May 30, 1933. J. M. GLADISH 1,911,445

TUFTING MACHINE WITH COMBINED NEEDLE GUIDE AND GRIPPER

Filed Jan. 21, 1932 2 Sheets-Sheet 1

Fig. 1.

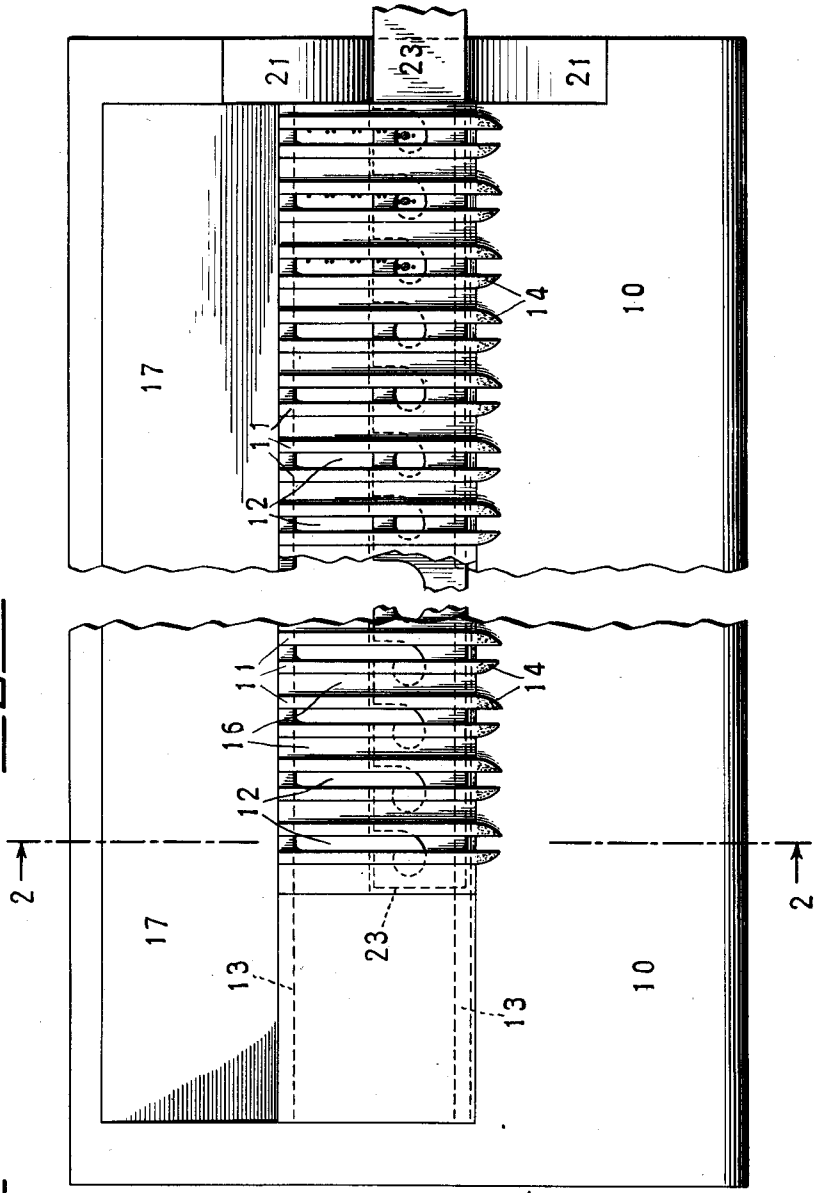
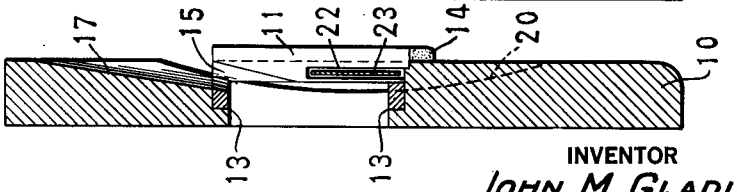


Fig. 2.



