

Oct. 20, 1936.

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2,058,047

TUFTING MACHINE

Filed Jan. 7, 1936

2 Sheets-Sheet 1

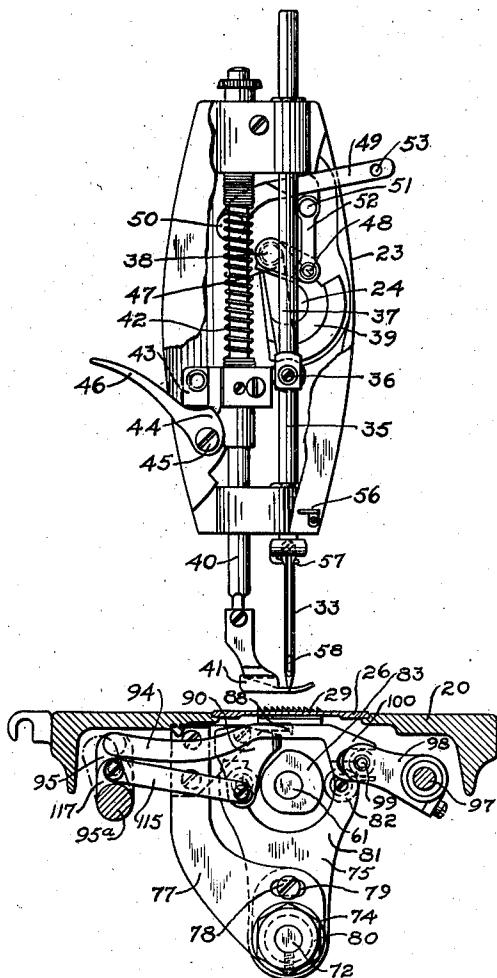


Fig. 1

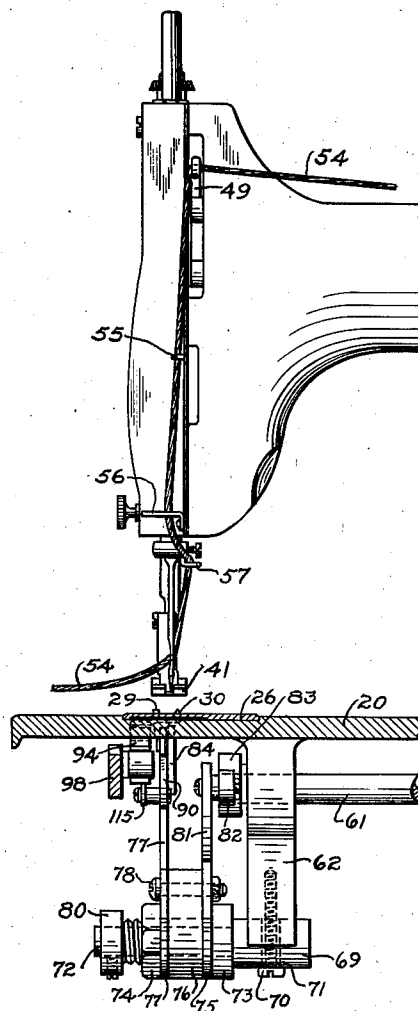


Fig. 2

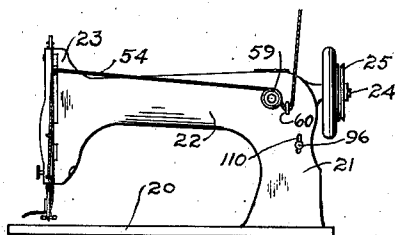


Fig. 3

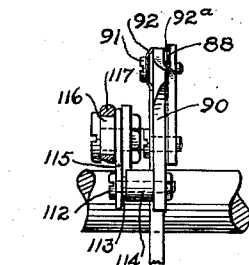


Fig. 11

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2 Sheets-Sheet 2

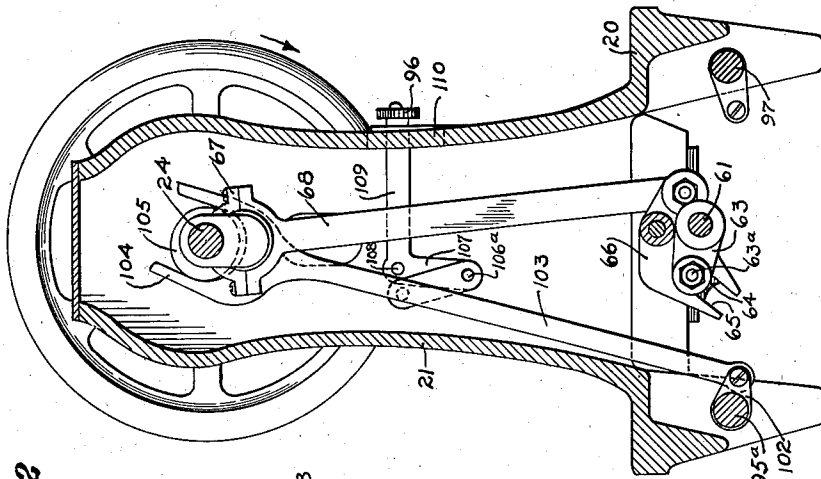


Fig. 4



Fig. 12

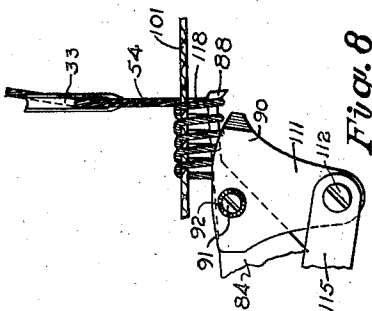


Fig. 8

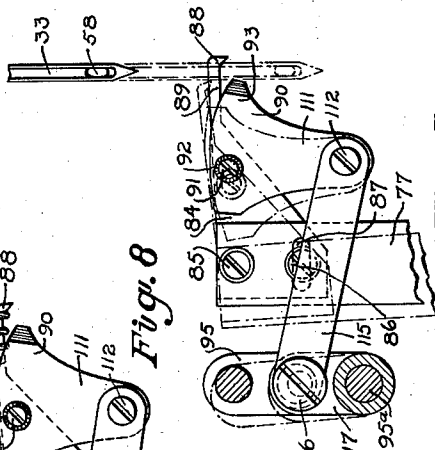


Fig. 5

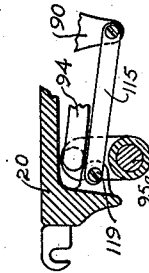


Fig. 10

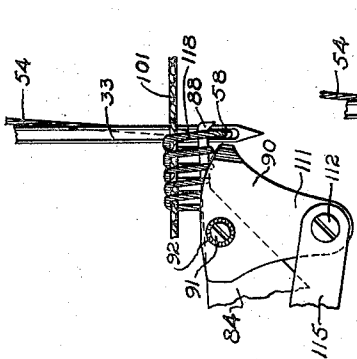


Fig. 7

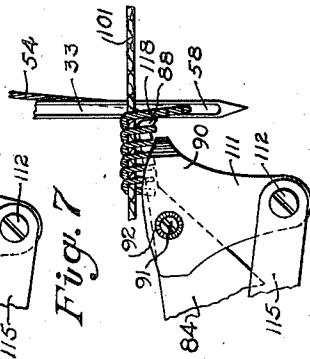


Fig. 6

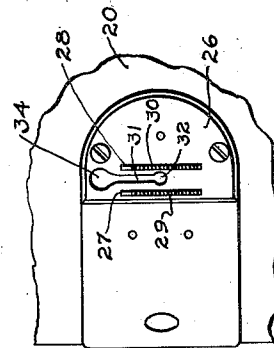


Fig. 9

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TUFTING MACHINE

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8 Claims. (Cl. 112-79)

This invention relates to improvements in machines for tufting or producing an artificial nap on fabrics.

5 An object of the invention is to provide a machine of the above type adapted to produce a nap or tufting by repeatedly piercing a fabric, carrying a suitable thread or yarn through the perforations to form loops, and subsequently cutting or trimming the loops.

10 A further object is to provide means by which the above operations may be performed automatically and continuously.

15 Another object is to provide means to take up all slack in the loops whereby knotting or tangling of the thread may be prevented.

Still another object is to provide improved shearing means whereby the action of the shear may be delayed to assure the proper formation and interrelation of the loops.

20 A still further object is to provide a machine of the above type which is simply and easily operated and in which various parts are readily adjustable to vary the performance of their functions to the best advantage.

