

May 16, 1933.

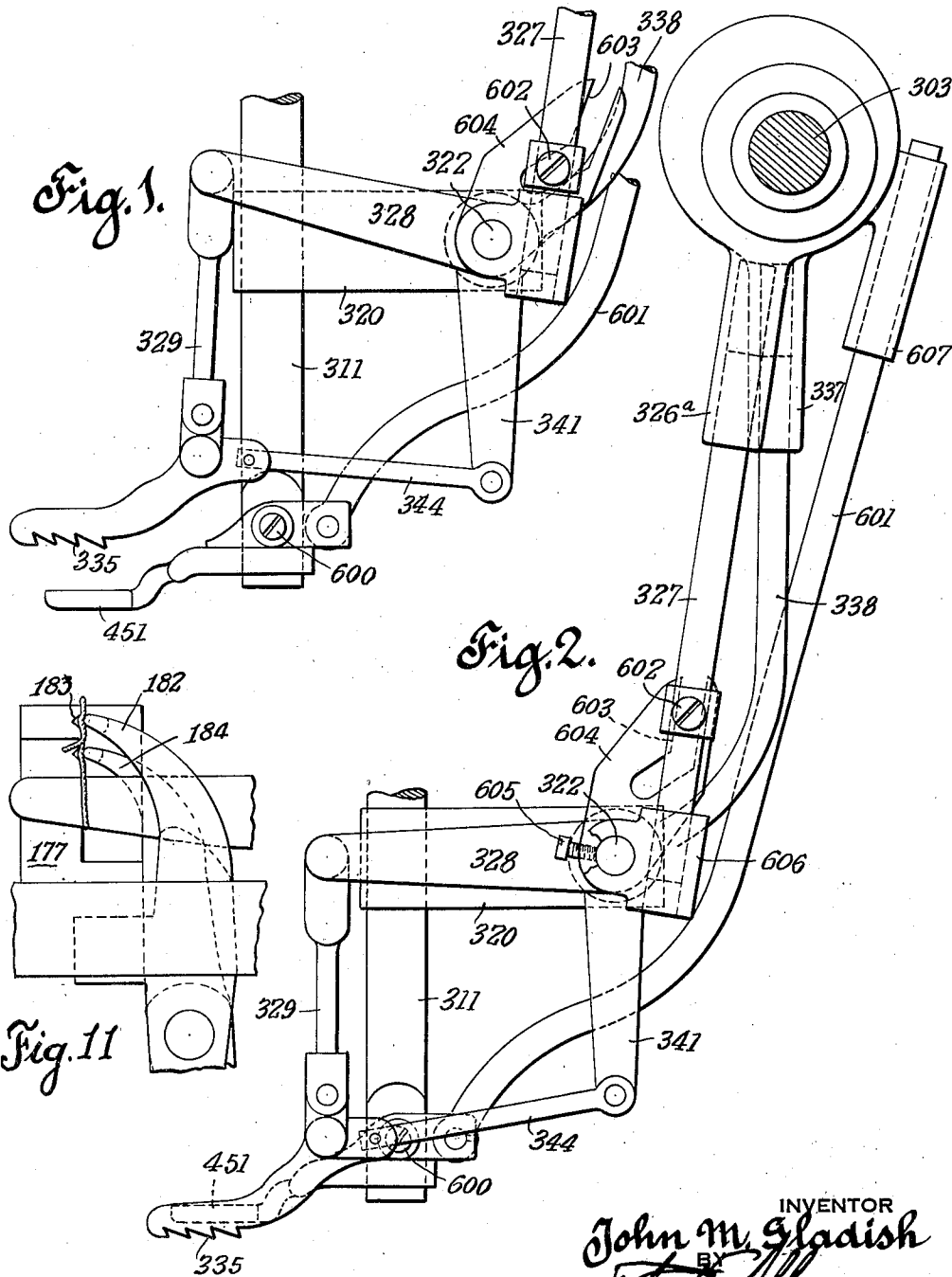
J. M. GLADISH

1,909,531

TUFTING MACHINE

Filed Jan. 21, 1930

4 Sheets-Sheet 1



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May 16, 1933.