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TUFTING MACHINE WITH COMBINED NEEDLE GUIDE AND GRIPPER

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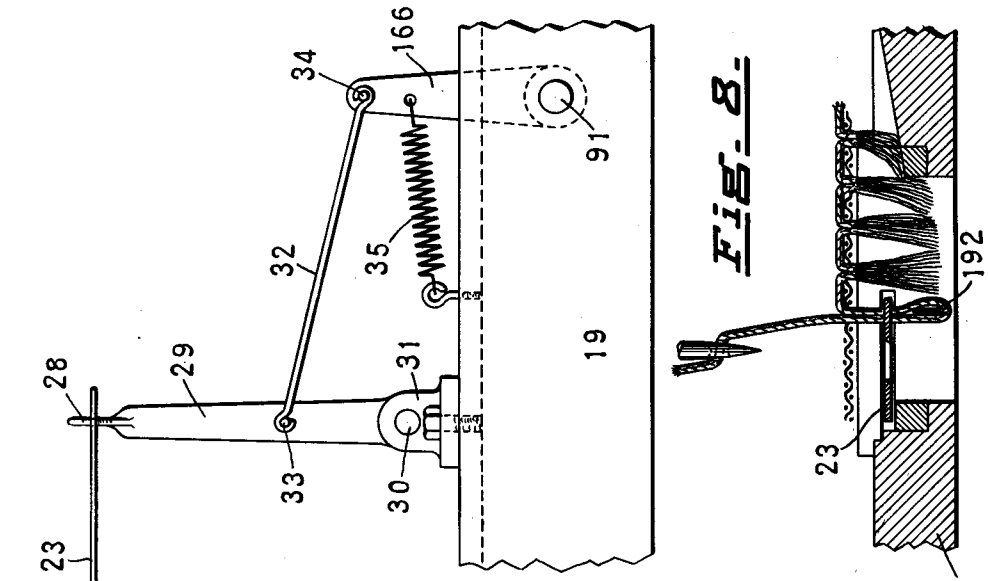


Fig. 8.

Fig. 7.

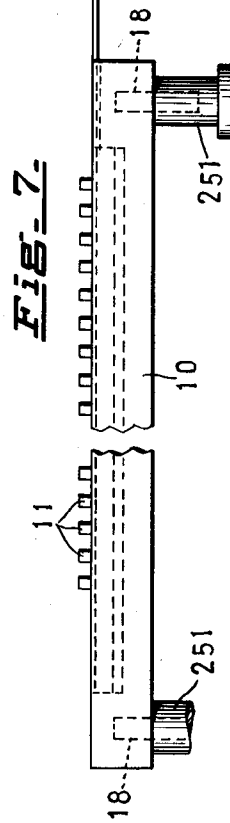


Fig. 6.

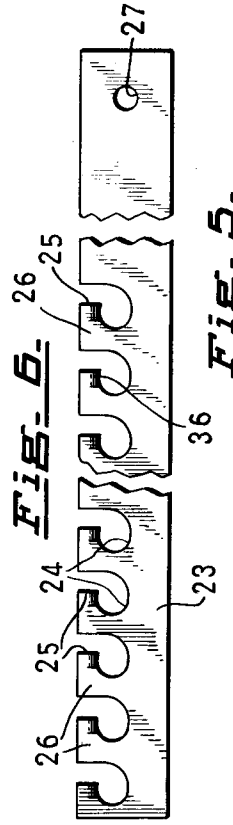


Fig. 5.

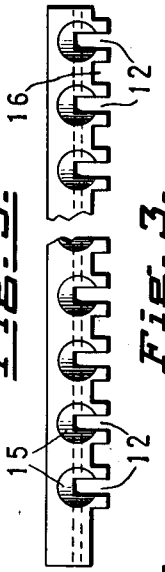


Fig. 3.

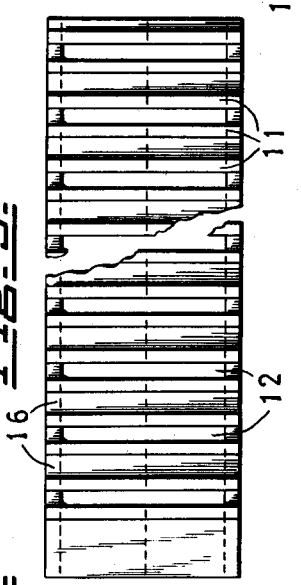
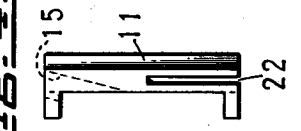


Fig. 4.



