

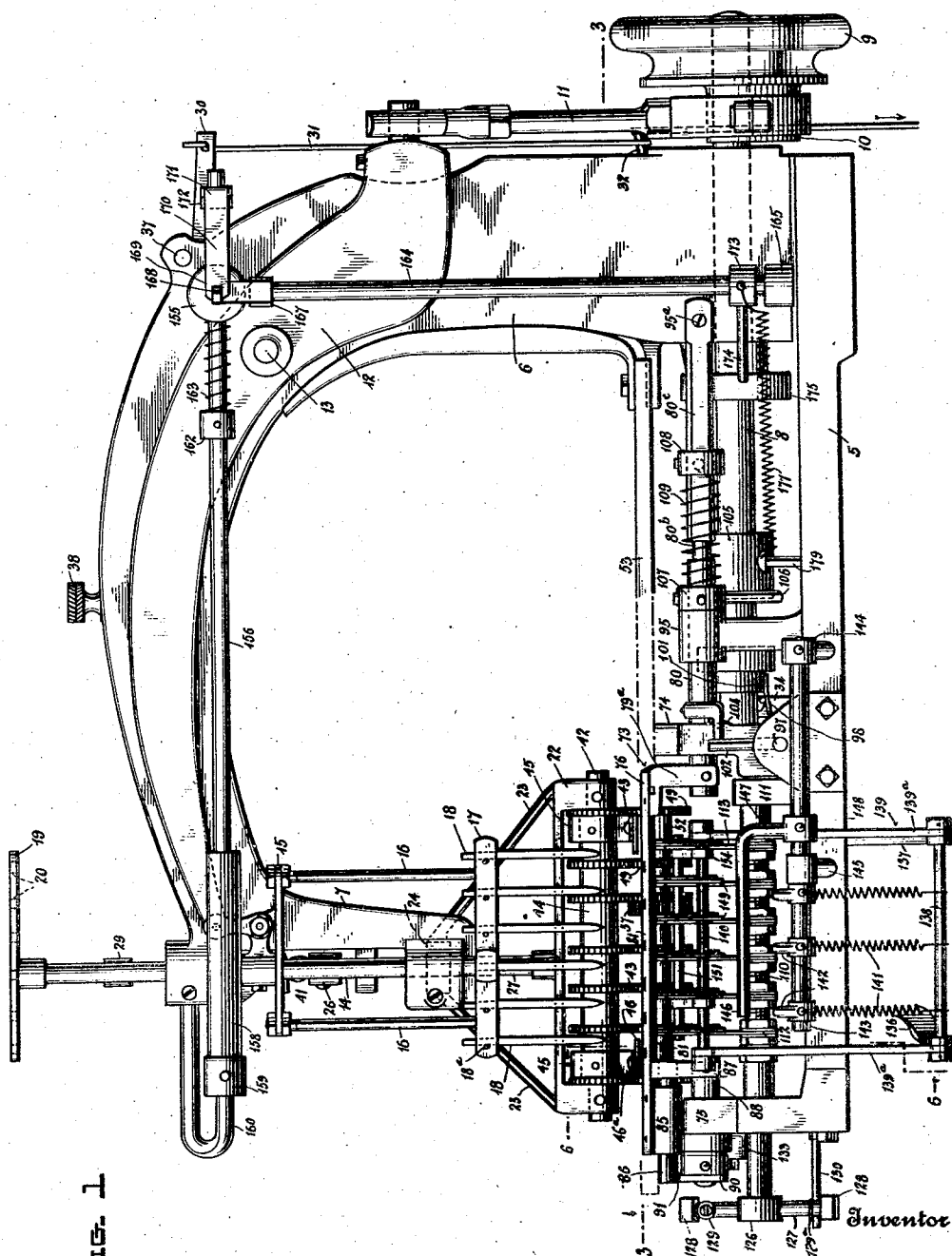
April 14, 1931.

J. M. GLADISH

1,800,522

TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

Filed Sept. 20, 1927 9 Sheets-Sheet 1



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1,800,522

TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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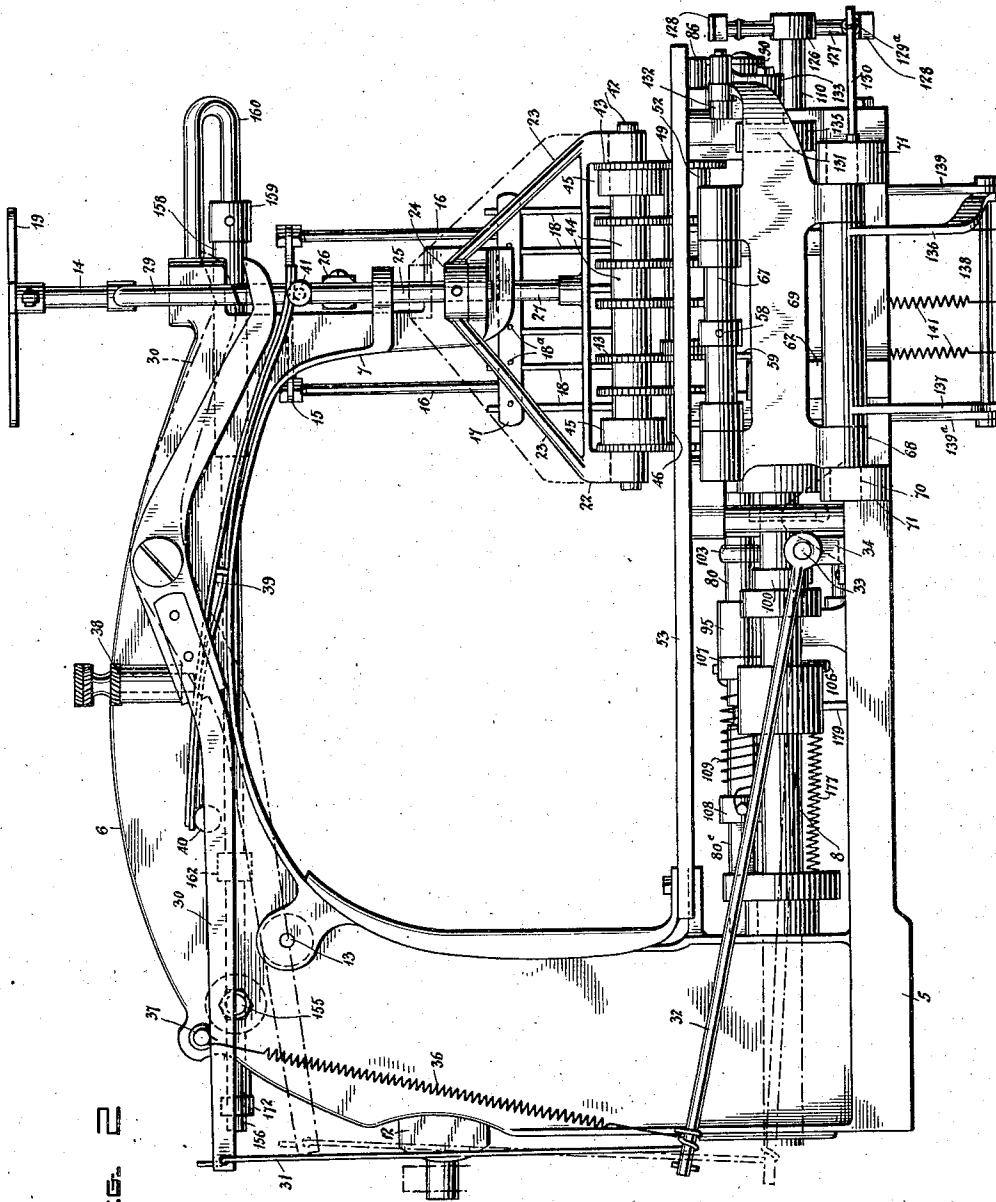


FIG. 2

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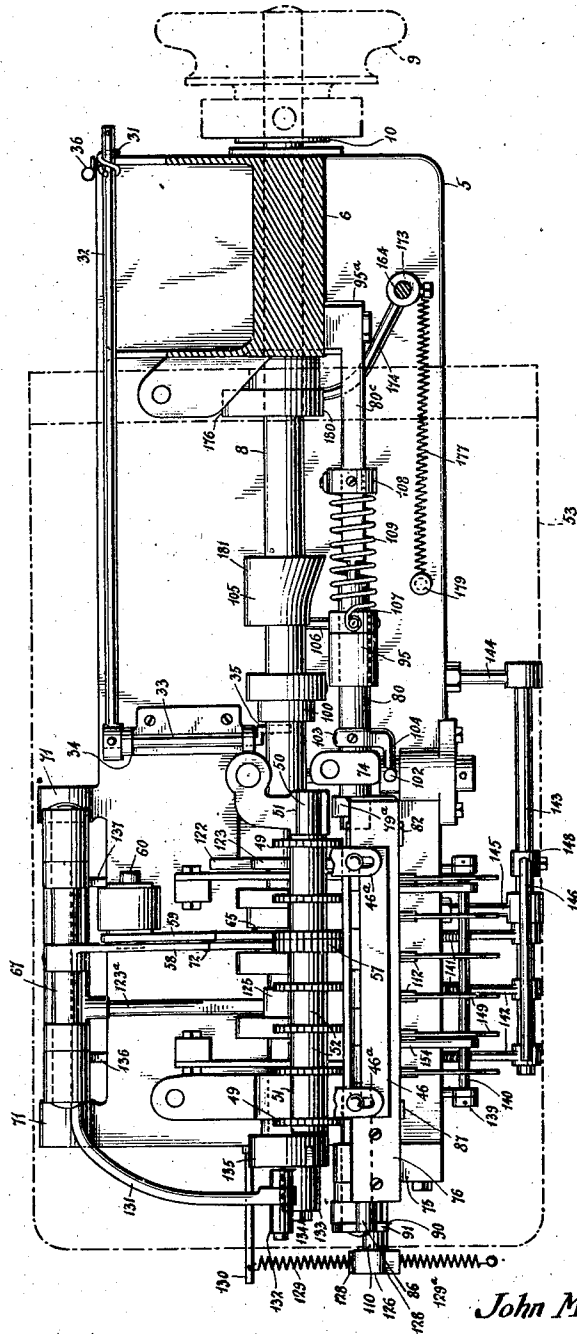
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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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9 Sheets-Sheet 3

