Feb. 9, 1937. W. LOOS 2,070,287

TUFTING MACHINE

Filed Oct. 2, 1935 2 Sheets-Sheet 1

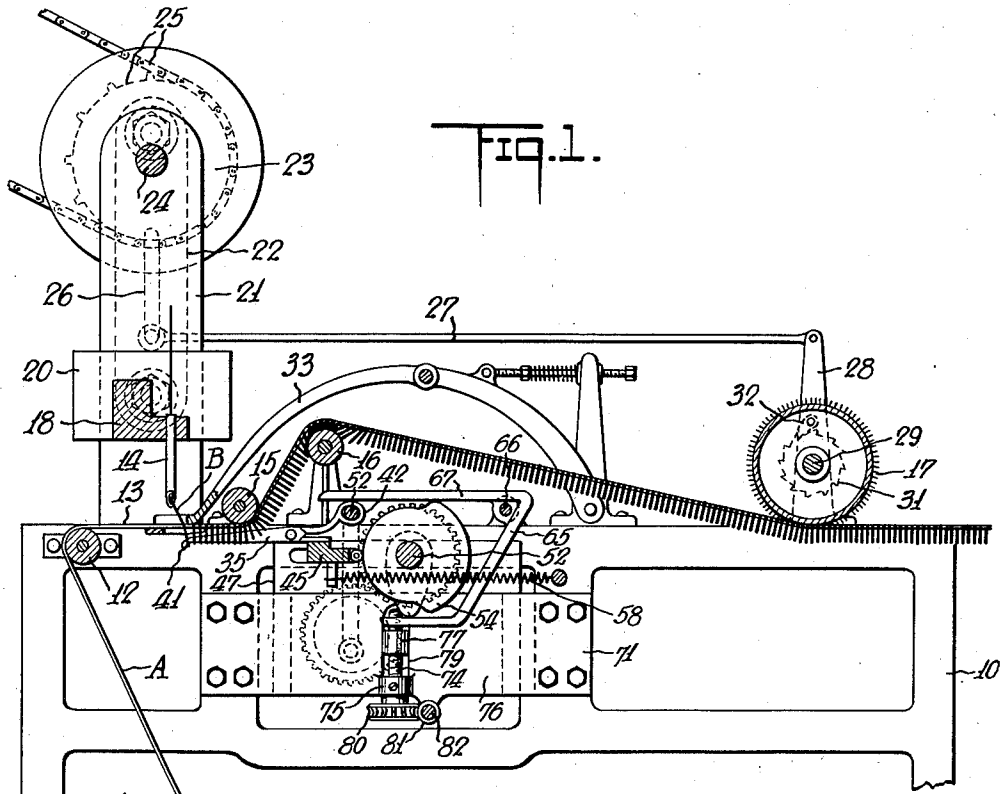


Fig. 1.

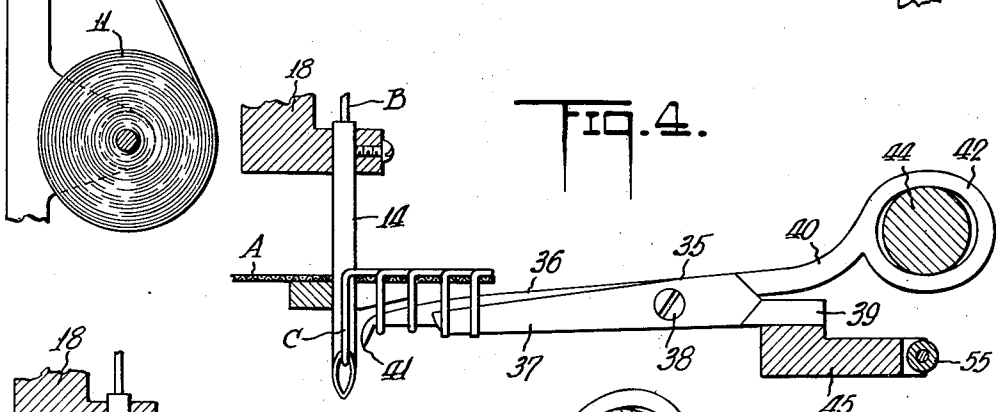


Fig. 4.

