July 11, 1933. L. A. SMITH 1,917,334

TUFTING MACHINE

Filed June 25, 1932 2 Sheets-Sheet 1

Fig. 1.

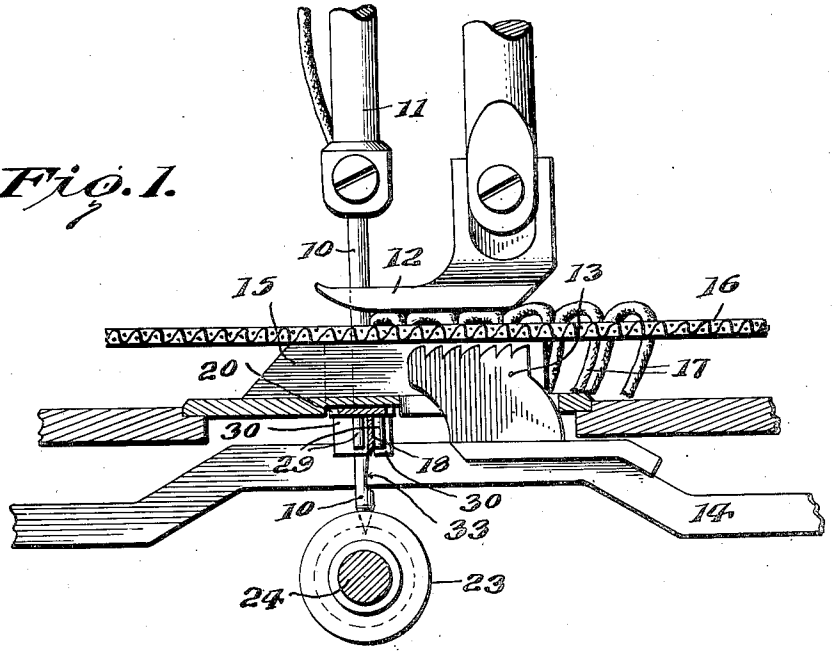
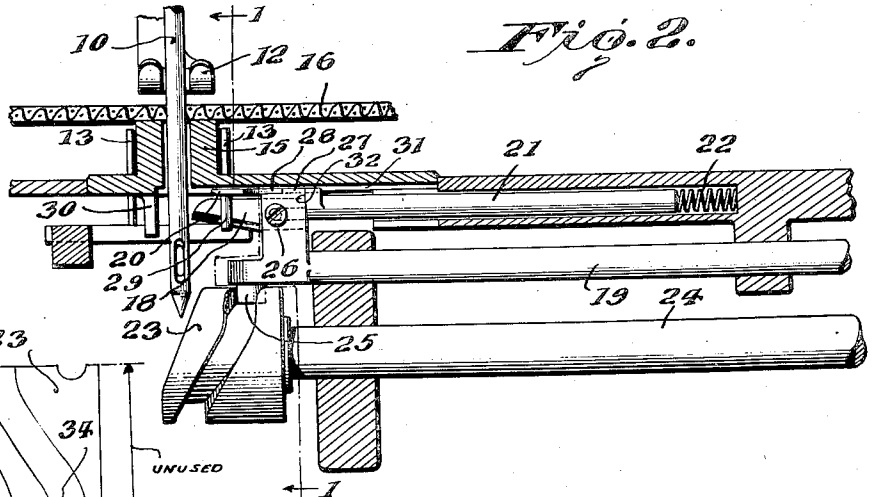


Fig. 2.



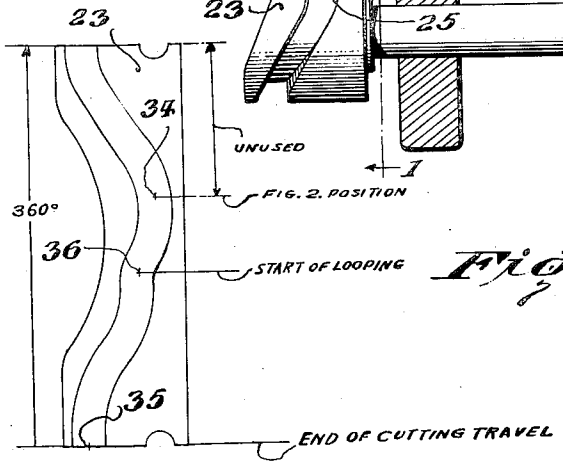


Fig. 3.