25 Other purposes and advantages will appear during the course of the following description in connection with the attached drawings, in which

Figure 1 is an end view of the machine partly in section;

30 Figure 2 is a side view of the same, partly in section;

Figure 3 is a side elevation of the upper part of the machine illustrating the means of maintaining the thread under proper tension;

35 Figure 4 is a cross sectional view showing the means of driving the cam shaft;

Figure 5 is a detail view of the looping and shearing means;

40 Figure 6 is a fragmentary view of the same showing the needle in lower position and the shearing completed;

Figure 7 is a similar view showing the looping hook advanced to form a loop and the needle moving upward;

45 Figure 8 is a second similar view illustrating the loop completed.

Figure 9 is a fragmental plan view of the feeding shoes and throat plate;

50 Figure 10 illustrates an alternative manner of attaching the shear link;

Figure 11 is a detail side view of the shearing means; and

Figure 12 illustrates a row of completed tufts.

Referring to Figures 1, 2, and 3, the numeral 55 20 indicates a bed plate to which is attached the

usual upright 21 having an overhanging arm 22 terminating in a head 23. The usual horizontal shaft 24, Figure 3, is journaled in the upright 21 and head 23 and is adapted to be revolved by any suitable means such as a belt (not shown) on the conventional pulley 25.

A throat plate 26 is removably secured to the bed plate 20 below the head 23, and has slots 27 and 28 to accommodate the usual feeding shoes 29 and 30, as fully illustrated in Figure 9. A central slot 31 has at one end a slightly enlarged eye 32 through which a needle 33 is adapted to reciprocate. A larger eye 34 is provided in the other end of the slot 31 to allow the sheared loop ends to emerge as the material is fed through the machine.

The needle 33 is secured in the usual manner to the lower end of a rod 35 slidable vertically in the head 23. The rod 35 has a wrist pin 36 connected by means of a connecting rod 37 to a crank pin 38, the pin 38 being carried by a crank plate 39 on the end of the shaft 24. By the connections described, the rod 35 is reciprocated when the shaft 24 revolves.

A second vertically slidable rod 40 carries the usual presser foot 41, and is urged downward by a helical spring 42. A block 43 secured to the second rod 40 is adapted to be engaged by a lift cam 44 pivoted to the head 23 at 45 and operable by means of a lever 46 to raise the presser foot from the work.

A second crank member 47 is secured at one end to the end of crank pin 38 and has at its other end a second crank pin 48. An outwardly extending take-up lever 49 pivoted to the head 23 at 50, carries a pin 51 connected to the second crank pin 48 by means of a link 52. The outer end of lever 49 has a hole 53 through which a thread or yarn 54 is threaded as shown in Figure 2. From the hole 53, the yarn 54 is carried down through stationary guides 55 and 56 and a movable guide 57 and through the eye 58 of the needle 33.

As the shaft 24 revolves, the second crank pin acts through the link 52 to oscillate the takeup lever 49 through a substantially vertical arc. A tension pulley 59, Figure 3, is attached to the head 21 horizontally in line with the middle of the arc described by the eye 53 in lever 49, and serves as a rear guide for the yarn 54. The tension pulley 59 receives the yarn through a guide 60 from a suitable reel or spool (not shown) located above the machine.

A rocker shaft 61, journaled near its front end in a downward extension 62 of the bed plate 20,

carries a lever 63, Figure 4, having a pin 63a on which is a block 64. The block is slidable in a slot 65 in a plate 66 pivoted to the bed 20 and adapted to be oscillated by a crank 67 on shaft 24 through a connecting rod 68. When plate 66 is actuated, as noted above, the block 64 transmits motion to the lever 63, thus oscillating the shaft 61.

The downward extension 62 of plate 20 carries at its lower end a pin 69 seated in a semi-cylindrical depression in 62 and secured thereto by a screw 70. The screw is provided with substantial clearance in its hole 71 in pin 69 in order to allow the pin 69 to be adjusted longitudinally for reasons hereinafter explained.

Rotatably mounted on extension 72 of pin 69 is a threaded bushing 73. Secured on the bushing 73 by means of a nut 74 are an inner lever 75, a spacer 76 and an outer lever 77. A bolt 78 is also provided to hold the levers and spacer tightly together, the outer lever 77 being slotted at 79, as shown in Figure 1, to permit adjustment of the relative angular positions of the levers. The bushing 73 is retained on extension 72 by means of a collar 80.