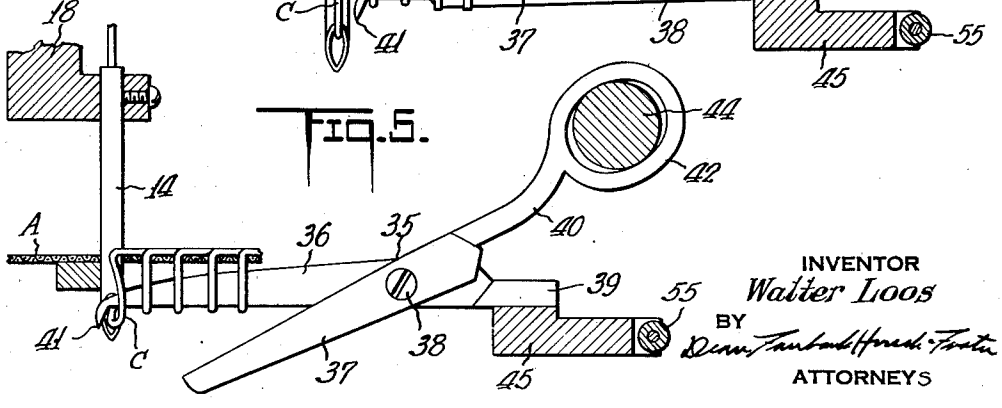


Fig. 5.

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Filed Oct. 2, 1935 2 Sheets-Sheet 2

FIG. 6.

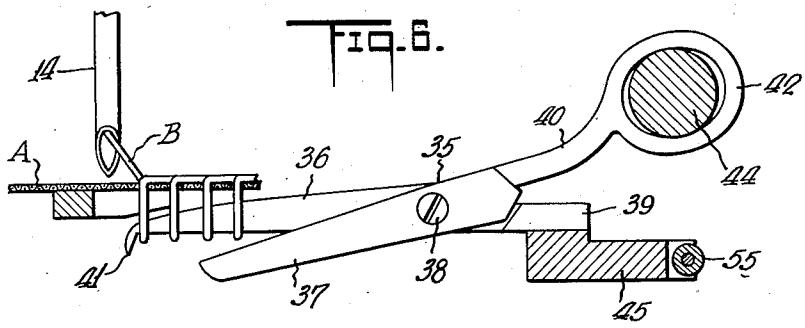


FIG. 7.

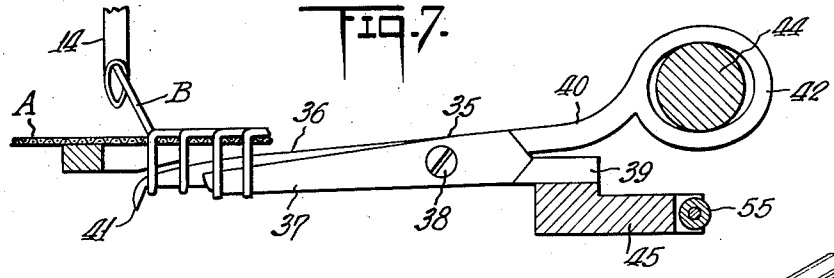


FIG. 2.

