METHOD OF AND APPARATUS FOR PRODUCING TUFTED PRODUCT HAVING UNSEVERED AND SEVERED LOOPS

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My invention relates to a method of and apparatus for producing tufted products.

An important object of the invention is to provide a method of producing severed and/or unsevered loops or tufts in the same row of tufts upon a fabric base, during the practice of the method.

A further object is to provide a novel and simplified apparatus to be used in the practice of the method.

A further object of the invention is to provide means which will securely hold the loops upon a looper, until they are severed, when it is desired to produce severed loops; said means operating to free the loops so that they may move off of the looper to produce unsevered loops, prior to the operation of the severing means, when unsevered loops are desired.

Another object is to provide tufting apparatus which may be embodied in a single needle or multiple needle machine.

Other objects and advantages of the invention will become apparent during the course of the following detailed description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same.

Figure 1 is a side elevation, partly diagrammatic, and partly in section, showing looper elements and associated parts of the apparatus employed in the practice of the method.

Figure 2 is an exploded perspective view of the looper elements.

Figure 3 is an enlarged fragmentary side elevation of the looper and other elements of the apparatus in a preliminary position during the practice of the method.

Figure 4 is a view similar to Figure 3 of the apparatus elements in a subsequent operative position during the practice of the method.

Figure 4a is a fragmentary edge elevational view of the apparatus elements looking from the left hand side of Figure 4.

Figure 5 is a further view similar to Figures 3 and 4 of the apparatus elements in a further operative position during the practice of the method.

Figure 6 is a further fragmentary side elevation of the apparatus elements in another adjusted position during the practice of the method.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 10 denotes the horizontal support or top included in a supporting frame 11 of a tufting machine.

A fabric base 12 travels upon the upper face of the top 10 and is intermittently fed to the right, Figure 1, as indicated by the arrows. The intermittent feed means for the fabric base 12 may include feed rollers 13 and 14 which are turned in the direction of the arrows. This is the feed means shown in Patent 2,879,729 to J. K. McCutchen. The invention is not restricted to any particular form of fabric feed means, however, and I also contemplate using the conventional dog feed means as shown in Patents 2,143,678 and 2,143,679 to Baggett et al. As should be obvious, the fabric base 12 is stationary when the needle descends and passes through the same to form a loop upon the looper, and the fabric is advanced a step when the needle is in the elevated position free of engagement with the fabric base.

The numeral 15 designates a vertical reciprocatory needle of the tufting machine, driven by conventional means, not shown, and 16 designates the usual presser foot, Figure 1. This construction is conventional and is shown in the McCutchen Patent 2,879,729.

Arranged beneath the horizontal top 10 and substantially below the needle 15 is a tufting hook or looper shaft 17, which is driven by and suitably timed with the drive shaft of the tufting machine. Rigidly mounted upon the rock shaft 17 is a first looper element 18, including an upstanding arm 19 and a generally horizontal head or bill 20. The looper element 18 includes an intermediate inclined portion 21, as shown. The bill or head 20 enters the loop as it is formed on the fabric base 12, and head or bill does not have the usual downturned hook at its free end, as shown in the drawings. The bill 20 faces to the left, Figure 1, or opposite to the direction of feed of the fabric base 12.

The numeral 22 designates a second looper element including a generally horizontal arm 23 and an upstanding portion 24, carrying a generally horizontal bill 25. At its free end, the bill 25 carries a downturned hook or keeper 26 for a purpose to be described.

The second looper element 22 is applied to and slidably contacts one side of the looper element 18, and the arm 23 is pivotally connected with the inclined portion 21 of the looper element 18, by a pin 27 or the like. The generally horizontal arm 23 is biased upwardly by a stiff leaf spring 28, having one end secured fixedly between lugs 29 formed upon the first looper element 18, near and above its lower end. The spring 28 bears upwardly against the lower longitudinal edge of the arm 23 of the second looper element 22. This arrangement normally maintains the downturned hook 26 somewhat below the lower horizontal edge of the bill 20 of the first looper element 18, as shown in full lines in Figures 3 through 5, and the hook or keeper 26 while in this position serves to positively retain the loops upon the side-by-side bills 20 and 25, so that the loops will be severed while upon these bills. A stop lug 30 on the forward side of upstanding arm 19 is engageable with the upstanding portion 24, as shown, to positively limit the downward movement of the hook or keeper 26 relative to the bill 20 without a hook, under influence of the spring 28.

When the arm 23 is swung downwardly to the position shown in broken lines in Figures 3 and 4, the bill 25 and hook 26 are swung upwardly with respect to the bill 20, and the downturned hook will no longer extend below the bill 20 and is preferably disposed slightly above the lower longitudinal edge of the bill 20, see Figure 6. Upward movement of the bill 25 and hook or keeper 26 is limited by a stop lug 31, rigidly secured to the upstanding arm 19 of the first looper element 18, and engageable with the portion 24 of the second looper element 22, as best shown in Figure 6.