The inner lever 75 has an upwardly extending fork 81 carrying rollers 82 which embrace a cam 83 on the end of rocker shaft 61.

The lever 77 carries at an upper end a hook plate 84 pivotally secured thereto at 85 and clamped by means of a screw 86 extending through a slotted hole 87 in lever 77, as shown in detail in Figures 5 and 11.

The hook plate terminates in a downwardly directed hook 88 having the lower side 89 of its shank ground to form a shearing edge. A shear blade 90 is loosely mounted in a pivot screw 91 secured in the plate 84, a spring washer 92 under the head of screw 91 serving to urge the shear blade and plate together. A forward extension 93 of blade 90 has an upper shearing edge cooperative with the shearing edge 89 of the hook member. The hook 88 extends a substantial distance beyond the cooperative shearing surfaces.

A lateral feed bar 94 carrying the shoes 29 and 30 is pivoted to a lever 95 on a feed rocker shaft 95a.

The shaft 95a is oscillated in the following manner:

Referring to Figure 4, the shaft 95a carries a lever 102 to which is articulated a rod 103 having an upper fork 104 engaging an eccentric 105 on the drive shaft 24. The rod 103 is connected by a guide link 106 to a pin 106a on the lower arm of a bell crank 107 swung on a stationary pin 108 in the upright 21. The horizontal arm 109 of the bell crank 107 extends out through a vertical slot 110, Figure 3, in the upright 21 and has an exterior clamping knob 96. When the eccentric 105 revolves it imparts a motion to the rod 103 which motion is given a longitudinal component by the swing of the guide link 106 about the pin 106a. The longitudinal motion of rod 103 oscillates the lever 102 and shaft 95a.

If the bell crank 107 is shifted counter-clockwise to carry the pin 106a farther to the right, the angle of motion of the link 106 is shifted farther downward from the top center position, and a greater longitudinal component of motion is given the rod 103, thereby increasing the motion of shaft 95a.

A second feed rocker shaft 97, driven by conventional means well known in the art and therefore not shown herein, has thereon a lever 98

carrying a pin 99 engaging a fork 100 on the feed bar 94.

The action of the feed is well known, being substantially as follows:

The bar 94 is raised by clockwise movement of lever 98 to bring the shoes 29 and 30 into engagement with the fabric 101, indicated in Figures 6, 7, and 8, under the presser foot 41, then moved to the left by counter-clockwise movement of the lever 95 to advance the fabric, next lowered by 10 counter-clockwise movement of lever 98 to retract the shoes, and finally returned to the right by the clockwise movement of the lever 95. When the adjusting means is used to increase the feed, the movement of the shaft 95a and the lever 95 is increased toward the left, in the manner previously described, as shown in dot and dash lines in Figure 1, thereby increasing the longitudinal movement of the feed bar 94.

The shear blade 90 has a downward extension 20 111 in which is secured a screw 112 having an enlarged portion 113 under the head thereof as illustrated in Figure 11. A relatively long spacer 114 is clamped between the enlarged portion 113 and the blade 90. A link 115, loosely fitted on 25 enlarged portion 113, connects the latter to an eccentric pin 116 fastened in a short lever 117 on the shaft 95a.

The operation of the device is as follows:

When the shaft 24 is revolved, the needle 33 30 is reciprocated through the throat eye 32 in the usual manner. As the needle travels to the bottom of its stroke, it draws a loop 118 of thread or yarn through the fabric 101 as shown in Figure 6.

As the needle starts its upward travel slack is developed in the loop. At this point, the cam 83, Figure 1, rocks the levers 75 and 77 to the right, suddenly thrusting the hook 88 forward close to the needle and through the loop 118 as shown in Figure 7. The needle 33 continues its upward travel, while at the same time the takeup lever 49 travels upward at greater speed than the needle. The effect of this greater speed of the takeup lever is to draw the thread taut around the hook 88 before the needle's eye emerges from the cloth, thereby preventing knotting of the thread under the cloth.

The result of the foregoing action is to leave a loop on the hook 88 as shown in Figure 8. The feeding device now feeds the cloth to the left, and as the feeding motion ends, the cam 83 rapidly retracts the hook to the left. The needle again descends and the operation is repeated to form a second loop, the second loop and the motion of the hook 88 past the needle pushing the first loop toward the left along the shank of the hook.