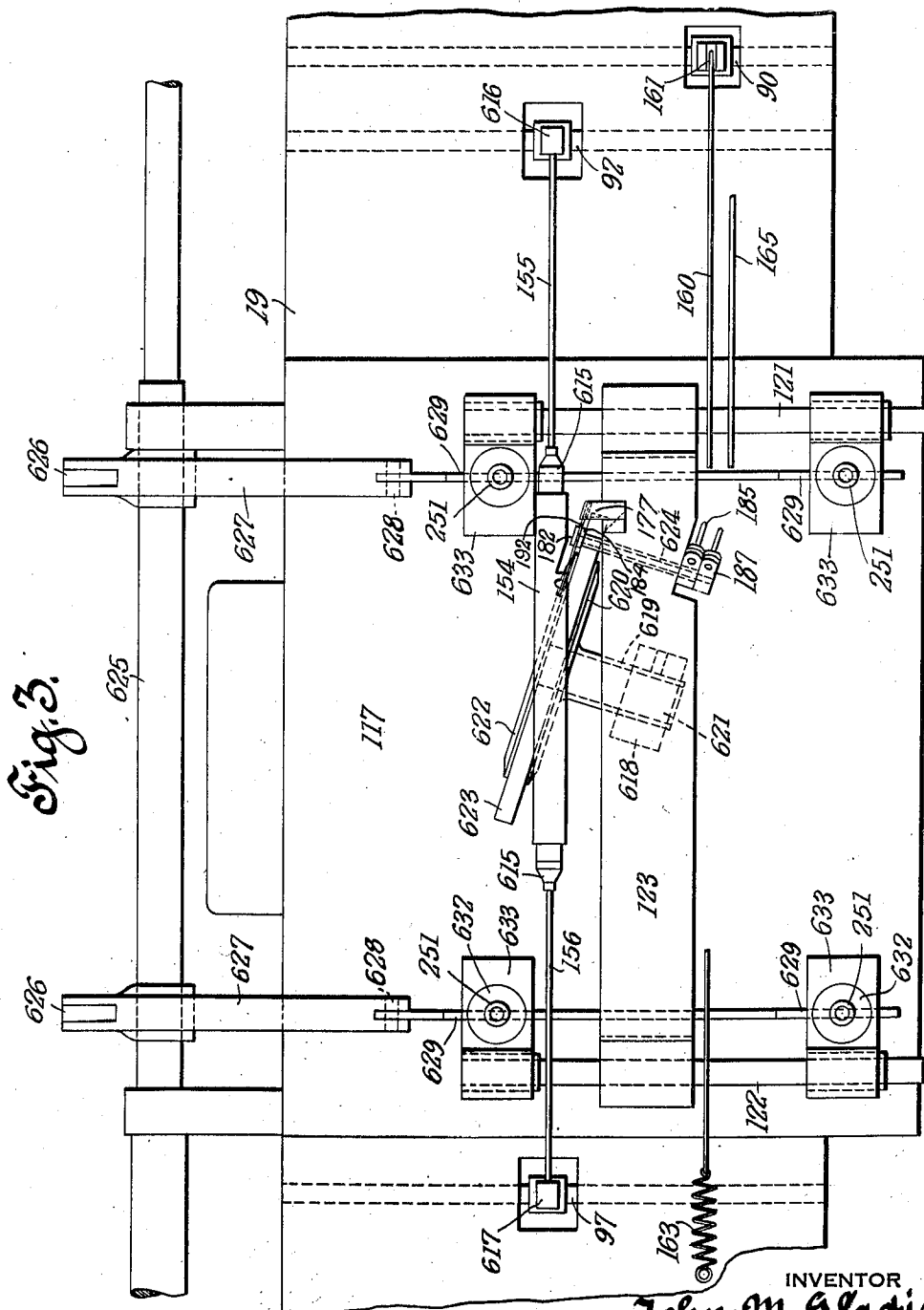
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Fig. 4.