FIG. 3



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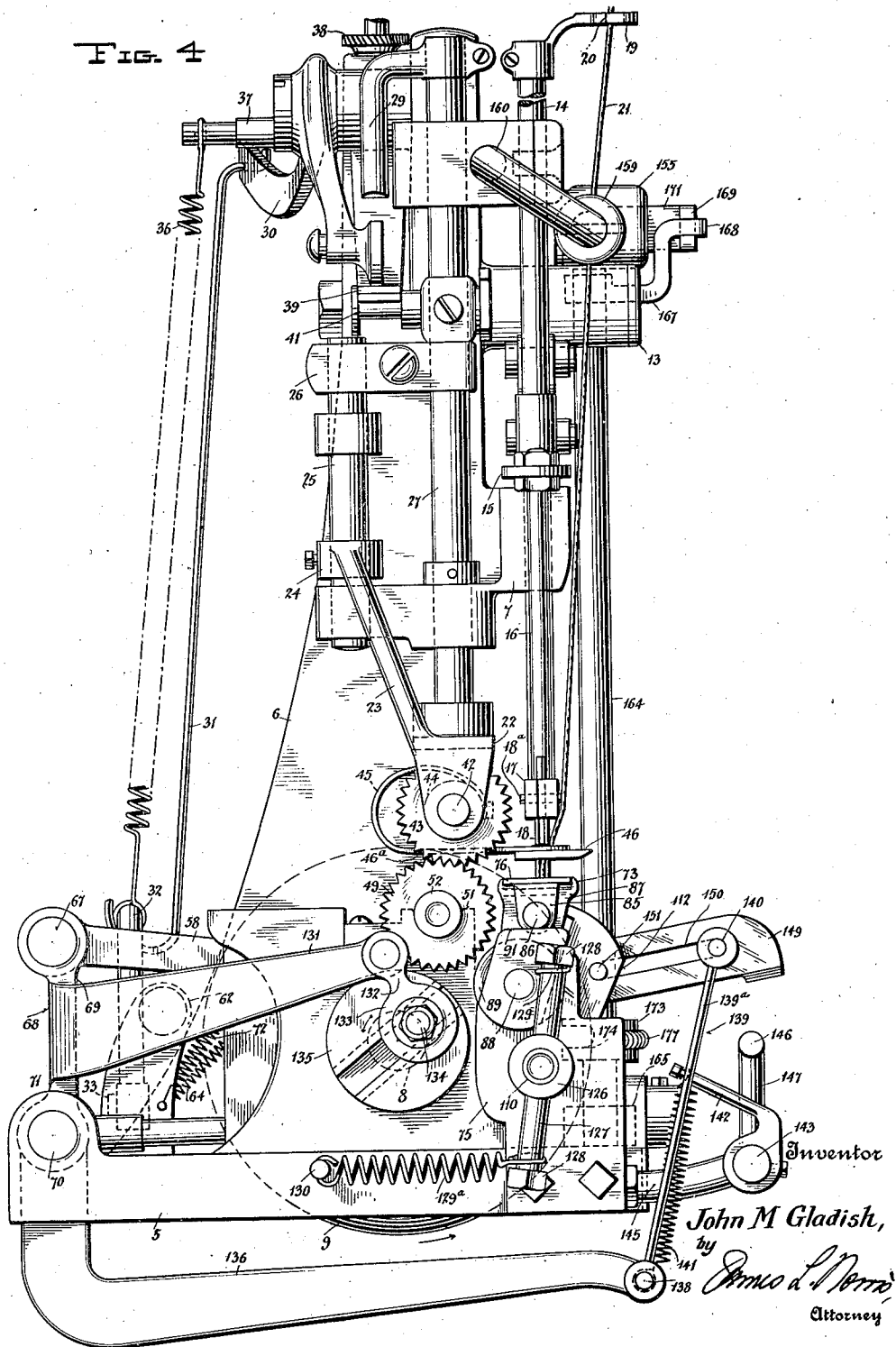
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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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FIG. 4



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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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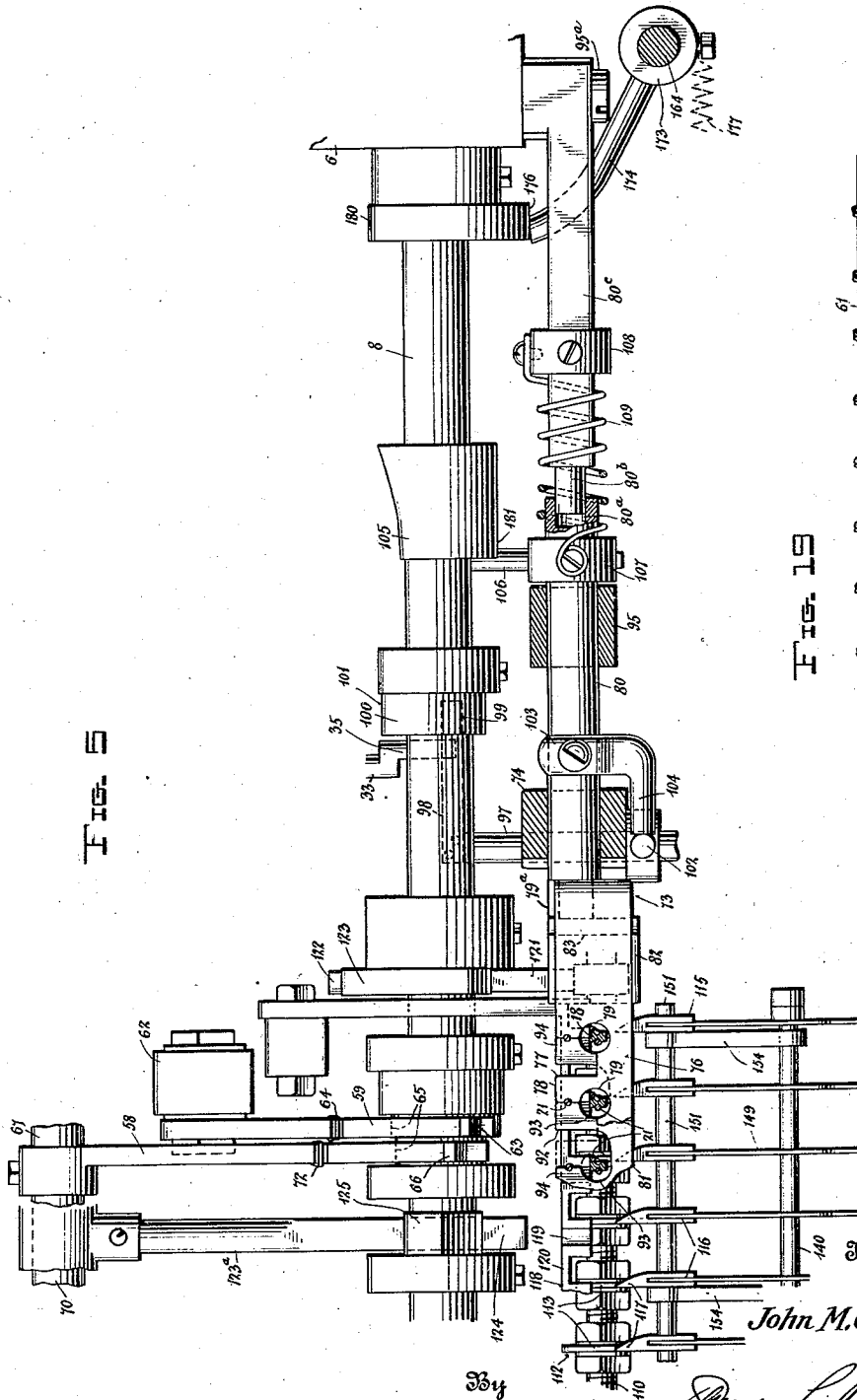


Fig. 18

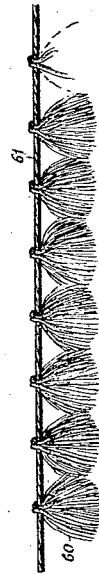


Fig. 19

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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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FIG. 6