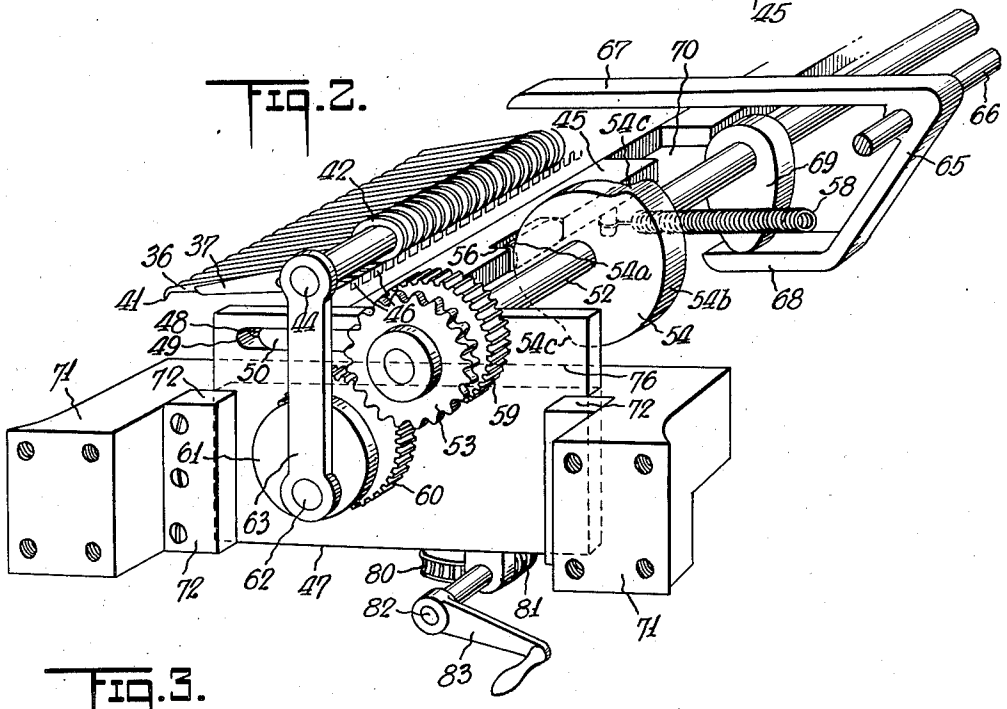
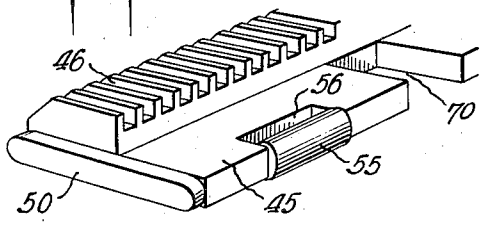


FIG. 3.



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TUFTING MACHINE

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Application October 2, 1935, Serial No. 43,149

9 Claims. (Cl. 112—79)

The present invention relates to tufting machines and more particularly to a new and improved mechanism for cutting the outer looped ends of the tuft threads or yarns after they are stitched to a foundation fabric.

In the ordinary type of tufting machine, a foundation fabric is fed across the path of operation of a gang of reciprocating tufting needles to sew a series of depending loops on said fabric. These loops are then cut at their outer ends to form the usual tufts.

One object of the present invention is to provide a new and improved mechanism for cutting the outer ends of these tuft loops without loss of thread or yarn.

In my improved construction, the cutting mechanism includes a pair of blades of different lengths pivoted face to face and having opposite cutting edges adapted to be brought together across the bases or outer ends of the loops to be cut. Means are provided for slipping or catching a loop onto the end of the longer blade as said loop is formed. This loop slides along said latter blade by the feed movement of the foundation fabric until said loop lies in position between the cutting edges of the blades. In this position, the blades are brought together to cut the loop. The number of pairs of blades corresponds to the number of needles. This mechanism serves not only to predetermine the length of the loops formed, thereby assuring uniformity in the height of the tufts, but also serves to cut the loops without loss of thread or yarn.

As an important feature of the present invention the movement of the blades back and forth substantially parallel to the plane of the fabric to cause one blade to enter the loops, is effected by separate actuating mechanism than that which swings the blades toward and from each other. Thus the timing of one movement may be made independent of the timing of the other movement. The closing of the blades is not accomplished by movement of the carriage, but is accomplished by an independent rotary member.

As another feature of the present invention, the cutting blades are such as to be capable of being constructed from the ordinary sewing scissors, these being slightly altered to adapt them for the purpose of the present invention.

Various other objects, features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawings in which there is shown for the purpose of illustration, one embodiment of the present invention. In these drawings:—

Fig. 1 is an end view of a tufting machine having a cutting mechanism embodying the present invention,

Fig. 2 is a perspective view showing a portion of the cutting mechanism embodying the present invention,

Fig. 3 is a perspective view showing part of the cutting mechanism, and

Figs. 4, 5, 6 and 7 are views showing the operation of the cutting blades during various periods in their cycle of operation.