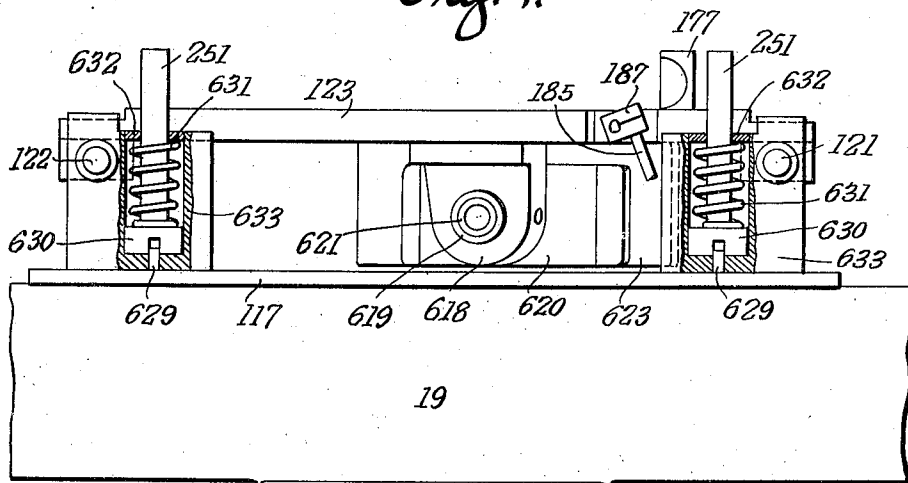
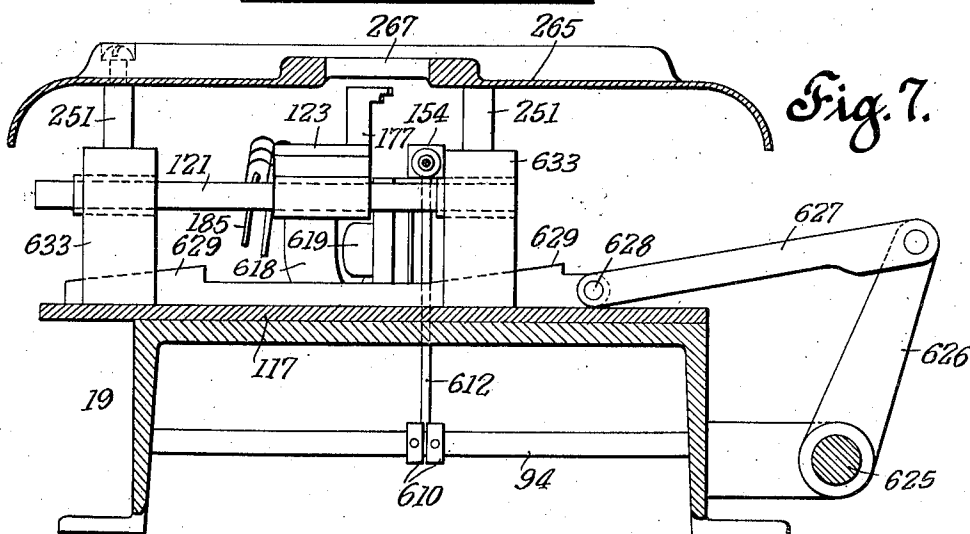


Fig. 7.



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Fig. 9.

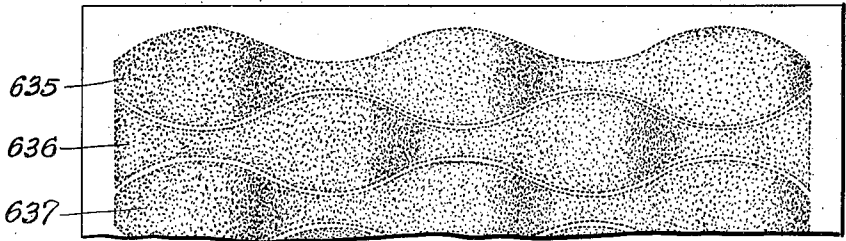


Fig. 10.

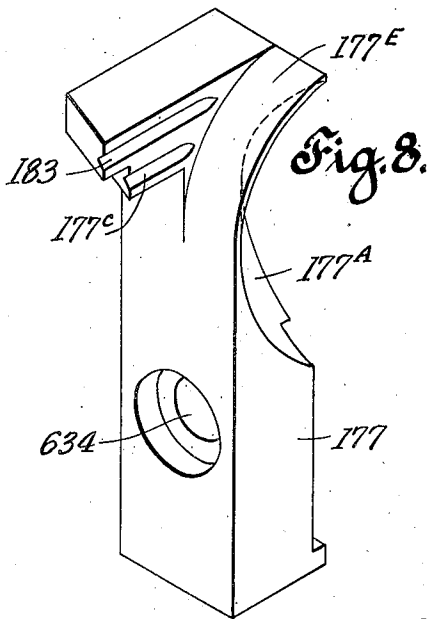


Fig. 5.