A flexible element or cable 32 is secured to the free or outer end of the arm 23, as at 33, and this cable is
3 trained about a pulley 34 having a fixed support. When it is desired to raise the bill 25 and hook 26, the cable 32 is pulled in the direction of the arrow, and the second looper element 22 will be swung clockwise upon its pivot 27 toward the position shown in broken lines in Figures 3 and 4 and in solid lines in Figure 6. When the pull or tension on the cable 32 is relaxed, the leaf spring 28 automatically returns the second looper element 22 to its position shown in full lines in Figures 3 and 4. While I have shown the cable 32 moving the second looper element 22 to its pivot 27, the invention is in no sense restricted to this means, and the illustration in the drawings is for the purpose of explaining the operation of a single needle mechanism employed in the practice of the method. I may also employ a multiple needle machine with a plurality of pairs of the looper elements 18 and 22, and where this is done, the arms 23 may be moved automatically and controlled by conventional pattern mechanism or by electronic control means or the like.

The numeral 35 designates a horizontal rock shaft arranged beneath the top 10 and spaced from the rock shaft 17. The rock shaft 35 carries a laterally extending arm 36 having a cutting blade 37 rigidly secured thereto at 38. The cutter blade 37 has a top cutting edge 39 which slidably contacts the side face of the first looper element 18 remote from the second looper element 22. The cutter blade 37 has a shearing action with the lower cutting edge 40 of the bill 20 of the first looper element. This cutting arrangement is conventional and is shown in Patents 2,143,678 and 2,143,679 to Baggett et al.

The rock shafts 17 and 35 are turned in suitably timed order by the drive shaft of the tufting machine, so that the looper elements 18 and 22 will reciprocate in proper timing and rhythm with the rise and fall of the needles 13 and 14 and the intermittent feed of the fabric base 12. The timing means for the elements is conventional and well known and need not be dealt with herein. The second looper element 22 is of course bodily carried by the looper element 18 and reciprocates therewith as the rock shaft 17 turns. The rock shaft 35 imparts to the cutter blade 37 the proper oscillatory movement to effect the severing of the loops by the coaction of the cutting edge 39 against the bill 20. As best shown in Figure 4a, the needle 15 passes close to the side of the looper element 22 which is remote from the cutter blade 37.

Operation of the apparatus during the practice of the method is as follows:

When it is desired to produce severed loops upon the fabric base 12, the spring 28 holds the hook or keeper 26 in the lowered position with respect to the bill 20 and the hook 26 projects below both bills 20 and 25, which are in side by side relation. When the bills 20 and 25 enter the loop, Figure 4, the loop cannot escape from the bills 20 and 25 before being severed by the blade 37 as indicated in Figures 4 and 5. When the bill 25 is in the lowered position with respect to the bill 20, as explained, the needle 15 may descend and passes through the fabric base 12 and forms a loop L1 in and beneath the fabric base. When the needle reaches its lowermost position and moves up slightly, the looper elements 18 and 22 have moved forwardly or to the left sufficiently so that they will enter the formed loop L as the needle rises, Figures 5, 20, and 25. The loop L is held upon by the bill 25 by the downturned hook or keeper 26. As the needle rises, the looper elements 18 and 22 move rearwardly or to the right of the needle 15, Figure 5, and at this same time, the shaft 35 is rocked to raise the blade 37 which will sever the loop or loops upon the bills 20 and 25. This severing is assisted in the conventional and well known manner through the coaction of the cutter blade 37 and looper bill 20. The hook or keeper 26 projecting between the bills 20 and 25 positively holds the loop or loops upon these bills so that they will be severed before they can escape from the bills, and this is shown in Figure 5.

When it is desired to produce unsevered loops upon the fabric base 12, the cable 32 is pulled and the arm 23 is swung downwardly and the bill 25 rises with respect to the bill 20, and the downturned hook 26 no longer extends beneath the bill of the second looper element 22 and is pos-

When the needle rises, and the loop elements 18 and 22 move rearwardly or to the right of the needle, the bills 20 and 25 will move out of the unsevered loop and this is freed from the bills 20 and 25, Figure 6. The bills 20 and 25 move out of the loop L before the blade 37 travels upwardly sufficiently to sever the loop upon the bill 20. This action will be repeated upon each cycle of operation of the machine, as long as the cable 32 holds the arm 23 in the lowered position.

As the bills 20 and 25 move out of each loop L, which loop is under tension, the tension on the loop will draw the loop up at its bottom toward the fabric base 12, Figure 6, so that the loop is at an elevation above the lower edges of the bills 20 and 25, and these bills cannot re-enter the previously formed loop when the bills are again moved rearwardly or to the left. The bills are then traveling to the right step by step with the fabric and will pass over the bills 20 and 25, Figure 6, but the bills cannot re-enter the unsevered loops which are thus produced upon the fabric base 12 so long as the hook 26 is maintained elevated above the lower edge of the bill 20. Any number of unsevered loops may thus be produced in a group or row.