The mechanism for stitching tuft loops on to a foundation fabric, in itself forms no part of the present invention, and may be of any suitable construction, as for instance that shown in my prior Patent 1,970,703, issued August 21, 1934. In this construction there is provided a frame structure 10 on which is supported a reel 11 for the foundation fabric A. This fabric unwinds from the reel 11 and travels over an idler roller 12, over a work table 13, and across the path of movement of a gang of reciprocatory hollow tufting needles 14. It then passes in contact with a pair of spaced idlers 15 and 16, and underneath a feed roller 17 having a series of spurs on the surface thereof for engaging the fabric A.

The needles 14 are secured to an angle bar 18 supported between a pair of cross heads 20 which are mounted for vertical reciprocation on a pair of uprights 21 respectively serving as cross head guides. To operate these cross heads 20, each one has pivotally connected thereto one end of a pitman 22, and other end having a pivotal eccentric connection with a disc 23 fixed to a shaft 24 journaled in the uprights 21. The shaft 24 is rotated by any suitable means as for instance sprocket wheel and chain 25. By means of this arrangement, the rotation of the shaft 24 causes vertical reciprocation of the gang of needles 14.

In order to intermittently feed the foundation fabric A in synchronism with the operation of the needles 14, the pitman 22 is provided with a longitudinal slot 26 in which is loosely mounted one end of a connecting rod 27, the other end of which is pivotally connected to an arm 28 loosely mounted on a rock shaft 29. This rock shaft has fixed thereto the feed roller 17 and also carries a ratchet wheel 31 cooperating with a pawl 32 pivotally connected to the arm 28. By means of this arrangement, the transverse movement of the pitman 22 imparts an intermittent movement to the foundation fabric A in one direction in the path of operation of the needles 14.

The machine is also provided with the usual resiliently mounted presser foot 33 for holding the foundation fabric in position on the work table 13 when the needles are withdrawn therefrom.

By means of the machine so far described, the needles 14 with a tufting thread B passing therethrough move downwardly to pierce the foundation fabric A while the latter is stationary, and then move upwardly, leaving on the bottom side of the foundation fabric a row of depending looped tuft threads C.

As an important feature of the present invention, the means for cutting the loops formed by the needles 14, includes a row of scissors 35 each cooperating with a corresponding needle and each including a pair of blades 36 and 37 pivoted face to face by a pivot pin 38 and terminating on one side of said pivot pin in a pair of handles or shanks 39 and 40 respectively. On the other side of the pivot pin 38, the blade 36 extends beyond the corresponding end of the blade 37 and terminates in a hook 41 to catch the loop of the tuft thread as it is formed.

In the operation of each pair of scissors 35, when the corresponding needle 14 passes through the foundation fabric A and is in its lowermost position to form a slightly tensioned loop C, said pair of scissors will be at its extreme right-hand position with its blades entirely closed as shown in Fig. 4. After the needle 14 moves upwardly a short distance, the tension on said loop is removed and the resultant looseness of said loop causes the portion thereof on the outside of said needle to flex away from said needle as shown in Fig. 5. In this position of the needle, the scissors move towards the left until the hook 41 on the blade 36 passes between the flexed portion of the loop and the side of the upwardly moving needle as shown in said Fig. 5. While the needle is moving upwardly, the blade 37 is swinging in a counterclockwise direction to open position with respect to the blade 36. As the needle continues to move upwardly, the base portion of the loop is caught on the hook 41 of the blade 36. As the needle leaves the fabric, the scissors move back towards the right and the blade 37 swings towards cutting position with respect to the blade 36 as shown in Fig. 6. During this movement of the scissors, the mabric A is simultaneously fed a short dstance towards the right to present a new transverse section to the operation of the gang of needles 14. When the scissors have reached the extreme right-hand position shown in Fig. 7, the blades at that point will come together to cut the right-hand end loop gathered on the blade 36.

As a feature of the present invention, I utilize the ordinary sewing scissors with slight variation. This variation consists in bending one end of a blade of the conventional scissors to form the hook 41, and in shortening the other blade to correspond with the blade 37. The usual digit ring 42 on the short blade 37 is used to advantage while the other digit ring connected to the blade 36 is removed and the shank portion of said latter blade connected to a horizontal reciprocating carriage as will be described.