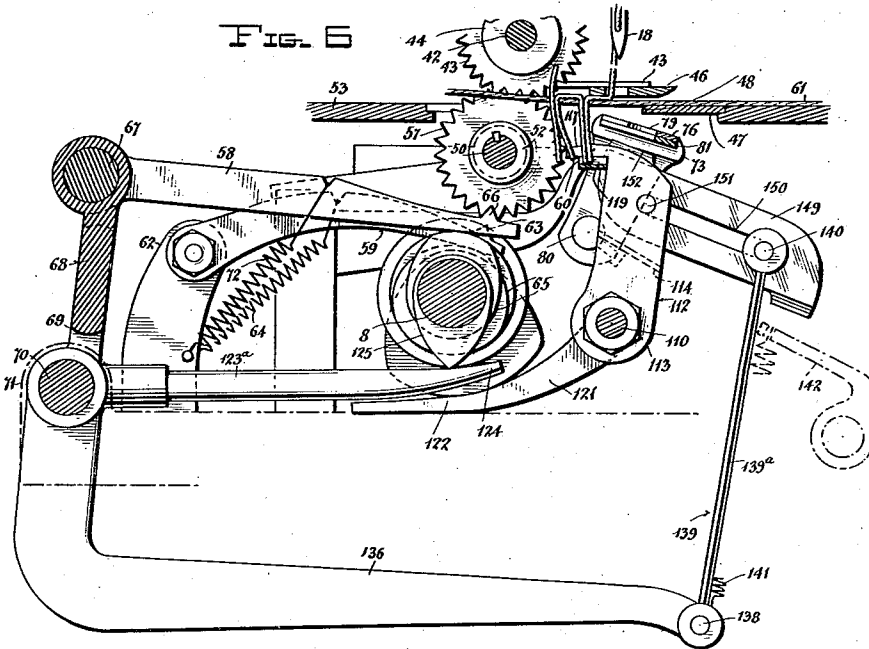


FIG. 7

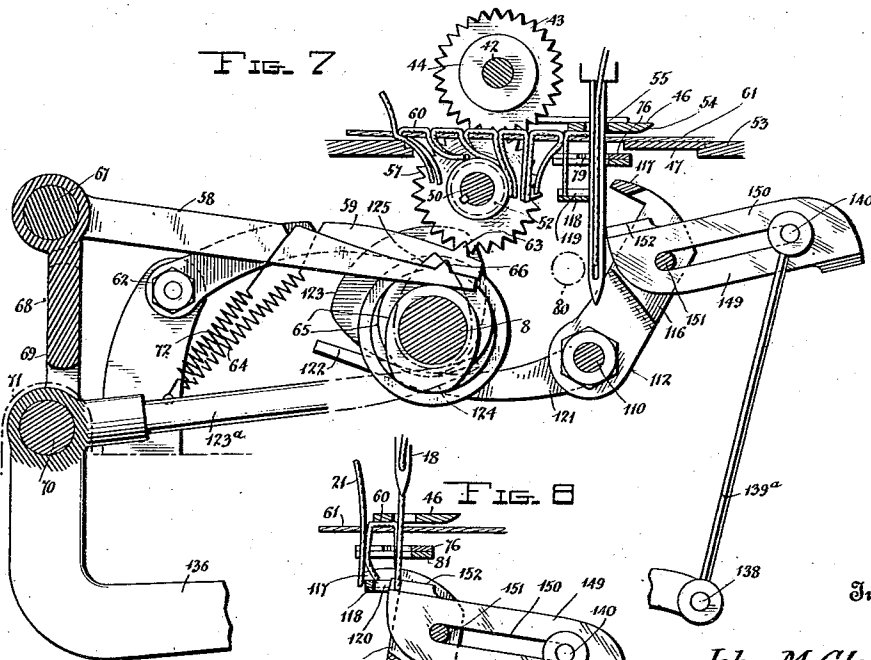
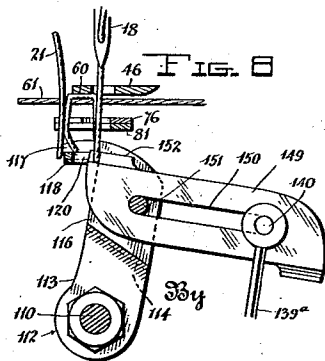


FIG. 8



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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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FIG. 9

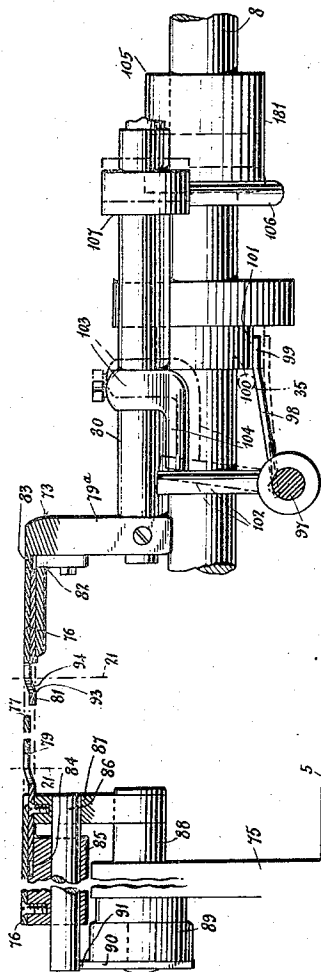


FIG. 10

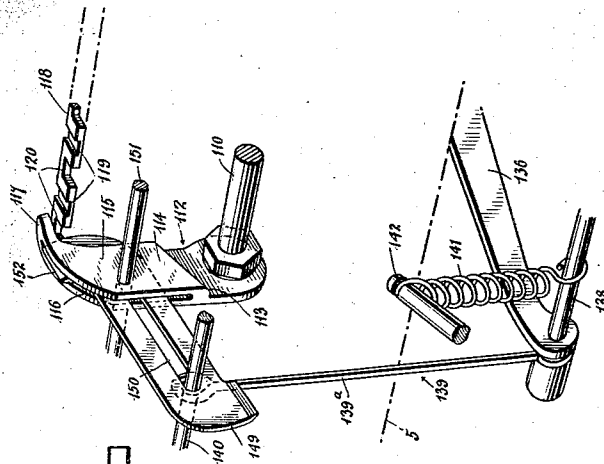
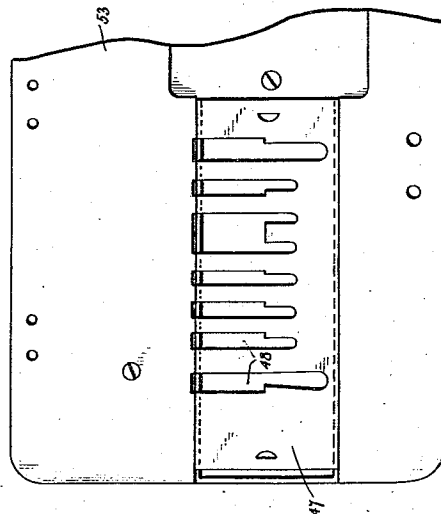


FIG. 11



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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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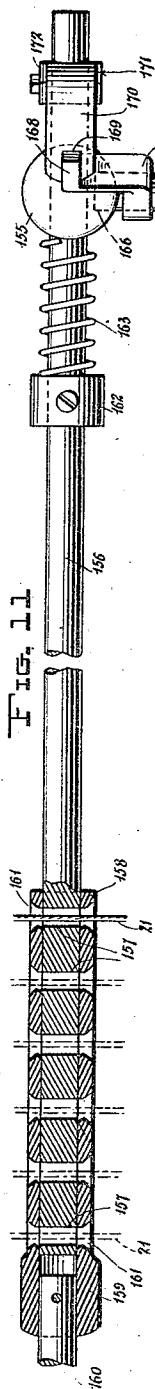


FIG. 11

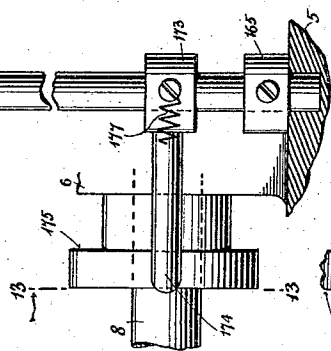


FIG. 12

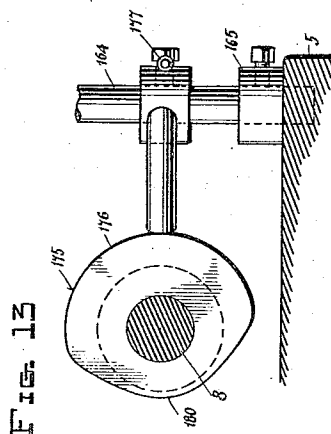
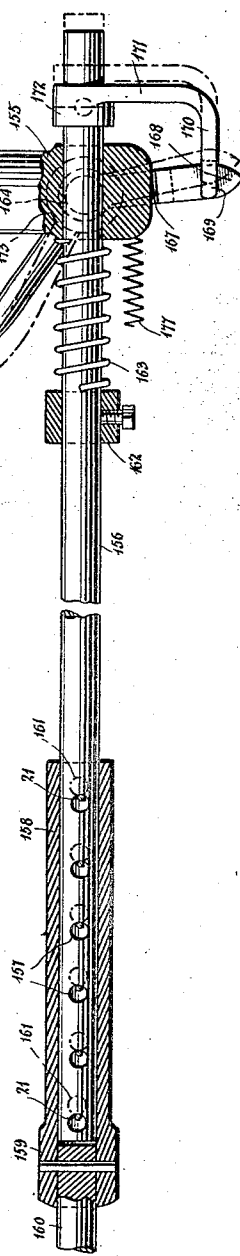