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UNITED STATES PATENT OFFICE

JOHN M. GLADISH, OF CHATTANOOGA, TENNESSEE, ASSIGNOR TO VALWAY RUG MILLS, INCORPORATED, OF LA GRANGE, GEORGIA, A CORPORATION OF GEORGIA

TUFTING MACHINE WITH COMBINED NEEDLE GUIDE AND GRIPPER

Application filed January 21, 1932. Serial No. 587,926.

This invention relates to tufting machines and has for its object to simplify their construction and cheapen their cost by reducing the number of operating parts.

Another object is to provide a machine of this class in which a looper or cutter may be quickly replaced if dull or broken or otherwise undesirable.

A further object is to provide a multiple needlel tufting machine provided with improved strand gripping means to prevent already formed tufts from pulling out on the downward stroke of the needles.

Referring to the drawings:

Fig. 1 is a top plan view of the throat plate embodying this invention.

Fig. 2 is a left end view of the device of Fig. 1.

Fig. 3 is a top plan view of the inserted portion shown in Figs. 1 and 2.

Fig. 4 is a left end view of the device of Fig. 3.

Fig. 5 is a top or rear end view of the device of Fig. 3.

Fig. 6 shows a detail of the combination needle guide and gripper plate.

Fig. 7 shows the actuating mechanism for the plate of Fig. 6.

Fig. 8 is a section through one of the slots 12 showing the strand being gripped.

The throat plate 10 of this invention is substantially heavier than the throat plate 265 of my prior application S. N. 290,977 filed July 7, 1928. A raised central inserted portion 11 of hardened steel is provided with slots 12 through which the newly formed tufts may pass out of the machine. This central portion 11 rests on ledges 13 formed in the throat plate 10 and may be held in place either by bolts or by solder. In the embodiment illustrated, soldered portions 14 are shaped as shown in Figs. 1 and 2, to engage the front ends of the walls of the channels or slots 12. Between the walls of the slots 12 are intermediate slots 16 which enable an already partially tufted fabric to be again passed through the machine without mashing the tufts, the already formed tufts passing through the slots 16 and the rounded front ends of the solder portions help to guide the already formed tufts in such a fabric into the slots 16. On such repassage of the goods newly formed rows of tufts may be provided between the already formed rows. The rear of the slots 12 are provided with a rounded and enlarged end 15 to enable the newly formed tufts to better pass out of the machine without being mashed under the presser feet which act upon the goods resting on the central inserted portion 11. The rear of the throat plate has an inclined surface 17 as shown in Figs. 1 and 2. Instead of having the throat plate 10 held in place by screws 266 as was described in said prior application #290,977, this invention contemplates the throat plate being held in place by dowel or guide pins 18 which have a good fit in the throat plate and in the customary supporting pins of posts 251 which are described more in detail in said prior application #290,977.

The pins 18 having a good fit in posts 251 and the throat plate, serve to accurately position the throat plate during operation. When it may be necessary to remove the throat plate to provide access to a looper or cutter located below the plate 10, it is possible to quickly remove the plate without the expenditure of time necessary to loosen bolts or screws, to make the necessary replacement or adjustment of the looper or cutting mechanism and continue operation of the machine with loss of only a minimum time. The right end 21 of the throat plate is recessed as shown in outline by the curved dotted line 20 in Fig. 2 in order to provide clearance for the plate 23 which will be described hereinafter.

As shown in Figs. 2 and 4 the central insert portion 11 is provided with a slot 22 of the shape indicated in which may reciprocate the plate 23 shown in detail in Fig. 6.

This plate 23 includes a plurality of fingers 26 having portions 25 which function as strand grippers. The rounded perforate portions 24 of the plate 23 are of a size to act as guides for the needles. In practice, the plate 23 has been made $\frac{1}{32}$ of an inch

in thickness and the slot 22, $\frac{3}{64}$ of an inch in depth. The curved needle guide recesses 24 have been made only slightly more in diameter than the width of the slots 12 and less than $\frac{1}{4}$ of an inch in diameter so that these needle guide portions may function to reduce any tendency one or more needles may have to be bent aside by the work when the needles become dulled or for any other reason may tend to be bent out of the way from a position for cooperation with the looper.