The means for reciprocating the scissors 35 horizontally, and for swinging the blade 37 about its pivotal connection, includes a carriage 45 having a series of transversely extending grooves 46, the shank portion of the blade 36 of each pair of scissors being welded or secured in each of said grooves.

The carriage 45 is supported at the ends in plates 47 mounted on the frame structure of the machine. In order to permit the horizontal movement of the carriage 45, each plate 47 is provided with a horizontal slot 48 having its ends 49 curved as shown, these slots 48 receiving tongues 50 which extend from the ends of the carriage 45, and which are curved at their sides to correspond to the curved ends of the slots 48. The slots 48 are longer than the width of the tongues 50 to permit horizontal movement of the carriage 45.

In order to impart such horizontal movement to the carriage 45, the plates 47 have journaled therein a shaft 52 which is continuously rotated by any suitable means, as for instance a sprocket wheel 53 connected to said shaft and driven from the same source of power which drives the shaft 24. This shaft 52 carries a cam 54 cooperating with a rotatable cam roller 55 disposed in a slot 56 formed in the carriage 45. The carriage 45 is urged towards the shaft 52 by a plurality of springs 58, one end of each of which is connected to the carriage 45 and the other end being connected to a suitable portion of the frame structure 10. The cam 54 has a low radially uniform portion 54*a* and a high radially uniform portion 54*b*, the two portions being interconnected by comparatively rapid rising portions 54*c*. This effects a comparatively quick movement of the scissors towards the left from the position shown in Fig. 4 to the position shown in Fig. 5, and a corresponding quick return to the right from the position shown in Fig. 5 to the position shown in Fig. 6.

In order to impart pivotal movement to the blades 37, the digit rings 42 are strung along a bar or rod 44. These digit rings 42 are loose on said bar 44 to permit relative rotational movement therewith. In order to impart the necessary oscillatory movement to said bar 44, the shaft 52 carries near each end a gear 59 meshing with a gear 60 suitably supported for rotation on the plate 47. Eccentrically secured to the shaft of the gear 60 is a disc 61 having a crank pin 62. Pivotally engaging this crank pin 62 is one end of a link 63, the other end of which is securely fixed to the rod 44. The gears 59 and 60 are of the same diameter so that upon a complete revolution of the shaft 52, the scissors 35 will have gone through a complete cycle of operation.

In the operation of the cutting device described, the bar 44 during the cutting stroke shown will have a tendency to deflect or flex upwardly. Therefore, in order to prevent such deflection of the rod during the cutting stroke while permitting the free movement of the bar 44 during the remainder of the stroke, I provide one or more bracing members 65 shown in the form of a U-shaped or bell crank bar, and each pivotally supported at one corner in a shaft 66. This bar 65 has an arm 67 adapted to rest on top of the digit rings 42 of the scissors, and a shorter arm 68 engaging a cam 69 mounted on the shaft 52. The cam 69 has a long or high portion which engages the arm 68 to press the arm 67 against the bar 44 and thereby brace it against upward deflection. During the remainder of the cycle, the cam 69 is in a position to permit the bar 44 to move vertically. Due to the close proximity of the shaft 52 to the carriage 45, said carriage is provided with a slot 70 in which the cam 69 rotates.

In order to adjust the gang of scissors 35 vertically in accordance with the height of the tufts

desired, each plate 47 is mounted in a guideway formed between a guide block 71 and guide bars 72. In order to move the plate 47 vertically there is provided an adjusting screw 74 passing through a lug 75 in the back plate 76 of the guide block 71, and engaging a threaded boss 77 which is connected to said plate 47 and which extends inwardly through an elongated slot 79 in said back plate 76. One or more set screws passing through the lug 75 and engaging circular grooves in the adjusting screw 74, hold said screw against endwise movement. At the lower end of the adjusting screw 74 is a worm wheel 80 which meshes with a worm 81 mounted on one end of a shaft 82 rotatable by a suitable handle 83. The other end of the shaft 82 carries a similar worm (not shown) operated by the handle 83 for moving both plates 47 together. By means of this arrangement, the plates 47 may be moved vertically, carrying with them the scissors and the operating mechanism therefor.