In this manner a succession of loops is formed and moved toward the left along the shank.

As stated above, the feeding motion to the left ends as the retracting of the hook begins, that is, the levers 95 and 117 are rocked to the left. As the lever 77 and hook plate 84 are rocked to the left by cam 83, the link 115 is restrained by the pin 116, rocking the shear blade counter-clockwise on the hook plate, thus closing the shears to sever any loop or loops between their jaws, as shown in Figure 6. As the hook 88 extends beyond the shears, one or more loops are always retained unsevered to insure continuous action.

Figure 12 shows a row of severed loops of multi-strand yarn, illustrating the manner in which the strands stand apart in the completed tufts. 75

While the hook and shear combination is held at the left, the lever 117 is rocked to the right, further closing the shear jaws. The prime purpose of connecting the link 115 to the movable lever 117 is to vary the shear opening in accordance with the length of feed. When large yarn is used in the device, it is necessary to increase the tuft spacing, that is the feed, in order to accommodate it. Also it is undesirable to give the shear jaws an opening at all times sufficient to receive the largest yarn, since with small yarn and short feed the wide opening of the shears in shearing a large number of thin loops causes unnecessary wear on the shearing edges.

With the present invention, the increased movement of the lever 117 to the left, which occurs with increased feed, and which starts as the hook 88 approaches right hand or looping position, has the effect of increasing the shear openings as the loops are being intercepted and drawn taut on the hook. While the loops in Figures 6, 7, and 8 are drawn separated slightly for purposes of clarity, it will be understood that in practice, especially with heavy soft yarn, the loops tend to lie close together and to push to the left as the last formed loop is drawn taut. With the structure shown, giving a compound shear action set up jointly by the looper and feeder, the shear jaws automatically enlarge their opening to receive the larger yarn, thereby preventing undue crowding of loops, but decrease the opening with small yarn and short feed. The device thus accommodates itself to a wide range of work while holding shear wear to a minimum.

As the feed device completes its return stroke to the right before the forward movement of the hook 88, the shears are always closed to the same point irrespective of their degree of opening.

In the case of a production machine designed for a fixed length of feed and size of yarn, the link 115 may be attached to an eccentric pivot 119 in the base 20, as shown in Figure 10.

The takeup lever 49 is so timed with the needle 33 that it moves down ahead of the latter to allow slack in the thread 54 as the needle moves to the bottom of its stroke. This slack removes undue downward pull on the cloth 101 as the loop is being formed, so that no tendency to draw the cloth into the throat slot 31 occurs as is liable to occur in other types of machines due to improperly adjusted thread tensions.

As the needle starts its up stroke and the hook 88 intercepts the loop 118, the lever 49 rises rapidly ahead of the needle to draw the thread taut before the eye 58 of the needle 33 passes upward through the cloth. Tangling and knotting of the thread is thus prevented and the loop 118 is drawn accurately on the hook 88.

Location of the tension member 59, at a point remote from the lever 49 and opposite the midpoint of the latter's travel keeps the longitudinal motion between the lever and tension within the elasticity of the thread, preventing formation of slack between these members and thereby permitting smooth operation without jerking or other irregularity.

During the shearing action already described, the screw 112 exercises a resisting force to the right, Figure 5, on the extension 111 of the shear blade. Due to the spacer 114 shown in Figure 11, and to the looseness of the link 115 on pin 112, this force tends to swing the shearing nose 93 of the blade laterally against the shearing edge 89 on the hook member 84, the spring washer 92 yielding to

permit the slight rock of the blade. If desired, a thin spacing washer 92a may be used between the blades to facilitate the rocking of blade 90.

The above action forces the shearing edges firmly into engagement and insures sharp cutting, the operation resembling that produced by the hand in operating a pair of scissors.

The eccentric screw 116 permits easy adjustment of the shear blade position with respect to the plate 84, as for instance, after re-grinding. The plate 84 may be adjusted on the lever 77 by loosening the clamp screw 86 and swinging the plate about the pivot 85, thus raising or lowering the hook 88 to vary the length of loop. The limit of forward travel of the hook may also be readily adjusted by loosening the nut 74 and bolt 78, Figure 2 and swinging the lever 77 with respect to the inner or cam lever 78. By means of the screw 70 in the oversize hole 71, Figure 2, the entire looper assembly may be shifted laterally to adjust the closeness with which the hook 88 passes the needle 33.