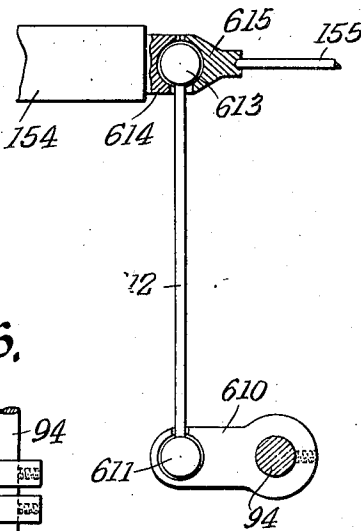
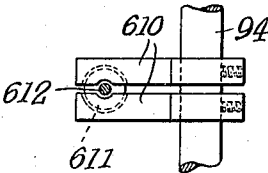


Fig. 6.



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TUFTING MACHINE

Application filed January 21, 1930. Serial No. 422,322.

This invention relates to tufting machines and has for its object to maintain a higher degree of uniformity of product than has heretofore been possible at high speed.

5 In prior machines, such as those described in my application S. N. 290,977 filed July 7, 1928, where the presser foot and feed dog are both mounted on the same yieldable support, with high speeds the presser foot has not stayed on the goods as it should but
10 has risen off the goods due to the inertia of the parts and to the feed dog lifting the presser foot off the work as the feed dog presses down against the work. This raising of the presser foot at high speeds permits the work to be raised and prevents the tufts being of as uniform length as is the case at low speeds.

Below the work table the looper and cutter support, especially in the large size multi-needle machines, possesses a substantial inertia at high speeds. Its longitudinal, lateral, and vertical movements at nearly the same time result in the many connections and bell crank levers, etc. through which
25 some of the motions are transmitted becoming loose and flexing and thus contributing to non-uniformity of tufts at high speeds.

According to this invention the mechanism both above and below the work support has been improved so that the new constructions cooperate to produce the novel result of greater uniformity and tuft length formation at both high and low speeds.

35 Referring to the drawings, Fig. 1 is an end view of the presser foot and feed dog actuating mechanism with the feed dog raised above the presser foot.

40 Fig. 2 shows the feed dog in operative position below the presser foot.

Fig. 3 is a simplified plan view of some of the parts below the work table.

45 Fig. 4 is an elevation partly in section of the device of Fig. 3.

Fig. 5 is a detail showing the mechanism for raising and lowering the looper support.

Fig. 6 is a top plan view of the lever 610 in Fig. 5.

50 Fig. 7 is an end elevation partly in section

showing the mechanism for controlling the height of the work table.

Fig. 8 is an enlarged detail of one of the abutments against which the strand grippers engage.

Fig. 9 is a top plan view illustrating one type of work which this invention is readily adapted to produce.

Fig. 10 shows an elevation of the work shown in Fig. 9.

Fig. 11 shows the grippers holding the strand against the abutment.

To facilitate an understanding of the present invention, where numerals below 600 are used they designate parts which are at least functionally similar to correspondingly numbered parts in said prior application S. N. 290,977.

Referring to Figs. 1 and 2 of the drawings, the yieldable support 311 carries the presser foot 451 on its lower end portion and also carries a block 320 in which is mounted the mechanism for actuating the feed dog 335. This mechanism includes the eccentric rod 327 which rotates the crank arm 328 to raise and lower the actuating link 329 while the eccentric arm 338 oscillates the crank arm 341 and the link 344 in such manner that the feed dog is moved to feed the work through the machine.