FIG. 13



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TUFTING ATTACHMENT MECHANISM FOR SEWING MACHINES

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FIG. 16

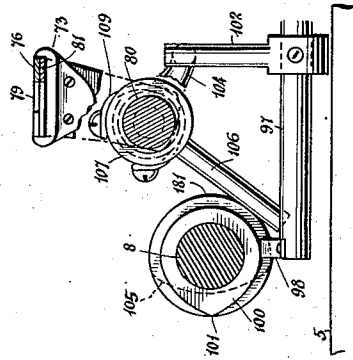


FIG. 17

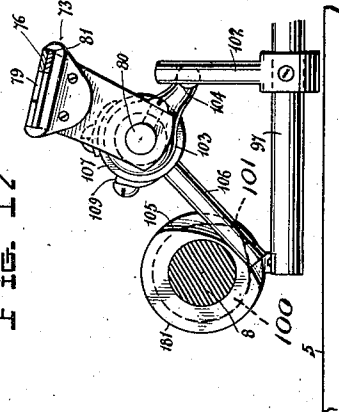


FIG. 14

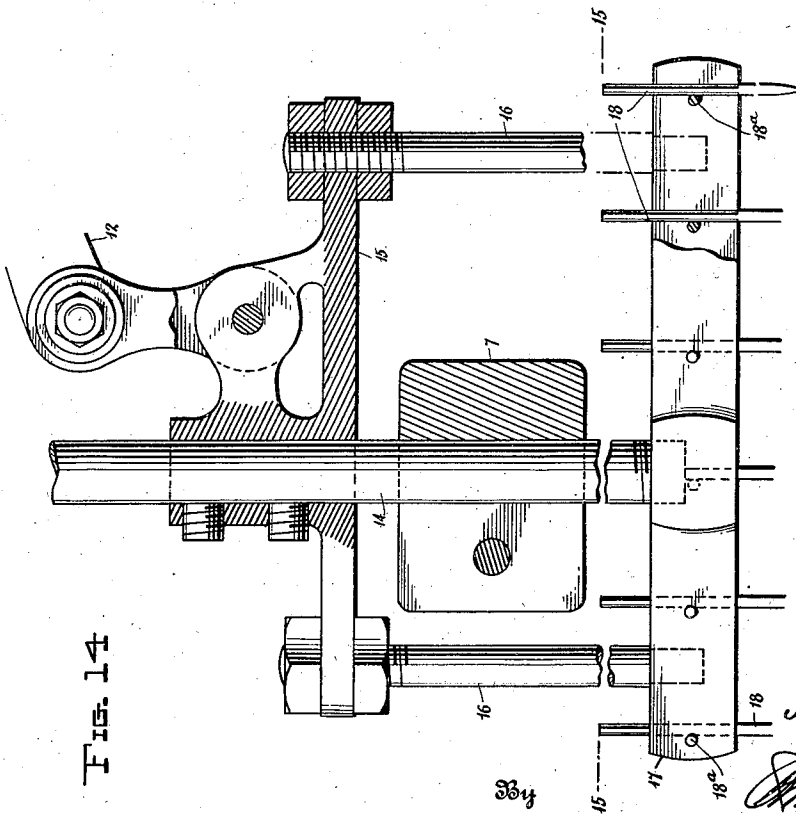
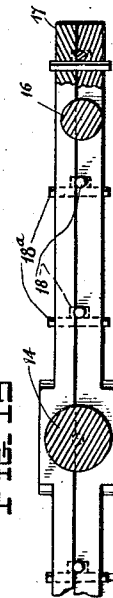


FIG. 15



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UNITED STATES PATENT OFFICE

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TUFTING-ATTACHMENT MECHANISM FOR SEWING MACHINES

Application filed September 20, 1927. Serial No. 220,698.

This invention relates to a machine for making tufted work on sheeting or woven fabric, and comprises elements which are embodied in a sewing machine, the improved mechanism being essentially in the nature of a sewing machine attachment and basically operating similarly to a sewing machine.

The present invention embodies improvements on the machines disclosed by Patents Nos. 1,485,213 of August J. Carter, February 26, 1924, and 1,575,570 of John M. Gladish, March 2, 1926.

One of the objects of the present invention is the automatic and simultaneous production of a series of alined loops in sheeting or fabric at one operation, and repeated formation of a multiple series of groups of loops in regular sequence, all the loops of each group either being severed to form a pile of uniform length, or being permitted to remain intact, the successively formed severed groups of loops or continuous loops being secured to the sheeting or fabric with such positiveness as to withstand loosening or displacement during washing operations, so as to increase the wearing durability of this class of products.

A further object of the invention is to expedite the formation of tufted fabrics by simultaneously forming groups of alined loops and thereby covering a greater area in less time than where a single loop is formed and severed, and to generally improve machines of this class and produce superior spreads, rugs, and other analogous articles by advantageous mechanical operation without the intervention of hand operation.

An individual removable cutting device is provided for each loop, whereby cut pile loops or alternating cut and uncut loops may be formed, thus providing a means whereby the design may be altered.

With these and other objects and advantages in view, the preferred construction and arrangement of parts embodying the invention will be described and claimed more fully hereinafter.

In the drawings:—

Fig. 1 is a front side elevation of a machine embodying the invention.

Fig. 2 is a rear side elevation of the machine.

Fig. 3 is a horizontal section on the line 3, 3, Fig. 1.

Fig. 4 is an end elevation of the machine.

Fig. 5 is a horizontal section of a portion of the mechanism taken slightly below the plane of the section 3, 3, Fig. 1.

Fig. 6 is a transverse vertical section on the line 6, 6, Fig. 1.

Fig. 7 is a view similar to Fig. 6 showing the mechanism in a different position.

Fig. 8 is a partial transverse vertical section of a portion of the mechanism as illustrated by Figs. 6 and 7, showing one of the needles and the cooperating parts in a position differing from that illustrated by Figs. 6 and 7.

Fig. 9 is a longitudinal vertical sectional elevation of a part of the mechanism and particularly illustrating the cams in full and dotted positions for actuating the loop controlling means.

Fig. 10 is a detail perspective view of one of the cutters and hooks and a part of the loop controlling means together with a part of the mechanism for operating the hook and cutter.

Fig. 11 is a longitudinal vertical sectional elevation, partially broken away, of the thread holding means.

Fig. 12 is a horizontal sectional plan view of the mechanism shown by Fig. 11.

Fig. 13 is a cross sectional view on the line 13, 13, Fig. 11.

Fig. 14 is an enlarged detail sectional elevation particularly illustrating the needle holding means.

Fig. 15 is a horizontal section on the line 15, 15, Fig. 14.

Fig. 16 is a detail sectional elevation of the cam mechanism for controlling the operation of the loop controlling mechanism, and showing one position of the said latter mechanism.

Fig. 17 is a view similar to Fig. 16 with the loop controlling mechanism in different position.

Fig. 18 is a detail plan view of a part of the work support particularly showing the throat plate.

Fig. 19 is a detail sectional elevation showing a portion of the completed product.

The improved mechanism embodying the present invention is shown applied to a sewing machine, comprising the usual supporting bed 5, an upwardly and outwardly projecting fixed arm or goose neck 6 having a head 7 at its free extremity, a shaft 8 extending longitudinally through the base of the arm 6, a driving pulley 9 on the said shaft, an eccentric 10 also mounted on the shaft near the driving pulley 9 to actuate a connecting rod 11 attached to a rocker arm 12 fulcrumed on the front side of the fixed arm or goose neck 6, as at 13, the opposite end of said arm 12 being secured to a novel form of needle bar 14 reciprocatingly mounted in the head 7, and having an upper cross bar 15 to which is secured by rods 16 a needle holding bar 17 in which is mounted a plurality of needles 18 held in the said bar 17 against movement by removable key-pins 18^a extending transversely through the bar 17 and providing for replacement of the needles 18 in the event of breakage, as best shown in Figure 14. On the upper end of the needle bar 14 is a horizontal guide bar 19 having a plurality of openings 20 therein for the reception of the thread 21 (Figure 4). Instead of the usual presser foot 35 a horizontal yoke carrier 22 is provided and held by upwardly converging braces 23 depending from a head 24 mounted on a guide rod 25 which is secured by a transverse clamp 26 to a presser bar 27 mounted to move in the head 7 between the needle bar 14 and guide rod 25 and having a depending lifter pin 29 secured to the upper end thereof for engagement by a lifting lever 30 fulcrumed on the rear side of the arm 6 and extending rearwardly and having a connecting rod 31 attached to its rear end and to the rear end of a downwardly and forwardly inclined rod 32. The rod 32 is attached at its forward end to the rear end of a transverse crank shaft 33 mounted in bearings 34 on the bed 5 and provided with a crank 35 at its forward end (Figure 3). The crank 35 of the shaft 33 serves as a stop to limit the movement of the said shaft 33 when actuated by adjustment of the inclined rod 32. A spring 36 has its opposite ends connected to the rod 32 and to a rearwardly extending stud 37 projecting over the lifting lever 30 and against the resistance of which the said rod 32 is lowered. In practice this rod 32 will be connected to a suitable treadle and controlled by the foot of the operator to rock the lever 30 and raise the presser bar 27 and, through the latter, the guide rod 25 and the yoke car-