In the position of the mechanism shown in Fig. 2, the scissors are in their extreme right-hand position having completed their cutting stroke, and the blades of each pair of scissors are in entirely closed position. As the mechanism is operated from the position shown in Fig. 2, the blades 36 move horizontally towards the left, while the blades 37 are being swung into open position. The scissors are so mounted that the cutting or bottom edges of the blades 36 lie and move in a plane parallel to the path of movement of the foundation fabric across the field of operation of the needles 14. The mechanism is so geared as to operate in synchronism with the needles 14 and the fabric feeding mechanism.

The cutting mechanism is built in a compact unit as described, and is such that it may be attached to any existing tuft loop stitching machine with slight variations in the existing structure.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a reciprocatory carriage, a pair of blades pivoted face to face and provided with opposite cutting edges on one side of their pivotal connection and shanks respectively on the other side of said connection, one of said shanks being connected to said carriage, a rod connected to the other shank and extending substantially at right angles to the length of said shank, and a rotary member connected to said rod for reciprocating the latter and swinging said last mentioned shank about its pivotal connection while said carriage is being reciprocated.

2. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a carriage, a pair of cutting blades pivoted face to face and terminating at one end respectively in a pair of shanks, one of said shanks being fixed to said carriage, means for imparting translatory reciprocating movement to said carriage, a pitman connected to the other shank and means for reciprocating said pitman to swing said last-mentioned shank and its corresponding blade about its pivotal connection.

3. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a pair of cutting blades pivoted face to face, said blades on one side of the pivotal connection having respectively a pair of shanks, and one of said shanks having an opening at its outer end, means connected to the other shank for moving said blades into loop engaging position, and a member in said opening and having a reciprocatory movement for swinging said first mentioned shank about its pivotal connection to cut the loops engaged between the cutting edges of said blades.

4. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a reciprocatory carriage, a row of aligned scissors having a series of corresponding blades thereon fixed to said carriage, the other series of corresponding blades terminating in aligned rings, a rod passing through said rings, means secured to said rod for imparting oscillatory movement to said rod to swing said last mentioned blades cyclically into open or closed position about their pivotal connections, and means operable only during the cutting period for bracing said rod against undue flexing.

5. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a reciprocatory carriage, a row of aligned scissors having a series of corresponding blades thereon fixed to said carriage, the other series of corresponding blades terminating in aligned rings, a rod passing through said rings, means secured to said rod for imparting oscillatory movement to said rod to swing said last mentioned blades cyclically into open or closed position about their pivotal connections, a bracing member resting upon said rod intermediate of the ends thereof, and cam means for pressing said bracing member against said rod during cutting periods to prevent undue flexing of said rod.

6. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a reciprocatory carriage, a row of aligned scissors having a series of corresponding blades thereon fixed to said carriage, the other series of corresponding blades terminating in aligned rings, a rod passing through the aligned rings, means secured to said rod for imparting oscillatory movement to said rod to swing said last mentioned blades cyclically into open or closed position about their pivotal connection, a bell crank having one arm resting upon said rod, and cam means cooperating with the other arm to press said first mentioned arm against said rod during cutting periods to prevent undue flexing of said rod.

7. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including pairs of spaced guides, plates mounted in said guides, a carriage extending between said plates and supported thereon for reciprocatory movement, a row of aligned scissors connected to said carriage, means for operating said scissors cyclically into open or closed position, and means for adjusting the position of said plates along said guides.

8. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a pair of blades pivoted face to face, a carriage to which one of said blades is secured, said carriage being movable in a direction substantially parallel to the plane of the fabric whereby the blade secured to said carriage may catch the loops as they are formed, a pair of rotary members connected for simultaneous rotation about parallel axes, means operated by one of said rotary members for reciprocating said carriage, and means operated by the other of said rotary members for swinging the other blade to effect shearing of the loops.

9. A mechanism for cutting the tuft loops stitched upon a foundation fabric, including a pair of blades pivoted face to face, a carriage to which one of said blades is secured, said carriage being movable in a direction substantially parallel to the plane of the fabric whereby the blade secured to said carriage may catch the loops as they are formed, a pair of rotary members connected for simultaneous rotation about parallel axes, a cam operated by one of said rotary members for reciprocating said carriage, and a reciprocating pitman operated by the other of said rotary members for swinging the other blade to effect shearing of the loops.

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