Unlike the prior constructions the presser foot 451 is pivoted at 600 to the yieldable supporting member 311 and is oscillated slightly about this pivot by the eccentric rod 601 which is rigidly fixed to the rear of the presser foot (and not pivotally secured thereto). The upper end of the eccentric rod 601 is free to slide in the guide 607 so that it is the movement in this end of the eccentric rod to the right and left which is effective in oscillating the presser foot slightly and substantially opposite in phase to the raising and lowering of the feed dog. Pressure downwardly through link 329 is transmitted by the feed dog 335 to the work. Since the work is substantially rigidly supported on the work table this downward pressure causes an upward thrust in the block 320 and the support 311 to yield against its springs (not shown). This upward thrust tending to lift the

100

presser foot has been such that the inertia of parts would cause the presser foot to stay off the goods at very high speeds and it is to counteract this effect that the presser foot in this invention is given a positive oscillatory movement by the eccentric rod 601, such slight movement being only enough to assist in keeping the presser foot closer to the work without impeding the usual cooperative action of the feed dog and presser foot.

Unlike prior constructions this invention contemplates overcoming the danger of the goods catching in the serrations in the bottom of the feed dog when the presser foot is raised from the work and the work is inserted or removed from the machine. In order to accomplish this result automatic means is provided such that when the presser foot is raised off the goods in the usual manner by raising the yieldable support 311 the feed dog is simultaneously raised above the presser foot so that there will be no danger of the feed dog projecting below the presser foot and accidentally catching the goods to tear or pull out any of the previous stitches or tufts. This automatic mechanism includes a pin 602 secured to the eccentric rod 327 and carrying a roller which fits within the slot 603 of the lever 604, said slot being of the general shape indicated in Figs. 1 and 2. The lever 604 is secured to the shaft 322 by a set screw 605 or other convenient means so that motion of the eccentric rod oscillates crank arm 328 in the usual manner.

Loosely mounted on the shaft 322 is the member 606 which constitutes a guide for the lower end of the eccentric rod 327. The upper end of the eccentric rod 327 is fixed to the eccentric at 326A and not slidably mounted therein as is the rod 338 on the eccentric 337. As was stated before, rocking of the eccentric rod 327 to the right and left raises and lowers the feed dog through the crank arm 328 and link 329, the motion from the rod 327 being transmitted to the shaft 322 through the pin and roller 602 engaged in the slot 603 of the lever 604, thus causing the lever 604 to oscillate shaft 322. When the presser foot and its yieldable support 311 are raised off the goods the shaft 322 is likewise raised, since this shaft is carried by the block 320 secured to the support 311. Raising the shaft 322 causes the pin and roller 602 to be moved further into the slot 603 and into the angularly disposed portion of the slot as shown in Fig. 1, with the result that the raising movement rotates the shaft 322 more sharply than it otherwise would and in the clockwise direction to raise the feed dog above the presser foot as shown in Fig. 1, so that there will be no likelihood of the goods becoming accidentally engaged or caught in the feed dog.

In Fig. 3 the looper 192 and its support 154 and the abutment and gripper carrier

123 are shown as adapted for a single needle but it will be understood that these are readily adapted for any number of needles. As is customary the looper support 154 is given a motion longitudinally of itself by the connecting rods 155 and 156 which are shifted by means of the shafts 92 and 97. This looper support 154 also has an upward and downward movement, that is, a motion parallel to the needle travel. Likewise the looper support 154 has a motion toward and from the operator. The motion toward and from the operator as well as the motion up and down is not transmitted by the large number of parts that were previously necessary and not only does this invention reduce the total number of parts but it lessens the likelihood of lost motion and flexure affecting tuft length uniformity at high speeds. In the present improvement the support 154 as well as member 123 are made of a hardened and tempered aluminum alloy better adapted for high speed action without excessive wear than are the prior heavier constructions. To raise and lower support 154 the main shafts are used although these are farther separated and placed below the ends of the looper support as shown in Fig. 5. Secured on the shaft 94 is the lever 610 made in two parts as shown in Fig. 6 and arranged to snugly engage the ball 611 at the lower end of connecting link 612 which is provided at its upper end with another ball 613 snugly fitted between the housings 614 and 615. These ball and socket joints are preferably of the type adapted to give minimum lost-motion and wear. At the other end of the looper support is a similar ball joint and at the ends of the connecting rods 155 and 156 are similar ball and socket joints 616 and 617.