This invention contemplates the use of a combined looper and cutter of the sort described in said previous application #290,977, as well as actuating mechanism for the loopers and cutters like that described in said prior application or like that described in the improved construction of my later application S. N. 422,322 filed January 21, 1930. The plate 23 shown at the left of Fig. 1 is in the open position with the gripping portion 25 substantially flush with the left side of the slots 12, while the same strip at the right portion of Fig. 1 is shown in closed position with the gripping portion 25 substantially abutting the right wall of the slots 12 in Fig. 1. It will be understood that the strip 23 does not simultaneously have any portion in both an open and closed position but that the entire plate 23 is either in the open or closed position or in movement between such extreme positions.

The plate 23 is provided in its right end portion with a hole 27 in which fits a pin 28, the pin 28 being fixed to the lever 29, shown in Fig. 7 as being pivoted at 30 in a supporting bracket 31 bolted to the channel member 19 which constitutes the main frame of the tufting machine. The channel member 19 is the same as the channel designated by the corresponding numeral in prior application S. N. 290,977. The lever 29 is actuated from the oscillating shaft 91 through the lever arm 166 and connecting rod 32 which engages pins 33 and 34 on the levers 29 and 166 respectively.

The movement for the lever arm 166 and the plate 23 is of a comparatively small amount since the plate 23 has a travel of only the width of the slots 12 and therefore all connections between the plate 23 and its actuating mechanism should be substantially free from any lost motion. The shaft 91 and lever 166 are the same parts which are designated by the same numerals in prior application #290,977, these parts being driven by the cam 77 and lever 101 shown in said prior application. A spring 35 is shown as being attached at one end to the channel member 19 or bed of the machine and attached at its other end to the lever arm 166. In such position the cam 77 (not shown) may move the plate 23 into its closed or strand gripping position and the spring 35 functions to move the plate 23 from its closed to its open position. If desired the spring may be used to move the plate 23 to its closed or gripping position where the machine is intended for use with strands of different size and the cam to move the plate 23 to the open position, just the reverse of the construction illustrated.

In operation the needles on the downward stroke pass through the fabric with the plate 23 in its closed or strand gripping position in order that none of the previously formed tufts may be pulled out. When the needles reach the lowermost position the flexible loopers of said prior application #290,977 are bent aside by the needles in passing between the strands and needles. The plate 23 which functions as a combined gripper and needle guide remains in its closed position until the needle is at its lowermost position. As the needle starts its upward movement the gripping portions 25 move to the left to open the slots 12.

After the needle moves above the work, the work feeding mechanism causes the work to be moved rearwardly and while the loopers are engaged and also move rearwardly with the work as described in said prior application #290,977. The movement of both the work and the loopers causes the strands to be moved into position to be engaged by the grippers 25. As the top of the needle stroke is reached the travel of the work is completed and the grippers 25 engage at least two or three or more strands of the most recently formed tufts. After the grippers engage the strands the cutters sever the loops held by the grippers and the grippers stay in the closed position on the downward movement of the needles, as previously described, until the needles are in the lowermost position. The cycle of operations just described is such as to permit flexibility and high speed operation. For example, the grippers may or may not engage the strands during the cutting operation since with the thin flexible looper and cutter used there is less tendency to pull out any of the loops than would be the case where a substantially thicker and heavier looper were used, although it will be understood that the grippers preferably engage the strands during the cutting operation in order to provide greater uniformity in tuft length.

With the thin flexible looper used it is desirable that each needle should engage the looper in the same position and that one or more needles should not be bent aside for any reason. One cause of the needles being bent aside is the dulling of the needle points. Another cause is the use of substantially heavy strand carried by the

needles and such heavy strand sometimes tends to bend aside the needles as the strand engages the work and is pulled through it.

In the present construction the needle point is received within the needle guide before the eye of the needle is passed into the goods so that any subsequent tendency for the needle to be bent aside by heavy strand which it may carry is minimized in this invention, where as here the needle guide plate 23 is located quite close to the work.