INVENTOR
Loyd A. Smith,
BY
ATTORNEY

July 11, 1933. L. A. SMITH 1,917,334

TUFTING MACHINE

Filed June 25, 1932 2 Sheets-Sheet 2

Fig. 3.

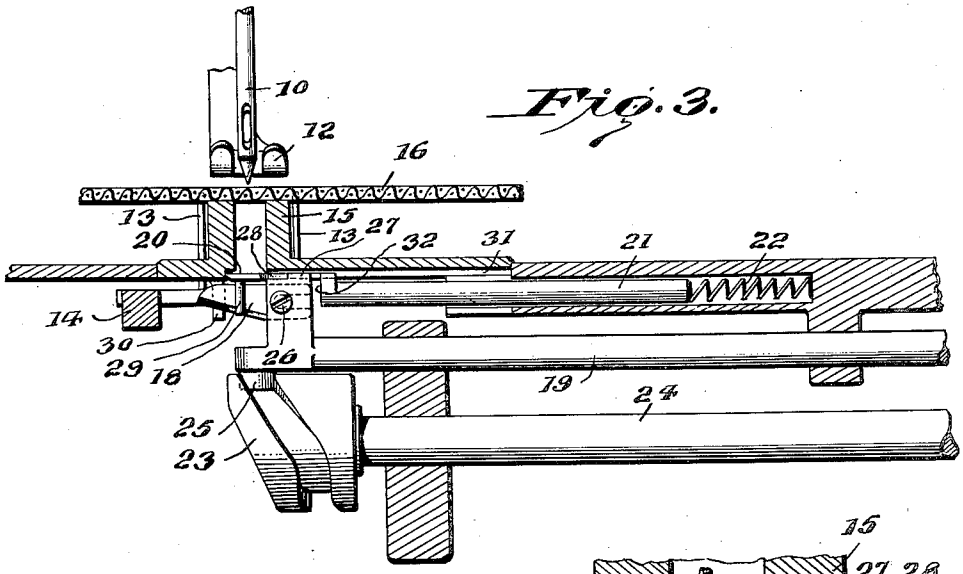
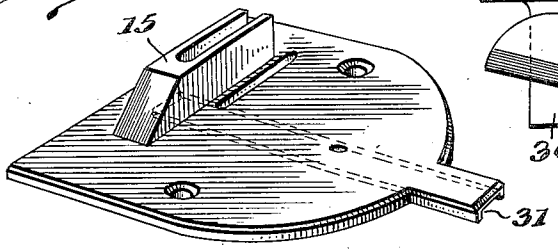


Fig. 5.



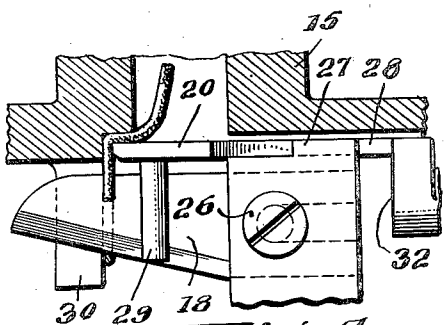


Fig. 4.

Fig. 6.

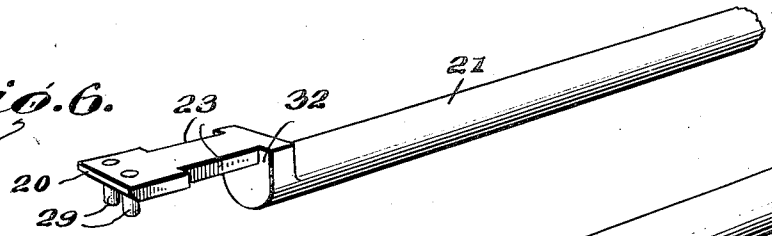
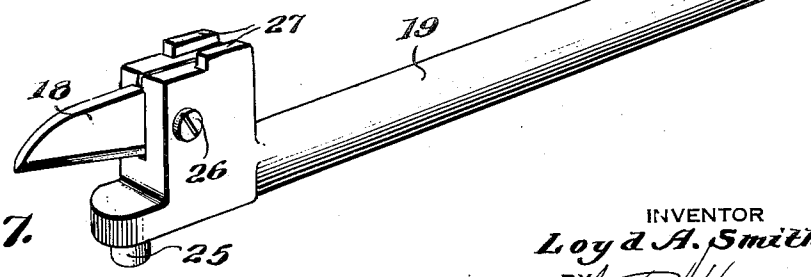


Fig. 7.