In Figs. 3 and 4 it will be seen that below the member 123 is mounted an integral projection 618 arranged at an acute angle to the longitudinal axis of said member and of the general shape illustrated. Snugly fitted in the projection 618 is the sleeve 619 which carries at its outer end the guide 620 in the form of a rectangular disc perforated to receive the stem 621 fitting within the sleeve 619 and carrying at its outer end the guide 622 of similar shape to the guide 620. A set screw or other means may firmly position the sleeve and stem within the projection 618 so that the guides are rigidly fixed far enough apart to allow the sliding fit for the guide plate member 623 which is an integral projection below the looper support 154. This plate 623 which slides between the guides 620 and 622 is recessed to allow the desired endwise and vertical movement around the stem 621. Motion of the member 123 forward and backward is imparted in the usual manner by the shafts 121 and 122. This forward and backward movement is transmitted to the guides and from the guides

620 and 622 to the plate 623 and the looper support 154.

Longitudinal motion is imparted to the looper support 154 by the connecting rods 155 and 156 and thus imparts angular movement to the looper support along the guides 620 and 622. This construction guides more accurately the looper support and the loopers and cutters than do a plurality of bell crank levers 148, etc. in the prior construction.

As before, the member 123 carries a gripper abutment 177, there being an abutment for each needle and likewise two grippers 182 and 184 as shown in Fig. 3 for each needle located and actuated in substantially the same manner as before, the grippers being mounted on concentric shafts 624 and provided at their ends remote from the grippers with separate actuating means 185 and 187. Each actuating means comprises a connection as before extending from the actuating members 160 and 165 up to the concentric shafts so that the grippers are rocked as these actuating members 160 and 165 are shifted. In the present case the connecting rods between the concentric shafts 624 and the slidable actuating members 160 and 165 should be slightly yieldable or flexible for the reason that it is difficult otherwise to obtain such precision that each gripper engages its strand with the same pressure. If these connections between the shiftable connections 160 and 165 are made slightly yieldable or flexible the desired result of having the grippers all engage their respective strands with the same degree of clamping action, is more readily attained.

Another manner in which the present construction substantially simplifies the earlier construction is in the means for lowering and raising the work support to control the length of tufts. Instead of having a large number of levers and shafts, the present invention contemplates a shaft 625 extending along the machine and adapted to be rocked by some lever located above or below the work support which may or may not be connected with the means for controlling the length of loops on the upper side of the work, as was the case in the prior machine of the aforementioned application. As shown in Figs. 3, 4, and 7, extending from the shaft 625 are a pair of lever arms 626 at the outer ends of which are pivotally connected links 627 which are preferably connected at 628 to the slidable wedge members 629, each member 629 having two wedge surfaces as shown in Fig. 7. These wedges slide through recesses in the guide blocks 633 and engage the slotted heads 630 on the stems 251 which support the work table. A connection 632 closes the mouth of each opening receiving the head 630. Spring 631 engages the closure 632 and the heads 630 and maintains

the heads in engagement with the wedges 629 so that as the shaft 625 is rocked, the work support is raised and lowered. This does away with the larger number of parts previously necessary to accomplish the same result.

In Fig. 8 is shown an improved form of abutment member 177 against which a pair of gripping members of the usual shape engage to hold the strand. These abutments are located in the same position on the member 123 as before and are attached only slightly different, such for example as having a hole 634 through which passes appropriate connecting means for attaching the abutment 177 to the member 123. As before the portion 177C is engaged by one gripper and the portion 183 is engaged by the other gripper but with this improved abutment the abutment surfaces are each provided with a groove of V-shaped cross section as illustrated, so that the strand may be more strongly gripped on the edges of these grooves and firmly held. As before, the abutment member is provided with a recess 177A to allow passage of the adjacent looping member and the slope 177E acts as a needle guide. While not shown this abutment member may have the additional recess 177B of the former abutment.

In Figs. 9 and 10 is illustrated the new type of work which this machine is especially adapted to provide, the numeral 635 designating one row of tufts while other rows are designated by 636 and 637, each row having the length of tufts changing in the manner illustrated. Where the tufts are long they spread out to a greater width and give the appearance illustrated in Fig. 9, especially after laundering, while that portion of each row of tufts in which the tuft length is short does not spread out to the same extent and for this reason both the plan and elevation of the tuft rows possess a wavy effect.

In Fig. 9 the tuft rows 636 between the rows 635 and 637 which were previously stitched on the first passage of the goods through the machine are so adjusted that these intermediate rows are substantially 180 degrees out of phase with the undulations of the first rows. Many other effects may be produced where some mechanism is provided for readily or automatically rotating shaft 625 to control the tuft lengths.