Among the advantages of this invention may be mentioned:

The great simplification in construction by the provision of a combined needle guide and strand gripping mechanism thus enabling the plurality of grippers 182 and 184 described in the prior application S. N. 290,977 to be dispensed with as may also the abutment members 177 against which such plural grippers operate. In this invention the gripping portions 25 clamp the strand against the right side wall of the slots 12. This right side wall of the slots 12 which functions as the strand abutment during gripping may have a slot therein due to the slot 22 in which the plate 23 moves, such a slot being slightly wider than the thickness of the plate 23 provides good gripping action, althought if desired it will be understood that after the plate 23 has been inserted the portion of the slot 22 in the plane of the abutment surface and against which the grippers cooperate may be closed by solder or the like. Closing the slot 22 in the abutment surface will not provide as good a strand clamping action, will not make the plate 23 easily removable, and will necessitate the spacing between the fingers being larger and the fingers 26 narrower. Therefore such a construction is not preferable.

In any case the plate 23 is readily removable with the throat plate 10 when the throat plate is raised from its guide pins 18 by moving the plate 23 out from around the pin 28.

It should be borne in mind that a slotted abutment provides a better gripping action for a strand than would a smooth abutment surface.

The quick removability of the throat plate is another feature and in this construction the weight of the throat plate tends to maintain it in position on the guide pins 18. This quick removability of the throat plate does not hold up production when it is necessary to replace a looper and cutter. Another advantage of this invention resides in the absence of any narrow guide slots or the like adjacent the looper and cutter, which might become filled with lint. In the present construction the looper and cutter does not need to be guided between the multiple grippers as shown in said prior application #290,977, and it will be seen that any lint formed during the looping and cutting operation in this invention is free to fall to the bed of the machine.

The automatic lubrication of the plate 23 in the slot 22 is another feature of this invention. If oil or other usual lubricant were used there would be an almost inevitable danger of damaging the work through discoloration. In the present invention it has been found that the slight clearance between the plate 23 and the sides of the slot 22 is sufficient to enable particles of lint to gather and form a cushion and lubrication without danger of overheating due to rapid reciprocation of the plate 23.

When the gripping portion 25 of the plate 23 is of the width indicated it will grip both sides of the last formed loop, as shown in Fig. 8. and will be found to be satisfactory when the machine is set for formation of five to eight stitches per inch, as is customary. However, if more than the two strands illustrated are gripped that will generally be no disadvantage.

Generally the slot 22 is from about .010 to about .015 inch wider than the thickness of the plate 23. This clearance has been found satisfactory for eight to twelve ply yarn usually used. Where a finer yarn is used it may be necessary to substitute a plate 23 which has a closer fit in the slot 22. Where it is desired to use two sizes of yarn in the same fabric at the same time the machine can be so adjusted that the gripper will satisfactorily clamp the smaller strand and such adjustment will then force the larger strand slightly into the slot 22.

The customary foundation for receiving the tufts include two, three and four plies of heavy duck previously sewn together. With such a foundation a dull needle point will be more likely to cause the needle to be bent aside and follow the line of least resistance, sliding off into pockets between the stitches or sliding off any hard place in the fabric foundation. It is to lessen the likelihood of the needle being bent aside from such causes that the plate 23 functions as a needle guide.

The rear edge 36 of the needle guide opening is slightly rounded or bevelled on the top side but provided with a square edge on the lower side. This permits the yarn traveling downward with the needle and the square edge on the underside helps prevent the yarn from moving upward with the needle. Generally the gripping means does not release the strand until after the needle has started its upward stroke and moved away about 1/64 of an inch upwardly. This delay in release of the gripper is sufficient to allow the looper 192 to fully engage the strand. As the needle begins

its upward movement from its lowermost position, the strand will be held to some extent by the square bottom edge of the needle guide portion 36 to aid in holding the strand against rising until the looper has fully entered the loop. As shown in Fig. 8 it will be seen that the gripper plate 23 is approximately in the center of the loop between the fabric and the looper. Clamping the strand in such mid position by the lower edge of the portion 36 of the needle guide keeps the strand from moving forward with the forward motion of the looper during its engagement. In order to obtain a uniform appearance on the back of the rugs being formed it is desirable to apply considerable tension to the strand to pull the strand down tight against the back of the fabric and as the needle reaches the bottom of its stroke the strand has been pulled tight owing to the fact that the previously formed loop is held securely by the gripper.

As the needle starts its upward movement there is a tendency for the fabric and strand to move upwardly upon release of this tension and it is at this point in the operation that the additional strand clamping means provided by the bottom edge of the needle guide portion 36 becomes of advantage.