INVENTOR
Loyd A. Smith,
BY
ATTORNEY

Patented July 11, 1933

1,917,334

UNITED STATES PATENT OFFICE

LOYD A. SMITH, OF LA GRANGE, GEORGIA, ASSIGNOR TO TRULINE, INCORPORATED, OF LA GRANGE, GEORGIA, A CORPORATION OF GEORGIA

TUFTING MACHINE

Application filed June 25, 1932. Serial No. 619,237.

This invention relates to tufting machines and has for its object to provide a high speed machine which is simple and inexpensive and constructed to facilitate turning the work in making designs.

Another object is to shorten the travel of the loop forming mechanism and also the loop gripping and cutting mechanism if any, to facilitate high speed operation.

It has been customary to cut a formed loop or tuft by having the cutter pass into the loop formed by the looper and then either shear the loop or cut it by a downward movement of the cutter without any shearing action. Either expedient has required considerable travel of both the looper and cutter to accomplish this result because there was a tendency for the end portion of the loop remote from the work to swing or move with the looper as it moves into the loop. This tendency for the lower end portion of the loop away from the work to swing or move with the looper or cutter is greatly reduced with the result that a much shorter travel for the looper and cutter is made possible and such shortened travel permits high speed operation.

In the embodiment of the invention illustrated this tendency for the loop to swing or move with the looper or cutter is greatly reduced by the provision of an abutment close to the needle for holding the lower end portion of the loop against such swinging movement.

Specifically this abutment is slotted longitudinally of the loop to allow passage of the looper and cutter therethrough and the clearance between this abutment and the looper and cutter is small enough to prevent the strand entering this slot with the result that the end portion of the loop cannot be moved beyond this abutment. With such slotted abutment each side of the lower end portion of the loop is held against movement with the looper or cutter.

Referring to the drawings, Fig. 1 shows an end view of one embodiment of this invention.

Fig. 2 is a side view of the device shown in Fig. 1.

Fig. 3 is a view corresponding to Fig. 2 but with the cutter at the end of the travel just before completion of the cutting operation.

Fig. 4 is an enlarged view showing the strand in position just before completion of the cutting operation.

Fig. 5 is a top perspective of the slotted throat plate.

Fig. 6 is a perspective of the gripper and its support.

Fig. 7 shows a perspective of the combined looper and cutter and its support.

Fig. 8 is a developed view of the slotted cam which actuates the looper and cutter and gripper.

This machine includes the needle 10 provided with the usual needle supporting and actuating mechanism 11, and presser foot 12, which is operated in the usual maner. Feed dogs 13 of conventional type cause the work 16 to travel through the machine. These feed dogs 13 are arranged one on each side of the slotted throat plate or work support 15 and are carried from the supporting and actuating bar 14 which travels in the usual manner. This machine is preferably adapted for forming cut tufts 17 on the underside of the work, although if desired it may be changed by controlling the travel of the looper and its cam to avoid cutting.

The looper and cutter are combined into a single tool of the shape illustrated which is made from a razor blade. The cutting edge is shown in Figs. 2 to 4 inclusive, as being inclined, and the outer end portion of this cutter is dull to function as the looper. The portion immediately behind the dull edge is sharpened to serve as the loop cutting edge. As shown in Fig. 7 the cutter is provided with an edge which is bevelled on both sides. This looper and cutter is removably secured to a bar 19 which is slidably mounted in the machine frame as illustrated in Figs. 2 and 3. For holding both sides of the strand during cutting, a loop gripper 20 is slidably carried by the bar 21 and moved toward its gripping position by the spring 22 engaging the machine frame. The slotted cam 23 is mounted on the rotatable shaft 24 for actuating the

looper, cutter and gripper. The shaft 24 may be the usual shuttle actuating shaft of the ordinary sewing machine which upon removal of the shuttle and substitution of the cam 23 has been found adapted for satisfactorily operating the looper, cutter and gripper.