Figure 11 shows the grippers 182 and 184 which are shown in Figure 3, these grippers being of the same sort shown and described in the prior application Ser. No. 290,977 referred to above. The abutment 177 shown in Figure 8 is unlike the abutment of said prior application by the provision of grooves into which the strand may be partially forced by the grippers so that a better gripping action is provided on the edges of these V grooves in the face of the abutment.

By having a Jacquard or other automatic mechanism operate a control lever, not shown, on the shaft 625, a variety of designs may be produced with variations in tuft length and pleasing effects are also attainable where such an automatic mechanism to control tuft lengths cooperates with some automatic mechanism for controlling the selective operation of the needles in the attainment of various shapes and colored patterns.

I claim:

1. A multi-needle tufting machine having a work table, a movable support carrying a number of loopers on one side of the work table and on the other side of the table a presser foot mechanism and feed mechanism, and ball and socket bearing means for actuating said looper support with at least two motions.

2. A multi-needle tufting machine having a work table, a movable support carrying a number of loopers on one side of the work table and on the other side of the table a presser foot mechanism and feed mechanism, means for actuating said looper support longitudinally of itself, laterally, and up and down, angularly disposed guides along which said looper support moves and ball bearing means for imparting a thrust to said looper support at an acute angle to said guides.

3. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, a support for said looper, mechanism for giving said looper support motions toward and from said needle and toward and from said work support and ball and socket connections between said looper support and its actuating mechanism and through which both of said motions are transmitted to said looper support.

4. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, and ball and socket bearing connections for imparting motions to said looper support longitudinally and transversely of the needle.

5. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, and a guide engaging the looper support to control its direction of motion toward and from said needle and transversely of the needle path, and means for moving said support along said guide longitudinally of the needle, the longitudinal

movement of the looper toward and from the needle taking place along said guide.

6. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, a guide engaging the looper support to control its direction of motion toward and from said needle and transversely of the needle path, and means for simultaneously moving said support and guide in the general direction of work travel, the longitudinal movement of the looper toward and from the needle taking place along said guide.

7. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, a guide engaging the looper support to control its direction of motion toward and from said needle, a needle guide, a strand gripper and a supporting member common to said looper guide, needle guide and gripper.

8. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, a guide engaging the looper support to control its direction of motion toward and from said needle, means for applying force at a small angle to said guide for moving said support along the guide, said force being transmitted through a ball and socket connection to said looper support, and said looper support being of an aluminum alloy for high speed operation.

9. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper on the opposite side of the work support from that on which the needle is mounted, a strand gripper rotatable adjacent said looper to engage at least one side of a loop, means for cutting said loop, means for actuating said gripper which means includes a shaft on which the gripper rocks, a yieldable-extension on said shaft and mechanism to actuate said extension to rotate the gripper.

10. A tufting machine comprising at least one strand gripper for each needle, a support for said gripper and on which it oscillates, a rocking shaft for said gripper, a yieldable arm secured to said shaft for operating said gripper and a member for actuating said arm.

11. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work to the machine, a looper, a strand gripper, and an

abutment against which the gripper presses to hold the strand, the faces of said gripper and the abutment being shaped to coact and cause bending and unequal compression of the strand between them.

12. A tufting machine comprising a needle, actuating means therefor, a work support, tuft-forming means, means for adjusting the height of the work support which means includes wedges on which said support is mounted, and mechanism for moving said wedges.

13. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a looper support, looper support guide means, means for moving the looper into a loop and also away from the needle actuating mechanism, both of said last mentioned movements taking place along said looper guide means, and mechanism for moving the looper and guide means back and forth in the general direction of work travel whereby the looper has a movement in three directions each at an angle to the others.

14. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a looper support, looper support guide means, means for moving the looper into a loop and also away from the needle actuating mechanism, said guide means being stationary with respect to both of said last mentioned movements of the looper, and means for moving said guide means transversely of the needle travel and at an angle to the movement of the looper into a loop.

15. A tufting machine comprising a needle, actuating mechanism therefor, a work support, means for feeding the work through the machine, a looper, a looper support, means for moving the looper in at least three directions each of which is at an angle to the other directions of its movement, and a guide along which at least two of such looper support movements occur.

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