Where the plate 23 is connected to its operating lever 29 by only the pin 28 it will be appreciated that upon quick removal of the throat plate 10 the plate 23 is automatically disengaged from the lever 29 and is removable with the throat plate 10.

The strand on the rear side of the needle on its downward stroke is under greater tension than that on the front side due to the strand in the previously formed loop being gripped and also due to the friction of the needle eye. Because of this fact it is desirable to locate the needle guide close to the rear side of the needle so that it may normally engage the strand and reduce any tendency for the needle to flex due to the strand being tighter on the rear side.

As will be seen from Fig. 33 of the drawings in prior application S. N. 290,977 it has been found advantageous to use needles having a ground out portion just above the eye of the needle on the rear side, that is, the side away from the operator in order to provide a recess portion on the needle for cooperation with the combined looper and cutter. Owing to this ground out portion there is a tendency for the point of the needle to flex rearwardly as there is less metal on that side of the needle axis than on the front side. This is an advantage as it tends to confine the needle flexure in one direction and accordingly it is only necessary to provide guiding means on one side of the needle, that is on the rear side.

The openings in the plate 23 through which the tufts pass may be of the same width as the slots 12. The grippers preferably engage both strands of the last formed loop whether the loop is cut or not. As the term "loop" is used in the claims, the term is not intended to necessarily include only uncut loops but may also include cut loops.

The machine of this invention may be the same as that described in prior application S. N. 290,977, in respect to the mechanism not specifically described herein, and differs only in respect to the mechanism which is specifically described.

I claim:

1. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, strand gripping means for the newly formed loop, said last mentioned means comprising a plate slidable within a slot closed on the top and bottom at least in part by said work support, and mechanism for actuating said plate in timed relation to said needle.

2. A tufting machine comprising a work support, a plurality of alined needles, means for simultaneously actuating the needles to form loops, said work support being provided with a plurality of substantially parallel slots one behind each needle to receive the formed loops, a plurality of gripping fingers, each adapted to clamp a newly formed loop against one side of its slot, a slidable member in front of said alined needles and by which said fingers are actuated, and means for moving said member to cause the fingers to open and close said slots in timed relation to the movement of said needles.

3. A tufting machine comprising a work support, a plurality of alined needles, means for simultaneously actuating the needles to form loops, said work support being provided with a plurality of substantially parallel slots one behind each needle to receive the formed loops, a plurality of gripping fingers, each adapted to clamp a newly formed loop against one side of its slot, a slidable member in front of said alined needles and by which said fingers are actuated, means for moving said member to cause the fingers to open and close said slots in timed relation to the movement of said needles, said fingers being fixed to said slidable member within a slot below the top of said work support.

4. A tufting machine comprising a work support, a plurality of alined needles, means for simultaneously actuating the needles to form loops, said work support being provided with a plurality of substantially parallel slots one behind each needle to receive the formed loops, a plurality of gripping fingers, each adapted to clamp a newly formed loop against one side of its slot, a slidable member in front of said alined needles and by which said fingers are actu-

ated, means for moving said member to cause the fingers to open and close said slots in timed relation to the movement of said needles, said fingers being fixed to said slidable member within a slot below the top of said work support, said fingers being shaped to constitute needle guides.

5. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, strand gripping means for the newly formed loop, said last mentioned means comprising a plate slidable within a slot within said work support, said plate being shaped to constitute a needle guide by being bevelled on its top edge adjacent the needle, and mechanism for actuating said plate in timed relation to said needle.

6. A tufting machine comprising a work support, a needle, means for actuating the needle, a needle guide surrounding the needle, and located closer to the needle at the back than at the front and close enough to the work for the needle point to be received within said guide before the strand carried by the needle has been pulled into the work, and means for moving at least part of said needle guide in timed relation to the needle to permit feeding the work with newly formed tufts.

7. A tufting machine comprising a work support, a needle, means for actuating the needle, looping and cutting mechanism on the opposite side of said work support from the needle actuating mechanism, said work support having a slot therein through which the formed tufts are passed out of the machine, a support for said work support, guide pins for positioning said work support on its support whereby said work support may be held without the use of bolts or other clamping means and yet be readily and quickly removable to provide access to said looping and cutting mechanism.