rier 22. On the rear side of the forwardly projecting member of the arm 6 is a tension screw 38, the lower end of which engages the upper member of a flat spring tension organization 39 supported at its rear end by a projection 40 on the rear side of the arm 6, and at its forward end bearing downwardly upon a projection 41 clamped to and extending rearwardly from the presser bar 27, the forward extremity of the lifting lever 30 resting on the forward terminal of the spring organization 39. This spring organization 39 consists of two flat springs, as shown by Fig. 2, and the tension of the one spring relatively to the other is regulated by the screw 38 to institute the proper tension of this structure, and its purpose is well known in sewing machines. The carrier 22 has a pair of spaced arms depending therefrom which carry bearings for the opposite ends of a pin 42. The pin 42 carries a series of toothed feed discs 43 separated by space sleeves 44 so as to be positively maintained in uniform spaced relation. The yoke carrier 22 being connected to the presser bar 27 as heretofore indicated, is regulated as to pressure through the medium of the spring organization 39 and tension screw 38 and the series of toothed discs 43 carried by said yoke carrier serve as a part of the feed for the fabric as the needles operate in forming the loops during the tufting operation. Connected to the terminal space sleeves 44 are curved springs 45 of flat spring material which have horizontal arms or members 46^a extending forwardly under the yoke carrier 22, but clear of the end toothed discs 43, and to these members 46^a the presser foot proper, 46, is secured as shown in Figure 4. The presser foot 46 is located close to the throat plate 47 (shown in detail in Figure 18) which is transversely slotted as at 48 rearwardly through the rear edge thereof for projection therethrough of a lower series of toothed discs 49 carried on a shaft 50 loosely mounted in bearings 51 and separated by space sleeves 52, these latter toothed discs being of the same number and in vertical alignment and registering with the toothed discs 43 on the pin 42 mounted in the yoke carrier 22. The teeth of the discs 43 mesh with those of the lower discs 49 and the fabric to be tufted is fed between these two sets of discs, the fabric being held very securely against slipping by the teeth of the said discs on the upper and lower sides thereof, the thickness of the fabric and the feed space between the said discs being controlled by the elevation of the presser bar 27 and the carrier 22 a sufficient distance. The throat plate 47 is slidably mounted in the left hand portion of the work support 53, and the presser foot proper, 46, is mounted close to the upper side

thereof and has a lower smooth side which is curved upwardly or beveled at its front edge as at 54, and provided with a longitudinal slot 55 for the needles 18 during their vertical reciprocation. This presser foot proper 46, being supported by the spring arms 46^a, has a yielding movement to compensate for movement over the work support 53 of the fabric which is tufted.

The pin 42 and the shaft 50 are free to rotate in their bearings, and the axis of the shaft 50 is slightly in the rear of that of the pin 42. The toothed discs 43 and 49, which are mounted, respectively, on the pin 42 and shaft 50, do not have the teeth thereof in close engaging mesh, but have a loose mesh so that they will act as a practical feed for the fabric passing therebetween, and the spaces between these toothed discs serve as clearances for the loops or tufts when formed in the fabric. Keyed on the shaft 50 between the ends thereof and close to one of the discs 49 (Figs. 6 and 7), is a ratchet wheel 57 which is operated by forwardly projecting push and check pawls 58 and 59 which engage the said ratchet wheel at proper intervals to rotate the shaft 50 and the toothed discs 49 thereon in a rearward direction and to check movement of the said shaft at intervals while the loops or tufts 60 (Fig. 19) are being completed in the fabric 61. The check pawl 59 is pivotally mounted at its rear end on a fulcrum support 62 held by the bed plate 5, and has a tooth 63 at its forward extremity which engages the ratchet wheel 57, the said check pawl extending over the forward extremity of the shaft 8 and held by a spring 64 in contact with a cam 65 on the shaft 8.

The push pawl 58 also has a tooth 66 at its forward extremity and lies close to the forward extremity of the check pawl 59, the rear end of the push pawl 58 being pivoted to an upper fulcrum bar 67 of a rocking frame 68 having side members 69 depending to a fulcrum bar 70 mounted at its ends in bearings 71 secured to the rear forward portion of the bed plate 5. The push pawl 58 is held by a spring 72 between the same and the bed plate in engagement with the said cam 65, the latter being shaped to alternately throw the tooth 66 of the push pawl 58 and the tooth 63 of the check pawl 59 into engagement with the ratchet wheel 57. The rocking frame 68 by its forward movement moves the push pawl 58 to impart movement to the ratchet wheel 57 at intervals to move the fabric 61 transversely over the work support and the tooth 63 of the check pawl 59 engages a tooth of said ratchet wheel at the end of each movement of the latter. The cam 65 is of such contour that the operation of the pawls 58 and 59 will be certain in their engagement with the ratchet wheel 57, the teeth 66 and 63 of the

respective pawls being alternately raised and lowered by the cam 65 to perform their functions relatively to the ratchet wheel 57.

A loop controller and clamp is located in advance of the pin 42 and shaft 50 which carry the discs 43 and 49. Said loop controller and clamp consists of a frame 73 mounted, as shown in Figure 1, between short standards 74 and 75 respectively secured to an intermediate portion of the bed and to the forward end of the latter, and this frame comprises an elongated top plate 76 which is formed with a series of rearwardly extending throats or slots 77 (Figure 5) separated by rearwardly projecting fingers 78, and circular recesses 79 are formed in the front walls of the slots at one side of the transverse centers of the latter, said circular recesses 79 forming needle passages. The throats or slots 77 form rearward openings for the passage therethrough of the loops after they are tufted or if allowed to remain intact without severance. At the end of the frame 73 adjacent the bearing 74 is a depending angular member 79^a (Figures 1 and 5) which is secured to the outer end of a countershaft 80, as shown by Fig. 9, wherein the elongated narrow plate 76 of this frame 73 is shown as broken away to disclose a companion fixed clamping plate 81, the latter plate being mounted under the plate 76. The angular member 79^a has an upper angular guide bracket 82 secured thereto and spaced from the plate 76 to form a guide space or way 83 in which the inner end of the companion plate 81 extends. The companion plate 81 at its opposite extremity extends into a guide space or way 84 formed between the plate 76 and a sleeve 85 mounted to slide on a pin 86 which is secured at its inner end to an arm 87 depending from the companion plate 81 and mounted to fulcrum on a rearwardly projecting fixed stud 88 extending through the standard 75 and provided at its outer end with a head 89 through which it is movable, a cam or guiding plate 90 being secured to the outer end of the stud 88 and having an upper slightly flattened cam edge 91 held in engagement with the outer end of the pin 86 and allowing the pin 86 slight sliding movement thereon. The frame 73, member 79^a thereof, angle bracket 82, and sleeve 85 have a limited sliding movement, and the companion plate 81 of which the opposite ends extend into the guide spaces or ways 83 and 84 does not slide. While the plate 76 and parts in direct operation therewith just specified have a sliding movement relatively to the plate 81, the plate 81 and the plate 76 unitedly have a forwardly and backwardly rocking movement. As shown in Figure 5, the plate 81 also has rearwardly opening throats 92 in the form of slots

which are provided at their forward terminations with circular recesses 93 similar to the recesses 79 in the upper plate 76, but in reverse position relatively to the said recesses 79. The throats or slots 92 are separated by fingers 94 which are inclined or flared upwardly so as to meet and engage the fingers 78 of the plate 76, and thus close the slots in the two plates 76 and 81 at the rear, and leave only the recesses 79 and recesses 93 of the plates 76 and 81 clear for the movement of the needles 18 therethrough during the vertical reciprocation of said needles at predetermined intervals. The upper cam edge 91 of the cam plate 90 secured to the outer end of the stud 88 close to the head 89 supports the said pin 86 during the sliding and rocking movement of the two plates 76 and 81 and parts connected thereto as heretofore explained, the arm 87 being fulcrumed on the inner end of the stud 88, and also serving as a support for the pin 86 upon which the sleeve 85 slides as the plate 76 and its member 79^a slide longitudinally during the operation of forming the loops which are located below the said plates 76 and 81 in position to be operated upon by other mechanism which serves to retain the loops while they are severed and tufts thereby formed which is the main function of this machine. The reciprocation of the frame 73, plate 76 and parts connected thereto together with the throats or recesses 77 and 92 formed by the fingers 78 and 94 all contribute in their operation to the proper placement of the loops after the latter are formed by the needles 18 below the frame, and these parts also provide for the liberation of the completed loops after the latter are severed or cut, rearwardly over the throat plate 47 and work support 53 through the operation of the toothed discs 43 and 49 which regularly feed the fabric or work away from this mechanism when the loops are completed as desired. The movements of the frame 73 and the parts comprised in this organization of the machine is effected by the shaft 80 connected to the member 79^a, said shaft being journaled at its forward end in the support 74 and an auxiliary support 95, both of these supports being mounted on the bed plate or base 5. The shaft 80 has a socket 80^a in its rear end into which the reduced forward extremity of 80^b of a fixed bar 80^c slides. The fixed bar 80^c is secured at its rear end, as at 95^a, to the front side of the base of the goose neck 6.

