to facilitate the withdrawal of loops therefrom.

13. A method of tufting cut pile and loop pile in the same row of stitching comprising supporting and feeding a base fabric in one direction, actuating a needle to stitch a yarn continuously through said base fabric as said fabric moves to form a row of successive yarn loops on one side of said fabric, supporting upon one side of said fabric a reciprocatory hook having a free end pointing in the direction opposite to the direction of fabric feed so that said free end enters the loops in succession, closing the free end of said hook with yieldable means normally to prevent the withdrawal of loops from said hook, feeding to said needle upon each stitch predetermined lengths of yarn that are inadequate to accommodate the yarn requirements of the system whereby yarn is backdrawn from the loop with sufficient tension to cause said loop to move said yieldable means to open the free end of said hook and permit said loop to withdraw from the free end of said hook or that are adequate to accommodate the yarn requirements of the system whereby said loop will remain on said hook, and severing those loops that remain on said hook.

14. In a tufting machine, means for feeding a base fabric in one direction, a yarn-carrying needle for pentrating the fabric and forming loops therein, means for reciprocating said needle; a reciprocatory hook for entering the loops in succession and facing in a direction opposite to the direction of feed of the fabric, means for reciprocating said hook, a knife for cooperating with said hook to sever loops thereon, means for reciprocating said knife, a spring clip fixed to said hook, said clip having a free end biased against said hook near its free end for normally maintaining loops on said hook and for permitting escape of said loops from said hook when sufficient tension is exerted on said yarn, and means for feeding to said needle upon each stitch predetermined lengths of yarn that are selectively adequate or inadequate to accommodate the yarn requirements of the system, whereby when an adequate length of yarn is fed the loop will remain upon said hook and be severed by said knife and when an inadequate length of yarn is fed the loop will be backdrawn from said hook.

15. A hook for use in a tufting machine, said hook being planar and comprising a shank having a mounting portion for mounting the same in the hook bar of a tufting machine and a bill extending from said shank to define a throat between said bill and said shank, said bill having a top edge and a smooth bottom edge that extends from said throat substantially normal to the axis of the shank and that, adjacent to the end of said bill, slopes smoothly toward said top edge to form a point therewith, and a spring clip secured to the body portion of said shank and extending generally in spaced parallel relation to said bill, said spring clip having a free end that resiliently engages said bill adjacent to said point.

16. In a hook in accordance with claim 15 wherein said lower edge of said bill adjacent to said throat is formed to cooperate with a knife to sever loops of yarn against said lower edge of said bill.

17. In a hook in accordance with claim 15 wherein the free end of said spring clip flares outwardly relatively to said bill from the point where said spring clip engages said bill.

References Cited in the file of this patent

UNITED STATES PATENTS

1,831,485	Dykeman	Nov. 10, 1931
2,589,340	Chambers	Mar. 18, 1952
2,842,079	Rice	July 8, 1958
2,876,441	Boyles	Mar. 3, 1959
2,879,728	McCutchen	Mar. 31, 1959
2,879,729	McCutchen	Mar. 31, 1959
2,882,845	Hoeselbarth	Apr. 21, 1959