8. A tufting machine comprising a work support, a needle, means for actuating the needle, to form a loop, strand gripping means for the newly formed loop, said last mentioned means comprising a plate slidable within a slot closed on the top and bottom at least in part by said work support, and mechanism for actuating said plate in timed relation to said needle, said work support comprising a plate recessed to receive a smaller plate set into the first mentioned plate, said smaller plate being slotted to receive said strand gripping plate.

9. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, strand gripping means for the newly formed loop, comprising a gripping member, an abutment for cooperation with said member, mechanism for producing relative movement between said member and abutment, said abutment being provided with a slot across which the strand is clamped by said member, and said slot being wider than the thickness of said member and in the general plane of said member.

10. A tufting machine comprising a work support, a plurality of alined needles, means for simultaneously actuating the needles to form loops, said work support being provided with a plurality of slots one behind each needle to receive the formed loops, a plurality of gripping fingers each adapted to clamp a newly formed loop against one side of its slot, a slidable member for simultaneously actuating all of said fingers and located out of the way of the movement of newly formed tufts through the slots, for causing the fingers to open and close said slots in timed relation to the movement of said needles.

11. A tufting machine comprising a work support, a needle provided with an eye, mechanism for actuating the needle, means for forming a loop, a combined needle guide and gripper for the strand of the previously formed loop, means for moving said needle guide and gripper in timed relation to the needle actuating mechanism, said needle guide being shaped for normal engagement with the needle strand on that side of the needle on which the strand possesses greater tension.

12. A tufting machine comprising a work support, a needle provided with an eye, mechanism for actuating the needle, means for forming a loop, a needle guide arranged for normal engagement with the needle strand on that side of the needle where the strand is under greater tension and means for moving said needle guide in timed relation to the needle.

13. A tufting machine comprising a work support, a needle provided with an eye, mechanism for actuating the needle, means for forming a loop, a needle guide arranged for normal engagement with the strand on that side of the needle where the strand is under greater tension and means for moving said needle guide in timed relation to the needle, the portion of the needle guide engaging the strand carried by the needle being bevelled on the side adjacent the work support and provided with a square edge on its opposite side to assist in holding the strand as the needle begins its movement away from its extreme position.

14. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, a needle guide intermediate the work and the end of the loop being formed, said guide being bevelled on its edge adjacent the needle and work to form a chisel-like edge close enough to the

needle for normal cooperation with the strand carried by the needle whereby said guide may lessen any tendency for the strand to move toward the work with motion of the needle in that direction.

15. A tufting machine comprising a work support, a needle, means for actuating the needle, a looper to form a loop, the needle being shaped to provide greater flexibility in one direction than in another, a needle guide located between the looper and work and closer to the needle on the side toward which it is likely to bend than on any other side.

16. A tufting machine comprising a work support, a needle, means for actuating the needle, to form a loop, the needle being shaped to provide greater flexibility in one direction than in another, a needle guide located closer to the needle on the side toward which it is likely to bend than on any other side, said needle guide constituting a portion of a gripping means for an already formed loop.

17. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, a needle guide intermediate the work and the end of the loop being formed and located closer to the needle on the rear side thereof than on the front.

18. A tufting machine comprising a work support, a row of needles, means for actuating said needles in unison, the points of said needles being arranged in substantial alignment and a plurality of strand gripping means for already formed loops, said strand gripping means being arranged in substantial alignment back of the needles, and means for actuating said strand gripping means in unison and only in a direction substantially parallel to the row of needles.

19. A tufting machine comprising a work support, a row of needles, means for actuating the needles in unison, a plurality of loop forming means and a plurality of strand grippers adjacent the loop forming means and work and movable solely in a direction substantially parallel to the row of needles.

20. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, a needle guide intermediate the work and the end of the loop being formed and located close enough to the needle on at least one side to engage the needle strand, said needle guide means being shaped to exert a greater retarding action on the needle strand with movement of the needle in one direction than the other.

21. A tufting machine comprising a work support, a needle, means for actuating the needle to form a loop, a needle guide intermediate the work and the end of the loop being formed and located close enough to the needle on at least one side to engage the needle strand, said needle guide means being shaped to exert a greater retarding action on the needle strand out of than into the work.

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