A rock shaft 97, also journaled in the support 74 but at a right angle to the shaft 80, carries on its rear end an angular foot 98 which is inclined upwardly and rearwardly and has its extremity 99 (Figures 9, 15 and 17) bearing against a cam 100 on the shaft

8, said cam having a high part or member 101 which, when in engagement with the extremity 99 of the foot 98, rocks the shaft 97 and an upright pin 102 fixed to the said shaft at its front end adjacent to the bearing 96. A collar 103 mounted on the shaft 80 carries a finger 104 which, when the shaft 97 is rocked, is engaged by the pin 102 of the latter to longitudinally shift the shaft 80 and thus to longitudinally shift the plate 76. The shaft 80 is rocked to effect the rocking movement of the frame 73 and plates 76 and 81 by engagement of a cam 105 (Figure 3) fixed on the shaft 8 with a projection 106 extending from a collar 107 fixed on the shaft 80 close to the rear side of the bearing support 95. A coiled spring 109 surrounding the bar 80^c has its ends connected, respectively, to the collar 107 and to a collar 108 secured to and adjustable longitudinally of the bar 80^c and serves both to rock and to longitudinally shift the shaft 80 in the opposite direction and restore it to normal position after it has been longitudinally shifted by the rock shaft 97 and rocked by the cam 105. Thus the frame 73 and the parts carried thereby, including the plates 76 and 81, are brought at regular intervals into proper position relatively to the needles 18 and threads or strands 21.

Below the frame 73 at the front of the machine is a rock shaft 110 (Figs. 1, 4, 6, 7, and 10) mounted in a bearing 111 and the lower portion of the standard 75, the bearing 111 projecting up from the base or bed 5 at a distance outwardly from the standard 74. On this rock shaft 110 are secured a series of hooks 112 which are of the form shown by Fig. 10, and each having a lower shank 113 mounted on the shaft 110 and an offset or shoulder 114 which thickens the upper part 115 of the hook, the latter having a slot 116 extending therethrough and terminating in advance of the free end of a curved bill 117. The hooks 112 are of such length that their bills 117 may ride over and close to a fixed bar 118 having a series of transverse grooves 119 in its upper side, which grooves form passages for the severed loops in their rearward course, the front edge of the said bar 118 being vertically slotted as at 120 for the clearance of the needles 18 and particularly for the clearance of the cutters in severing the loops. The bar 118 provides an auxiliary retention means during the cutting of the loops and while the latter are held taut. As shown in Figures 6 and 7, the rock shaft 110 has a rearwardly projecting arm 121 fixed thereto, which arm has a flat reduced rear extremity 122 which is engaged at intervals by a cam 123 on the shaft 8 as shown by Fig. 6, and projecting forwardly from the fulcrum bar 70 comprised in the organization of the rear frame 68 is an arm 123^a having a forward flattened extremity 124 for en-

5 gagement by a cam 125 also mounted on the shaft 8, the arm 121 being spaced from the arm 123^a, that is to say, the said arm 121 is located a distance inwardly from the arm 123^a which is nearer to the outer end of the bed 5 of the machine. The bar 118 is carried by forwardly projecting fixed arms held by uprights rising from the bed 5 near the outer extremity thereof and in rear of the shaft 8.

10 The rock shaft 110 is projected through the outer standard 75 and has on its outer end a head 126 with a cross pin 127 mounted therein and formed with heads 128 at the free terminals, the said cross pin being engaged by lower and upper springs 129^a and 129 which are connected at their opposite ends to outwardly projecting pins 130 secured to the end of the bed 5. The rock shaft 110 and hooks 112 operate against the resistance of these springs and are restored by said springs to normal position to clear the bills 117 of said hooks from the bar 118 after the formation of the loops and prior to engagement of the said bills 117 with succeeding loops for a cutting operation.

The frame 68 is rocked by a forwardly projecting arm 131 which is connected to a projection 132 of a collar 133 secured to a wrist pin 134 of an eccentric 135 secured on the outer end of the shaft 8. Connected to the lower fulcrum bar 70 are two forwardly projecting levers 136 and 137 which extend under the bed 5 to the front of the machine, and are attached at their forward ends to a rod 138 of a front rocking frame 139 having side rods 139^a connected to the lower rod 138 and also to an upper similar rod 140. To the lower rod 138 are secured a series of depending springs 141 which are attached at their upper ends to rearwardly projecting arms 142 held by a fixed longitudinal rod 143 at the front of the machine, the latter rod being supported and extending from a projection 144 secured to the front of the bed.

45 The rod 143 is also engaged by a support 145 projecting from the front edge of the bed 5 near the outer end of the same, and this rod 143 is thus firmly supported to resist the stress brought to bear thereon. Secured to the rod 143 is a guard 146 which mainly extends longitudinally in advance of the frame 139 and has at the rear extremity an angular member 147 with a terminal set collar 148 mounted on the said rod 143. A series of cutters 149 is mounted on the upper rod 140 of the frame 139, each of which cutters is formed with a longitudinal slot 150 and held in firm spaced relation at their inner ends by a tie rod 151 which extends through the slots 150 and also passes through the hooks 112, the cutters at their inner ends each having an upwardly projecting cutting extremity 152 with a sharpened edge. The cutters 149 project through and are movable in the slots 116 of the hooks 112, the slots 150 of the cut-

ters permitting the necessary movement and swing thereof relatively to the hooks and remaining related parts during the operation thereof. The inner ends of the cutters 149 are held in fixed relation on the rod 151 by space sleeves or members, and the upper rod 140 of the cutter frame 139 is connected to the tie rod 151 of the said cutter frame by links 154, as shown in Figure 5, so that the cutters 149 are always held in positive registering position with relation to the slots 116 of the hooks 112.

On the upper front portion of the machine a clamping or holding means for the threads or strands 21 is located, this means being provided to cause the needles to maintain the threads in taut condition during the formation of the loops, and comprises a rear forwardly projecting bearing 155 in which is mounted the rear extremity of a longitudinally disposed slide rod 156 having in its outer extremity a series of openings 157, the outer extremity of the slide rod 156 being longitudinally shiftable in a sleeve 158, as shown by Fig. 11, and this sleeve has a tubular head 159 at its outer end attached to a crook arm 160 (Figures 1 and 4) secured to the upper part of the head 7 of the arm or goose neck 6. The sleeve 158 also has a series of openings 161 therethrough which are adapted to aline with the openings 157 in the rod 156, and on this rod 156 is a set collar 162 engaged by one extremity of a spring 163 surrounding the said rod and engaging at its opposite extremity with the bearing 155. The spring 163 tends to restore the rod 156 to its normal position after it has been reciprocated to form a bite between the openings 157 and 161 respectively in the outer extremity of the rod 156 and the sleeve 158 by reducing the clearance of said openings. In advance of the rear vertical member of the arm or goose neck 6 is a vertical rock shaft 164 which is loosely mounted at its lower end in the bed 5 and has a lower collar 165 secured thereto to maintain the same in place. The upper end of the rock shaft 164 extends into a seat 166 in the lower portion of the bearing 155, and secured on the upper extremity of this vertical rock shaft 164 is a crank 167 which has an upper horizontal forwardly projecting terminal member 168 loosely fitting in a slot 169 in the free end of a longitudinal arm 170 of an angle bracket 171 extending from a collar 172 secured on the rear end of the rod 156. A collar 173 secured on the vertical rock shaft 164 adjacent the lower end of the latter has a curved finger 174 projecting therefrom under the rear extremity of the shaft 80, as shown by Fig. 5, with its end bearing against the periphery of a cam 175 on the rear portion of the shaft 8, said cam 175 having a high projection 176, which, when it engages the end of the finger 174,

forces the latter outwardly and forwardly and rocks the shaft 164. A spring 177 extends between the collar 173 and a collar 178 secured to a stud 179 rising from the bed 5.

5 The spring 177 maintains the finger 174 in engagement with the cam 175 and operates to quickly restore the shaft 164 and finger 174 to normal position when said finger rides over the low portion 180 of the cam 175, as shown by Fig. 13.

10 All of the cams are so constructed that they will actuate the several parts in timed relation. For example, as shown by Figs. 16 and 17, the cam 105 which bears against the projection 106 to actuate the frame 73 and control the working movement of the latter frame, is formed with a high part 181, which, when it rides over the projection 106, forces the latter outwardly and rocks the shaft 80. During the rocking movement of the shaft 80 the finger 104 has a limited vertical riding movement relatively to the pin 102 projecting upwardly from the shaft 97, but the said finger 104 does not become dis-
25 engaged from the pin 102 since the rocking movement of the shaft 80 is controlled by the spring 109. When the projection 106 passes over the low part of the cam 105, the spring 109 rocks the shaft 80 to swing the frame 73 and the plates 76 and 81 outwardly and forwardly from the position shown in Figure 16 to that shown in Figure 17. The high point of the cam 100 is so located relatively to the low point of the cam 105 that it actuates the rock shaft 97 to move the fingers 78 of the plate 76 away from the fingers 94 of the plate 81 just before the plates 76 and 81 are rocked outwardly by the spring 109. The cam 100 is also so shaped
40 as to permit the spring 109 to quickly move the fingers 78 against the fingers 94 of the plate 81 and grasp the strand beneath the raised needle and hold the strand while said plates swing forwardly and until just before the plates swing outwardly in the next cycle. During this interval the needle reciprocates through the fabric and the aperture formed by the recess 79 of the plate 76 and the recess 93 of the plate 81 to form the succeeding
50 loop.

The eccentric 135 (Figure 4) is slotted and recessed at its outer end, and the wrist pin 134 is adjustable longitudinally of the said slot so as to modify the stroke of the arm 131 and the frame 68 and parts connected to the latter as heretofore explained, and by this means the loops are modified accordingly and all of the mechanism correspondingly changed as to time of actuation. When it is desired to form loops without cutting the latter to produce tufts, the cutters 149 will be removed, or in some instances the entire rocking frame 139 may be disconnected without in the least modifying the operation of the hooks 112.