This shaft normally has an adjustable oscillating movement which is adapted for operation of the cam 23. A roller 25 carried on the forward underside of the bar 19 travels within the cam slot and as the cam oscillates the bar 19 is moved back and forth. The screw 26 may removably clamp the looping and cutting blade 18 in position. The back of this blade 18 is slotted as shown by the dotted lines in Fig. 4 to permit its ready removal from the end portion of the bar 19. Projections 27 extend above the looping and cutting blade for engagement with each side portion 28 of the gripper. On the lower forward portion of the gripper are carried two downwardly projecting closely spaced members 29 which function as guides for the flexible looper and cutter member so that these members 29 are spaced apart not more than the thickness of blade 18, especially since they are always in engagement with the blade 18.

An abutment 30 is slotted longitudinally of the loop in order that the blade 18 may be guided into the slotted abutment. The clearance between the blade 18 and the abutment walls on each side is so small that the strand cannot enter the abutment.

This action of the abutment in holding the lower end portion of the loop below the gripper 20 substantially reduces any tendency for the lower end portion of the loop to be carried with the looper. The underside of the throat plate is provided with slot 31 extending transversely to the needle and throat plate slot and for reception of the gripper. This slot as shown in Figs. 2 and 3, is longer than the travel of the gripper 20. The left side of the needle and tuft slot shown in Figs. 2 and 3 is under cut at its lower portion to provide an abutment against which the gripper 20 may clamp the strand during the cutting operation. The slotted abutment 30 has no gripping function but merely holds the strand against being carried with the looper or cutter, and as shown in Figs. 2, 3 and 4, this abutment 30 is in substantial alignment with the short strand gripping abutment.

The projections 27 contact with only the right end portion 32 of the recessed sides 28 and do not engage the forward end portion or shoulder since the spring 22 continually presses the gripper 20 toward the left in Figs. 2 to 4, while the projections 27 on the looper support engage the shoulders 32 for moving the gripper 20 against the action of the spring during only a portion of the travel of the looper and its support. The needle is provided with a flattened portion 33 which is engaged by the flexible looper at a small angle so that it may be bent aside by the needle and engage the strand when the needle is at its lowermost position and not require any extra downward movement of the needle to create the usual slack for the entry of the looper.

In Fig. 8 the center of the roller 25 when at one extreme of its travel is in the position shown by the numeral 34, as shown by Fig. 2, while at the other end of its travel is in the position shown by the numeral 35. The travel of the roller in the cam slot is between the positions 34 and 35 and such angular travel is about 220°. The roller does not travel throughout the rest of the cam slot shown in Fig. 8 as being above the point 34 and while such portion of the slot might well be filled, it is nevertheless cut out to facilitate the operation of forming the cam slot. When the blade 18 is moved forward slightly and the roller is in the position shown by the point 36 in Fig. 8, the looper enters the loop between the needle and one side of the strand. At some convenient position about midway between the points 35—36 the cutting operation starts and is completed just before the roller reaches the end of its travel at the point 35. The cam may be placed in its proper position on the shaft 24 by moving the needle 10 to its lowermost point and the looper 18 to its extreme position shown in Fig. 2. With the parts in this position a set screw carried by the cam may be tightened to clamp the cam in its proper angular position on the shaft 24.

In operation with the needle at the top of its stroke and the work in place, the gripper is in its closed position shown in Figs 3 and 4, and the looper and cutter are in cutting position and the feed dogs are cooperating with the work for feeding the same.

As the needle starts its downward stroke the combined looper and cutter completes the cutting operation and reaches the end of its stroke and then begins its movement to the right in Figs. 2 to 4, out of the path of the needle. After moving to the right from the position in Figs. 3 and 4, the looper support and projections 27 engage the shoulder 32 forcing the gripper to the right against the action of the spring 22 until all the parts have cleared the needle path before it reaches the gripper. Just before the needle reaches the fabric the feed dogs have completed the feeding operation. After clearing the needle path the looper and gripper are held in the position shown in Fig. 2 until the needle reaches the bottom of its stroke, during which time the feed dogs are moving into position for the next feeding operation. As the needle starts its upward motion the looper and cutter and gripper move

to the left in Figs. 2 to 4, far enough for the looper to pass between the needle and strand without the gripper engaging the needle. In this position the looper holds the strand until the needle rises above the gripper level after which the looper and gripper are carried further to the left until the gripper substantially engages its abutment and clamps the strand including both sides of the loop in the position shown in Fig. 4. After this the blade 18 continues its movement to the left with the projections 27 out of contact from the shoulders 32 and the cutting operation takes place.