While, as noted, the various parts are readily adjustable, the inter-action between the needle and hook is not sensitive because of the quick action and long dwell provided by the cam 83. Proper action of the machine is therefore not dependent on fine adjustment, and the machine is rugged and dependable in performance without frequent expert attendance. The action of the takeup lever 49, as previously described, and the location of the tension device 59 also eliminate the necessity of accurately adjusting the tension.

It is obvious that the device may be constructed with a rotary shaft instead of the rocking shaft 61, a cam similar to the cam 83 furnishing the desired motion as already described. While the invention has been illustrated in preferred form, it is not limited to the precise structures shown, as various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. In a device of the character described, in combination, a throat plate adapted to support a fabric and having therein an elongated aperture, a needle reciprocable through said fabric and aperture and adapted to carry a yarn there-through, means to reciprocate said needle including a rotary shaft, a second shaft operable from said rotary shaft, a cam on said second shaft, a lever, a shear blade on said lever, an extended hook on the end of said blade, said lever being operable by said cam in timed relation to the reciprocation of said needle whereby said hook may intercept said yarn below said plate to form successive loops along said hook, means to feed said fabric along said plate, said means including a third shaft, a second shear blade cooperative with said first blade, and means operable partly by said lever and partly by said third shaft to actuate said second shear blade whereby said loops may be severed.

2. In a device of the character described, means to intermittently feed a fabric, said means including a rockable shaft, a needle reciprocable through said fabric and adapted to carry a yarn therethrough, a hook having shears on the shank thereof, means independent of said first means to oscillate said hook in timed relation with the reciprocation of said needle to intercept said yarn whereby a series of loops may be formed on said shank, and means operable partly by said oscillating means and partly by said shaft to

actuate said shears whereby said loops may be severed.

3. In a device of the character described, means to intermittently feed a fabric, a needle
5 reciprocable through said fabric and adapted to carry a yarn therethrough, a hook having shears on the shank thereof, means independent of said feeding means to oscillate said hook in timed
10 relation with the reciprocation of said needle to intercept said yarn whereby a series of loops may be formed on said shank, means operable partly by said oscillating means and partly by said
15 feeding means to actuate said shears whereby said loops may be severed, and a single adjusting device adapted to vary the length of feed and the opening of said shears.

4. In a tufting machine, in combination, a drive shaft, a throat plate adapted to support a fabric, a needle adapted to carry a thread, means
20 operable by said shaft to reciprocate said needle through said fabric and throat plate, a hook member, a second shaft operable by said first shaft, a cam on said second shaft adapted to oscillate said hook member to intercept thereon
25 successive loops of said thread, a shear on said hook member adapted to sever said loops, a feed shaft, means operable by said drive shaft to oscillate said feed shaft, a lever on said feed shaft, and a link connecting said lever and said
30 shear whereby said shear may be operated jointly by the motions of said feed shaft and said hook member.

5. A machine as claimed in claim 4 wherein

adjusting means is provided to vary the amplitude of oscillation of said feed shaft.

6. In a tufting machine, in combination, a base adapted to support a fabric, a drive shaft, a
5 needle having a terminal eye adapted to carry a yarn, means on said shaft to reciprocate said needle through said fabric whereby loops of said yarn may be formed on one side of said fabric, a
10 cam shaft operable from said drive shaft, a cam on said cam shaft, a lever pivoted to said base and carrying a pair of rollers engaging said cam, a second lever adjustably attached to said first
15 lever, and a hook member attached to said second lever, said cam having a lobe comprising an angular surface adapted to impart a rapid oscillation through said levers to said hook member to
20 rapidly advance the point of said hook member past said needle and a dwell surface adapted to hold said hook member stationary at the limit of its advance whereby said loops may be inter-
25 cepted.

7. A machine as claimed in claim 6 including means to adjust said hook member on said second
25 lever in a plane parallel to the motion of said needle.

8. A machine as claimed in claim 6 wherein said hook member includes a shank having
thereon a shearing edge, a shear blade pivotally attached to said hook member and engaging said
30 shearing edge, and a link connecting said shear blade to said base.

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