In the present instance the machine is shown as having six needles 18 and the thread guide 19 as having six openings 20 therein for the threads or strands 21 of like number and which are fed from a suitable source of supply extraneous of the machine, and a corresponding number of openings 157 and 161 are shown in the outer end of the gripping rod 156 and sleeve 158. Six hooks 112 and six cutters 149 are shown, the machine thus being equipped for forming six loops in each group at each reciprocation of the needles and a corresponding number of tufts, when the tufting operation is pursued. The completed product has the form shown by Fig. 19, the fabric showing only stitches on the upper side and the tufts in regular groups at the opposite or lower side.

Operation

85 The actuation of the several parts of mechanism heretofore described is mainly dependent upon the rotation of the shaft 8 which is adapted to be driven by a suitable power through the driving pulley 9, the said shaft 8 carrying the controlling cams heretofore described. The foundation of the product, which may be of any suitable strong fabric, preferably duck or canvas or a fabric of like nature, may be of any size or dimensions and is fed to the machine from the front, the shaft 8 being driven towards the rear. The strands or threads 21 may be plain or colored, and are first threaded through the openings 20 of the guide 19 and then through the openings 161 and 157 of the strand or thread grip and from the latter are threaded through the eyes of the needles 18. The fabric to be tufted, or to have the loops or tufts formed thereon, is then fed from the front of the machine rearwardly between the toothed discs 43 and 49 and is disposed on the work support 53 and under the presser foot proper 46, the yoke carrier 22 together with the said presser foot proper being elevated sufficiently to place the fabric in engagement with the toothed discs 43 and 49. The machine is then started and the shaft 8 rotated, and the needles 18 descend through the fabric passing through the plates 76 and 81 a predetermined distance below the latter in accordance with the adjustment, and when the needles reach their lower limit, one side portion of the strand carried by each needle is caught by one of the bills 117 of the hooks 112 and held separated thereby, and the loops thus provided are retained with equal dependence below the plate 76 and companion plate 81 (Fig. 6), and then drawn downwardly and rearwardly towards the fixed bar 118 and held by the bills of the hooks 112, the strands being also held by the fingers of the plates 76 and

81. Also the downward action of the needles and the gripping action of the rod 156 and sleeve 159 due to the sliding movement now imparted to the rod 156, cause the strands to be drawn taut and held by said upper gripping mechanism in view of the fact that at such time the bar 156 is shifted longitudinally in the sleeve 158 and the openings 157 in the bar and sleeve are closed against the strands by the movement of the bar 156. At this time also the cutting frame 139 with the cutters 149 moves forwardly and the forward ends of the cutters slightly move upwardly to cause the upwardly projecting cutting terminals 152 to sever the loops. Thereupon the cutters 149 and hooks 112 recede or move outwardly so as to permit the fabric and the severed loops to be moved rearwardly by the feed action of the discs 43 and 49 since the extremity of the arm 121 carried by the rock shaft 110 and the extremity of the arm 123^a are now engaged by the low portions of the cams 123 and 125, respectively, and the spring 141 is free to move the frame 139 upwardly. Subsequent to this movement the needles 18 again descend as above noted, and form a new set of loops which are in like manner severed, the mechanism all having a timed operation and groups of six loops being formed at each descent and ascent of the needles in regular sequence, the loops being severed so as to produce a pile of uniform length until all of the groups of six loops and the cutting operation ensuing in relation to the latter are completed over a predetermined length of the fabric. The fabric is then withdrawn and replaced in the machine to complete a continued sequence of the groups of severed loops over the entire area of the fabric, in line with or parallel to previously formed groups of loops. As the loops are severed they are cleared by the movement of the fabric 61 over the throat plate 47 through the slots 48 in the latter plate. The work support 53 provides for movement of the fabric thereover, and the lower toothed discs 49 extend or are exposed through the throat plate a sufficient distance for practical engagement with the fabric 61, the bills 117 of the hooks 112 regularly moving rearward and catching the loops formed by the needle at regular intervals and subsequently the cutters 149 operate. The swinging and sliding movements of the frame 73 carrying the plate 76 and the swinging movement of the companion plate 81 hold the loops in proper position for severance by the cutters 149. The bar 118 facilitates the rearward guiding of the severed loops, as shown by Figs. 6, 7, and 8. The severed loops 60 in passing rearwardly over the throat plate and rear portion of the work support pass also between the toothed discs 43 and 49 and the feed of the

fabric 61 and loops 60 after formation of the latter is thus maintained without interruption. The cutters 149 each has a cutting projection 152 at each of its extremities, the two projections at opposite extremities of each cutter being in reverse position so that the cutters may be shifted to substitute one set of cutting edges for the remaining set, should one set of cutting edges become dulled, without the necessity of removing the cutters for resharpening, except at comparatively long intervals. The cutters 149 also have an upwardly and downwardly rocking movement of themselves, owing to the movement of the frame 139 and the levers 136 and 137 and their operating mechanism, so as to bring the sets of cutting edges of the cutters into proper position through the slots 116 of the hooks 112 and just in rear of the bills 117, as shown by Fig. 10.

At any time found necessary the lifting lever 30 may be elevated to raise the carrier 22 and presser foot proper 46 and to clear the toothed disc 43 from the disc 49. This may be done manually at intervals, or by the foot through the medium of the treadle that will be connected with the rod 32 to elevate the presser bar 27, particularly when arranging the work in position or disposing the fabric to be tufted between the feeding discs 43 and 49.

From the foregoing description, it is apparent that through the rotation of the shaft 8, after the fabric has been placed between the feeding disks 43 and 49 (Fig. 6), the needles are moved downwardly to pierce the fabric and carry the threads or strands therethrough and that simultaneously with the descent of the needles, the frame 73 is moved to the position as shown in Figure 7, so that the needles can and do pass through the openings in the plates 76 and 81 with the points of the needles below the bar 118. At this time, the needles start to ascend and the arm 121 is depressed by its cam 123 on the shaft 8 and moves the hooks 112 to cause the hooks to enter between the needles and their respective strands, so that the lower closed portion of the loops will straddle the hooks and the slot 116 of the hooks and each hook itself will engage the bar 118. The rod 156 is now moved to cause the strands to be gripped in the clamp thereof above the needles and the strands are thus held taut, being secured to the respective hooks and to the clamp so that the needles during the withdrawal movement will slide upon the strands without moving the strands. At the same time, the continued downward movement of the levers 136, 137 lowers the frame 139^a and consequently actuates the knives to sever that portion of the loops straddling the slots 116 of the hooks, as clearly shown in Figure 8.

The frame 73 is now tilted to the front to assume the position as shown in Figure 6, while the free end of the push pawl 58 is raised to engage the teeth of the ratchet wheel 57 and the frame 68 is moved forwardly to push the pawl forwardly and thus rotate the disks 49 and 43 to feed the fabric and bring the portion of the strands on the upper face of the fabric under the rear portion of the presser bar 46, as shown in Figure 6, the rod 156 now releasing the strands so that the needles in their downward movement will carry sufficient thread therewith to form the succeeding loop.

As heretofore indicated, the loops may be permitted to remain intact by removing any one, any group, or all the cutters 149 which can be accomplished by disconnecting the frame 139, or separating the said cutters from the parts of the latter frame which engage said cutters. The loop forming or tufting operation hereinbefore described may be expeditiously carried on and various designs may be worked out in accordance with a predetermined pattern outlined on the fabric, and fabrics and loops of different colors may be used with pleasing effect.

The use of a multiplicity of needles 18 and corresponding parts, in view of the present mechanism devised especially for six needles, may be modified, or the needles and corresponding mechanisms may be increased, with economy in the cost of production by lessening the time required to loop or tuft the fabric area which is adapted to be treated.

It is also apparent that when alternating rows of cut and uncut loops are desired, the second, fourth and sixth cutting devices are removed or rendered inoperative, or these devices may be removed in groups of twos and threes, or entirely, as the design to be made may be changed.

What is claimed as new is:—

1. In a machine of the class specified, the combination of a group of needles arranged in alinement, means for guiding strands thereto, and mechanism having multiple devices for forming loops and including multiple means for holding parts of the strands separate from the needles for forming loops during the operation of the needles to produce successive groups of loops of uniform dimensions, and individually removable cutting means for the formed loops, one to each needle.

2. In a machine of the class specified, the combination of a plurality of reciprocating needles arranged in alinement and means for guiding strands thereto, means for supporting a fabric for penetration by the needles and strands, multiple loop forming mechanisms below the fabric supporting means acting in conjunction with the needles and

portions of the strands, means for holding portions of the successively formed loops and their ends secure against movement during the formation of successive groups of loops on the lower side of the fabric, and a removable loop cutting device to each needle for severing the end of its loop.

3. In a machine of the class specified, means for supporting and regularly feeding a fabric, groups of reciprocating needles vertically movable through said means and the fabric supported thereby, means for guiding strands to the needles, multiple loop forming mechanism cooperating with the needles below the fabric supporting means, means for temporarily holding a portion of each strand to produce successive loops of uniform dimensions, and a plurality of movable cutting means, one for each needle operating simultaneously to sever the held loops as formed, each of said cutting means being removable to produce a series of uncut and cut or all uncut loops on said fabric.

4. In a machine of the class specified, a group of reciprocating strand-carrying needles operative to penetrate and successively carry strands in stitch-like form through a fabric, means for separating and holding parts of the strands after they are carried through the fabric to form loops, and individually removable cutting devices, one to each needle, operating in conjunction with the loop holding means to sever the loops so as to produce tufts on one side of the fabric.