The slotted abutment 30 engages both sides of the loop before completion of the looping operation and during the cutting operation with the result that there is no tendency for the lower end portion of the loop to swing to the left or to be carried with the looper and cutter as they move across the end of the loop. The cutter having an inclined edge need not have any downward movement and the simple straight line movement for the bar 19 has been found sufficient for both the looping and cutting operations. As the needle rises above the fabric the feed dogs again engage and feed the goods. As the needle reaches its uppermost position the looper and cutter have advanced far enough to bring the sharpened cutting edge of the blade 18 in contact with the loop and cut the strand.

Among the advantages of this invention may be mentioned: its simplicity of construction and high speed operation. The ordinary sewing machine may be converted into a tufting machine of this character by dispensing with the shuttle and placing the cam 23 on the shuttle shaft 24. The body of the machine frame may be drilled to permit insertion of the bars 19 and 21. An important advantage of this invention is the relatively short travel necessary for the looper and cutter by reason of the cooperation of the slotted abutment 30 with the strand. The disposition of the feed dogs 13 outside of the needle and tuft slot and throat plate permits this slot to be narrower than is possible when the feed dogs are arranged within the slot. This narrowing of the tuft slot lessens the tendency for the goods to be bowed down into the slot under the tension of the strand and makes this machine better adapted for lighter weight fabrics which are more flexible than the heavier fabrics.

The short travel for the combined looper and cutter as well as the simplicity of operation of a tufting mechanism by a single cam all contribute to high speed operation. In this machine no more than one loop at a time is ever on the looper with the result that it is easier to turn the goods in working a design with this machine than is the case in those prior art tufting machines having several loops simultaneously maintained on the looper. The looper, cutter and gripper all travel transversely to the travel of the goods through the machine and are located in a position for ready cooperation with the loop being formed. Also the tuft slot in the throat plate need not be as long in this machine as has been necessary in some of the prior art machines. The advantages of the combined flexible looper and cutter have been pointed out in connection with prior inventions. For sharpening the blade 18 may be removed on loosening the screw 26 and withdrawing the same from its support. No tufting machine is known which actuates the looper, cutter and gripper by means of so few parts, or by means of such a simple construction, or in which the gripper is actuated by the looper and cutter as here.

If desired a different shaped cam may be substituted for the cam 23 and may only form the tufts without cutting them. This same result may be obtained with the present invention if the adjusment in angular travel of the shaft 24 permits of operation between the point 34 and a point only slightly beyond the point 36.

From the drawings it may be seen that the looper travel is comparatively small, being only about three times the width of the slot in the throat plate through which the needle travels. This short travel for the looper, cutter and gripper enables the machine to be operated at high speeds.

I claim:

1. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming and cutting means, means for gripping the loop, said gripping means being actuated by said loop forming means.

2. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, means for gripping a formed loop, means for cutting a gripped loop, and means for actuating said gripping means by means of the movement of the cutting means.

3. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming and cutting means, means for gripping the loop, said gripping means being actuated by said loop forming means during a portion of its travel.

4. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming and cutting means, means for gripping the loop, said gripping means being actuated by said loop forming and cutting means.

5. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the

machine, a looper, means for gripping a formed loop and means for actuating said gripping means and comprising a spring in alignment with said gripping means for moving the same in at least in one direction and substantially parallel to the movement of said looper.

6. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming means and a slotted cam for sliding said loop forming means in both directions of its travel, said cam being on a shaft in substantial alignment with the needle in a direction transverse of the work travel.

7. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a gripper, and looper guide means carried by said gripper.

8. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a gripper, and looper guide means carried by said gripper, and extending below said gripper toward said looper.

9. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a combined looper and cutter, a gripper for the strand during cutting, and guide means for the combined looper and cutter carried adjacent the active end portion of said gripper.

10. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming and cutting means, means for gripping the loop, said gripping means and loop forming and cutting means all being actuated from an axially oscillatable shaft located below and provided with a cam substantially directly beneath them.

11. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a loop cutter and a gripper, said looper, cutter and gripper all being substantially parallel with each other.

12. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a loop cutter and a gripper, said looper, cutter and gripper all being interconnected and slidable substantially parallel with each other.

13. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, means for gripping a formed loop, means for cutting a gripped loop, and means for actuating said gripping means by means of the movement of the cutting means during only a portion of the stroke of said cutting means.

14. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming means, a shaft on one side of the needle extending transversely of the work travel and oscillating on its axis, said loop forming means being located between said shaft and the work support, and means between said shaft and loop forming means for driving the latter from the former in the general direction of the shaft axis.

15. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a flexible looper, an abutment adjacent the needle and close enough to the looper and needle to engage the strand and prevent its being carried between the looper and abutment, and guide means cooperating with said looper to insure its proper cooperation with said abutment.

16. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming means, a loop gripper, loop cutting means, an abutment with which said gripper cooperates, and another abutment extending longitudinally of the loop and located beneath the gripper for reception of said loop forming and cutting means and for cooperation with the strand to limit any swinging movement of the loop portion below the gripper during the loop forming and cutting operations, said abutment being slotted only wide enough to receive the loop forming means without the strand.

17. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a combined and integral loop forming and cutting means, said loop cutting means including a knife having a movement of translation to and fro in only one path and a cutting edge arranged at an acute angle to the direction of movement of said knife.

18. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a combined looper and cutter and means for actuating said looper and cutter, all movement of said combined looper and cutter being translational and in the same direction during the looping and cutting operations.

19. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming means, a loop gripper, an abutment with which said gripper cooperates, a spring cooperating with said gripper for moving the same in at least a portion of its travel toward said abutment, and a

member for moving said gripper against the action of said spring and away from said abutment, said member having a greater travel than said gripper and moving the gripper during only a portion of the travel of said member.

20. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper movable in and across the end of a formed loop, an abutment extending longitudinally of the loop and cooperating with at least one side of a formed loop adjacent the end thereof away from the work for holding such portion of the loop against movement with the looper as it passes across said end of the loop.

21. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a loop cutter movable in and across the end of a formed loop, a stationary abutment slotted longitudinally of the loop for cooperating with each side of a formed loop adjacent the end thereof remote from the work for holding such loop portion against movement with the looper or cutter as they pass across the bottom of the loop, said cutter having an inclined edge and only a movement of translation in one direction.

22. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming mechanism, a loop cutter movable across the end portion of a formed loop, a loop gripper for holding at least one side of the loop during the cutting operation, and an abutment fixed below said gripper for cooperation with the end portion of a loop and located close enough to the needle and cutter to limit any tendency for the strand to slide with the cutter and swing about the gripped portion of the strand as the cutter moves across the strand during cutting.

23. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming mechanism, a loop cutter movable across the end portion of a loop during cutting, and a stationary abutment cooperating with the end portion of a formed loop adjacent the needle and close enough to the cutter to limit any tendency for the end portion of the loop to swing with the cutter during the cutting operation.

24. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, means for forming a loop, a loop cutter, and a gripper for holding the loop during cutting, said gripper and cutter being slidable in substantially parallel directions.

25. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a shaft substantially aligned with the needle axis and extending substantially normal to the direction of work travel, and means between said shaft and looper for actuating the looper in a plane of the shaft axis.

26. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, said work support being provided with a slot through which the needle may operate and through which the formed tufts may pass, a looper movable across said slot, a co-axial cutter integral with said looper, the travel of said integral looper and cutter being not substantially more than about three times the slot width.

27. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a loop forming means, a thin flexible loop cutter, a guide cooperating with said cutter and means for moving said guide in the direction of cutter travel.

28. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a flexible looper, a looper guide for cooperating with the looper, and means for moving the guide in the direction of the looper travel.

29. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming means, a loop cutter and a fixed abutment for such cooperation with the end portion of a loop carried by the looper that said abutment resists tendency for the loop to slide along with either the looper or cutter.

30. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, loop forming means, a thin flexible loop cutter, a guide cooperating with said cutter, and means for moving said guide by movement of said cutter.

31. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a flexible looper, a looper guide for cooperating with the looper, and means for moving the guide in the direction of the looper travel by movement of said looper.

LOYD A. SMITH.