When the cable 32 is released, and the spring 28 again returns the bill 25 to the lowered position, the bills 20 and 25 will enter the loops as formed, and the downturned hook 26 will positively retain these loops upon the bills 20 and 25 so that the loops are severed by the blade 37 for again producing severed loops L'. The cycle of operation is repeated for any desired number of times for producing upon the fabric base any desired number of severed or unsevered loops in any desired pattern, as should be obvious.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts, as well as changes in the method, steps and their order or sequence, may be resorted to, without departing from the spirit of the invention or scope of the subject matter of the bills of the first and second looper elements and while said hook is...
positioned below the lower side of the bill of the first looper element.

2. In a tufting machine, a work support, means to feed a fabric base intermittently over the work support, a reciprocatory needle to sew loops in the fabric base, a first looper element arranged near the work support and including a generally straight bill to enter the loops, means to reciprocate the first looper element, a second looper element mounted upon the first looper element and including a part adapted to project below the lower edge of said bill of the first looper element to then hold the loops on the first looper element, said part shiftable to a position above the lower edge of said bill so that the loops may pass from said bill, resilient means connected with the second looper element and using the same in a direction for maintaining said part below the lower edge of said bill, means connected with the second looper element and operable to shift the same in another direction for elevating said part of the second looper element, a cutter blade associated with the first looper element for severing the loops upon the bill of the first looper element while said part of the second looper element projects below said bill, and means to operate the cutter blade in timed relation with the first looper element.

3. In a tufting machine, a work support, means to feed a fabric base upon the work support, a reciprocatory needle to sew loops in the fabric base, a looper element arranged near the work support and including a generally straight bill to enter the loops as they are formed in the fabric base, means to reciprocate the looper element in timed relation with the reciprocation of the needle, a movable loop retaining element mounted upon said looper element and movable with relation thereto and adapted to project below said bill of the looper element to retain said loops upon the bill for severance thereon and retractable above said bill so that the loops may be removed from the bill without being severed, means connected with the movable loop retaining element to shift the same to the active and retracted position with respect to said bill, and means to sever the loops upon said bill of the looper element when said loop retaining element is active for retaining the loops upon the bill.

4. In a tufting machine, as a sub-combination, a first looper element having a bill to enter loops as the latter are formed upon a fabric base, a second looper element movably mounted upon the first looper element and including a keeper part having active and inactive positions with respect to the bill of the first looper element when the second looper element is moved with relation to the first looper element, said keeper part positively retaining said loops upon the bill of the first looper element when in the active position and allowing the loops to pass freely from said bill when in the inactive position, and means connected with said second looper element to move the same with said keeper part toward and from said active and inactive positions with respect to said bill.

5. In a tufting machine, a work support, fabric feed means, a reciprocatory needle to sew loops in the fabric, a first looper element having a bill to enter said loops, a second looper element movably mounted upon the first looper element and including a keeper part having an active position relative to said bill to retain the loops thereon and an inactive position relative to said bill to allow the loops to pass therefrom when the second looper element is moved with relation to the first looper element, means connected with the second looper element to move the same so that the keeper part is shifted to the active or inactive position when desired, means to reciprocate the first looper element relative to the needle, and means to sever the loops upon the bill of the first looper element when the keeper part is in the active position, the loops passing from said bill during reciprocation of the first looper element before severance of the loops by the last-named means can occur when said keeper part is in the inactive position.

6. In a tufting machine, as a sub-combination, a reciprocatory first looper including a generally horizontal first bill having a lower edge, a second looper pivotally mounted upon the first looper to bodily reciprocate therewith, the second looper having a second bill extending longitudinally of the first bill when the second bill is in a lower position relative to the first bill, said depending hook being spaced above said lower edge when the second bill is raised relative to the first bill, and means connected with the second looper to move the same for raising and lowering the second bill relative to the first bill.

7. In a tufting machine, fabric feed means, means to sew loops in the fabric, a reciprocatory looper including a hook insertable within the loops and freely movable therefrom when said looper is moved in one direction, a loop retaining element, means to movably mount the loop retaining element upon said looper for reciprocation therewith and with reciprocation relative to the looper, means connected with the loop retaining element to reciprocate it relative to the looper so that said element may be positioned to retain loops upon the looper or to allow free passage of the loops from the looper, and means to sever loops upon the looper when such loops are retained upon the bill of the looper by said loop retaining element.

8. In a tufting machine, fabric feed means, means to sew loops in the fabric, a reciprocatory first looper including a generally straight bill to enter the loops in said fabric, a second looper arranged upon one side of the first looper and pivoted thereto for swinging movement relative to the first looper and bodily movable with the first looper during reciprocation of the first looper, a second looper including a down-turned hook-like bill for retaining loops upon said straight bill in one adjusted position of the second looper relative to the first looper, said straight and hook-like bills adapted to enter said loops together in another adjusted position of the second looper relative to the first looper and to pass freely from said loops so that the latter remain unsevered when the hook-like bill of the second looper is elevated with respect to said straight bill, resilient means connected with the second looper to swing the same vertically upon the first looper to and from said adjusted positions, and means to sever the loops upon said straight bill of the first looper while the hook-like bill of the second looper is retaining the loops upon the straight bill.

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