5. In a machine of the class specified, a group of strand-carrying needles operative to carry strands through a fabric and to regularly extend portions of said strands in sequence upon one side of the fabric, multiple mechanism for forming the strands in successive groups of loops and tightly holding the latter at intervals to produce loops of uniform dimensions, and a plurality of individually removable cutting means movable in the said multiple loop forming mechanism, said cutting means being removable to permit the multiple loop forming and holding means to operate independently of said cutting means whereby successive loops of cut or uncut character may be formed.

6. In a machine of the class specified, a group of reciprocating strand-carrying needles for penetrating a fabric and for passing strands below said fabric, multiple loop forming means for separating portions of the strands carried by the needles from the remaining parts of the strands to produce successive loops below the underside of the fabric, mechanism for holding the loops during the withdrawal of the needles to produce loops of uniform dimensions, strand gripping means above the needles, and multiple cutting devices, one to each needle, engaging

the multiple loop forming means to sever the loops to form a tufted structure upon one side of the fabric.

7. A machine of the class specified, having a group of aligned strand-carrying needles, multiple loop forming and holding means having a simultaneous swinging movement transversely of the line of said needles and loop clamping means comprising a pair of plates mounted for relative sliding movement substantially parallel to the line of said needles and for unitary movement transversely of the line of said needles.

8. A machine of the class specified, comprising a group of strand-carrying needles for penetrating a fabric, multiple means for forming loops of the strands carried by the needles at one side of the needles and holding said loops taut after formation, and a plurality of cutting devices, one to each needle, to cut the loops to form pile members of equal length, the cutting devices comprising a series of cutters, each having a pair of oppositely disposed cutting edges, said cutters being reversible to cause either of the cutting edges of same to function in severing the loops, said cutting means also being removable without affecting the operation of the remaining mechanism.

9. In a machine of the class specified, the combination of a group of aligned reciprocating strand-carrying needles operative to penetrate and carry strands through a fabric, loop forming means having swinging movement to and from the needles to engage portions of the strands to form successive loops therefrom as the needles are withdrawn through the fabric, independent operative means having swinging and sliding movements for holding the loops in taut condition, a plurality of individually removable loop cutting devices, one to each needle, having a swinging movement to and from the loop forming means and entering the latter to sever the loops while held in taut condition, and means above said needles to grip and hold the strands taut while the loops are severed.

10. In a machine of the class specified, the combination of a group of strand-carrying needles arranged in alignment, a presser foot, a carrier associated with said presser foot, a series of toothed discs rotatably mounted on said carrier, a series of toothed discs cooperating with the first named discs, said discs serving to hold and feed a fabric relatively to said needles, a multiple loop forming and retaining means including a group of hooks mounted to swing toward and away from said needles and a frame mounted for rocking and sliding movement, and a series of cutters cooperating with the loop forming and retaining means to produce tufts at the lower side of the fabric.

11. A machine of the class specified, comprising a group of aligned strand-carrying needles, means cooperating with said needles for forming loops of the strands carried by the needles, a rocking and sliding loop retaining mechanism, and a plurality of simultaneously operated cutting devices mounted for cooperation with the said loop forming means and having a rocking motion imparted thereto to cut the loops.

12. In a machine of the class specified, a group of aligned strand-carrying needles, loop forming means comprising a plurality of oscillating hooks to engage a portion of the strands carried by said needles, a series of cutters movable upwardly into the hooks, and a rocking and longitudinally slidable loop retainer having cooperating recesses and fingers to engage the loops.

13. A machine for the class specified, comprising a series of vertically reciprocating strand-carrying needles adapted to penetrate a fabric, loop forming means comprising oscillating hooks to engage portions of the strands adjacent to the needles and hold portions of the strands while the needles are withdrawn from the fabric, a fixed bar cooperating with the hooks to hold the loops formed by the hooks, said bar having a series of slots in its front portion and recesses extending transversely of its upper surface, and a series of cutters having a rocking movement and cooperating with the hooks to sever the loops.

14. In a machine of the class specified, a group of aligned strand-carrying needles adapted to penetrate a fabric, means comprising a plurality of oscillating hooks to engage portions of the strands and hold the latter in looped form while the needles are withdrawn from the fabric, oscillating and slidable loop retaining mechanism for engaging and holding the loops as formed, a plurality of cutters cooperating with the oscillating hooks, the latter being slotted for the reception of portions of the cutters, and a strand-retaining means for holding the strands taut above the needles.

15. In a machine of the class specified, a group of aligned strand-carrying needles adapted to penetrate a fabric, mechanism for uniformly drawing a portion of the strands away from the several needles to form loops of same after the needles have penetrated the fabric, a fixed bar, a swinging and sliding means for moving the loops toward and holding them to the bar, and cutting means cooperating with the loop forming means to sever the loops and form tufts of equal length, mechanism above the needles through which the strands pass and by which they are clamped periodically to retain them against movement, and mechanism for operating the several parts.

16. In a machine of the class specified, a

fabric support, a needle bar movable toward and away from said support, aligned strand-carrying needles carried by said bar and movable through the fabric on said support
 5 and below the support, a throat plate in the work support having a series of rearwardly opening transverse slots, a presser bar, a carrier associated with said presser bar, a plurality of toothed discs mounted in said
 10 carrier, a series of rotatable toothed discs below the throat plate and projecting through the slots of the throat plate and cooperating with the first-named toothed discs, oscillating bills for separating portions of
 15 the strands carried by the needles below the throat plate to form loops, means for periodically holding the loops, and a plurality of swinging cutters movable relatively to the said bills for severing the loops and forming
 20 tufts on the lower side of the fabric.

17. In a machine of the class specified, a fabric support, a throat plate having a series of transversely and rearwardly extending slots, a series of vertically reciprocating
 25 strand-carrying needles operative to pass strands through a fabric on said support and below the throat plate, a plurality of oscillating bills for separating portions of the strands from the needles below the throat
 30 plate to form loops, oscillating and sliding means for holding the loops, a bar having slots and recesses against which the bills press the loops, and a series of oscillating cutters movable relatively to the bills to
 35 sever the loops and form tufts on the underside of the fabric.

18. In a machine of the class specified, a plurality of vertically reciprocating aligned strand-carrying needles, means for supporting
 40 a fabric for passage of the needles there-through, a transversely slotted throat plate on the work support and through which the needles and strands have movement, a fixed bar below the throat plate adjacent to the
 45 plane of movement of the needles and strands, said bar having slots and recesses, multiple loop forming devices movable between the needles and portions of the strands to form loops, means for engaging the loops
 50 as the said needles are withdrawn through the fabric and to hold the said strands taut against the said bar, means for severing the loops while held taut, and intermittently operated means for gripping the strands of the
 55 thread above the needles during the formation of the loops.

19. In a machine of the class specified, a plurality of vertically reciprocating aligned strand-carrying needles, means for supporting
 60 a fabric for passage of the needles and strands therethrough, a fixed slotted and recessed bar under the work support adjacent to the plane of movement of the needles, multiple loop forming devices movable between
 65 the needles and the strands carried

thereby and engaging the said bar, means for engaging the loops to hold the loops in fixed position against the said bar, a series of oscillating cutters movable into the said
 70 loop forming devices to sever the loops to form tufts, and strand holding means above said needles comprising a fixed sleeve and a reciprocating bar, the sleeve and bar having openings therethrough which are modified
 75 as to dimensions by the movement of the bar into the sleeve to grip the strands and hold that portion thereof while the loops are being cut.

20. In a machine of the class specified, the combination of a drive shaft, thread-delivering and loop-receiving mechanism operably connected to the drive shaft, and a cutting mechanism for severing the loops
 80 also operated from the drive shaft and including a rocking frame carrying the loop-receiving mechanism, a pivoted cutter carried by said frame, and means for operating the cutter to cut the loop while the same is held by the receiving mechanism.

21. In a machine of the class specified, the combination of a main shaft, thread-feeding and loop-forming mechanism operably connected to the shaft, said loop-forming mechanism including a slotted
 90 hook, a rocking frame operated from the main shaft to place the hook within the loop during delivery thereof by the feeding mechanism, a knife pivotally mounted in the hook, and operating means for the knife to move the cutting edge thereof into the
 95 slotted end of the hook to sever that portion of the loop spanning the slot.

22. In a machine of the class specified, the combination of a main shaft, thread-feeding and loop-forming mechanism operably connected to the shaft, said loop-forming mechanism including a slotted hook, a rocking
 100 frame operated from the main shaft to place the hook within the loop during delivery thereof by the feeding mechanism, means operable from the shaft for holding the thread simultaneously with the holding thereof by the hook and at a point above the feeding mechanism whereby the feeding
 105 mechanism is free to move upwardly without affecting the thread, a knife pivotally mounted in the hook, and operating means for the knife to move the cutting edge thereof into the slotted end of the hook to sever that portion of the loop spanning the slot.

23. In a machine of the class specified, the combination of a drive shaft, thread-delivering and loop-receiving mechanism operably connected to the drive shaft, and a cutting mechanism for severing the loops
 120 also operated from the drive shaft and including a rocking frame carrying the loop-receiving mechanism, a pivoted cutter carried by said frame, means for operating the
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cutter to cut the loop while the same is held
by the receiving mechanism, and a pair of
unitarily rocking and relatively slidable
plates operated from said drive shaft for
gripping said loops.

In testimony whereof I have hereunto set
my hand.

JOHN M. GLADISH.

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