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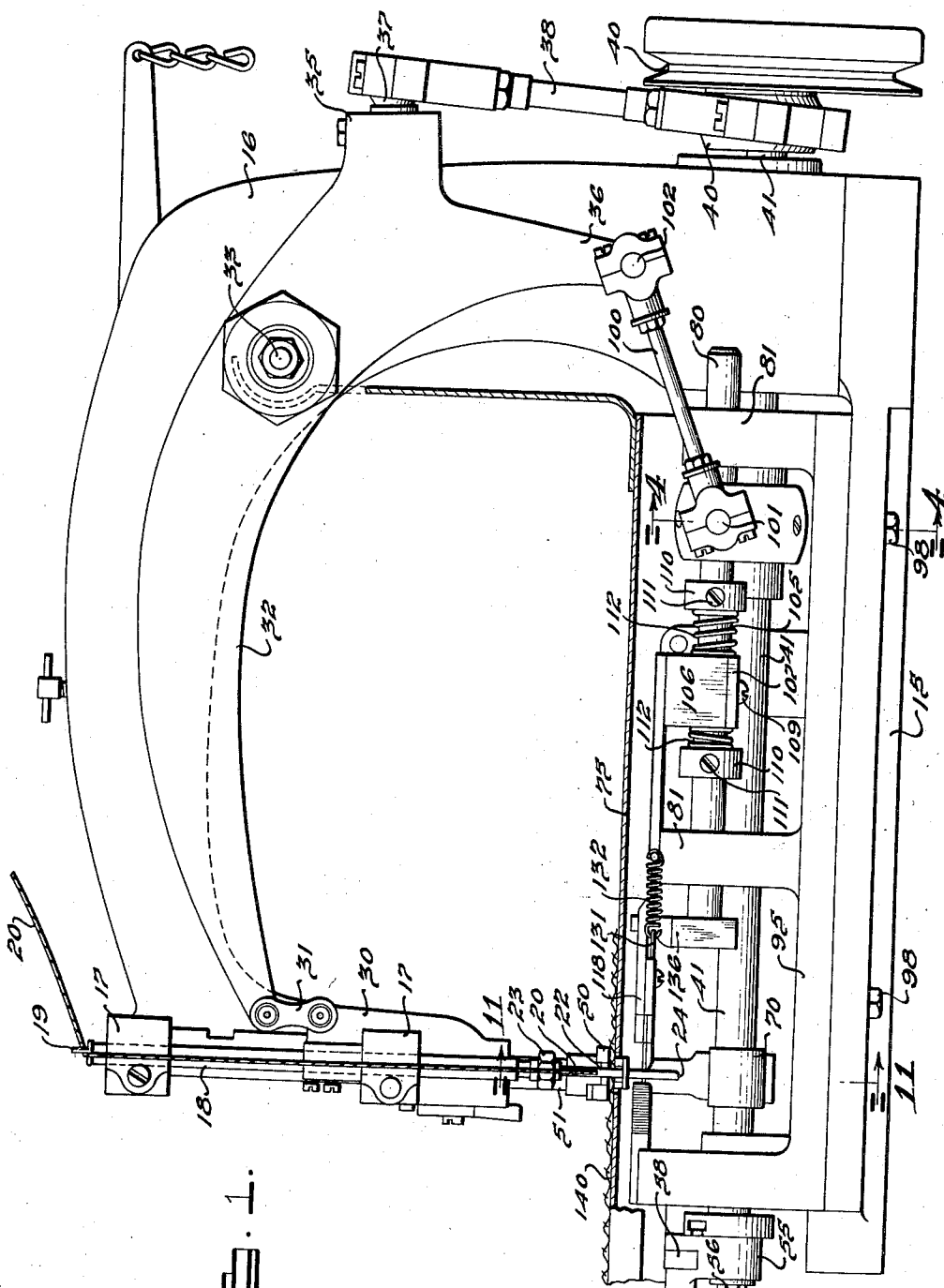
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2,193,109

TUFTING MACHINE

Filed Sept. 4, 1936

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

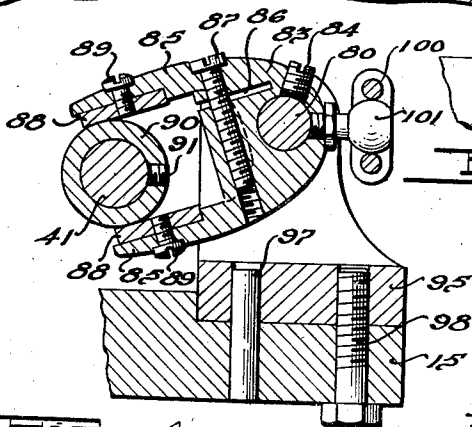
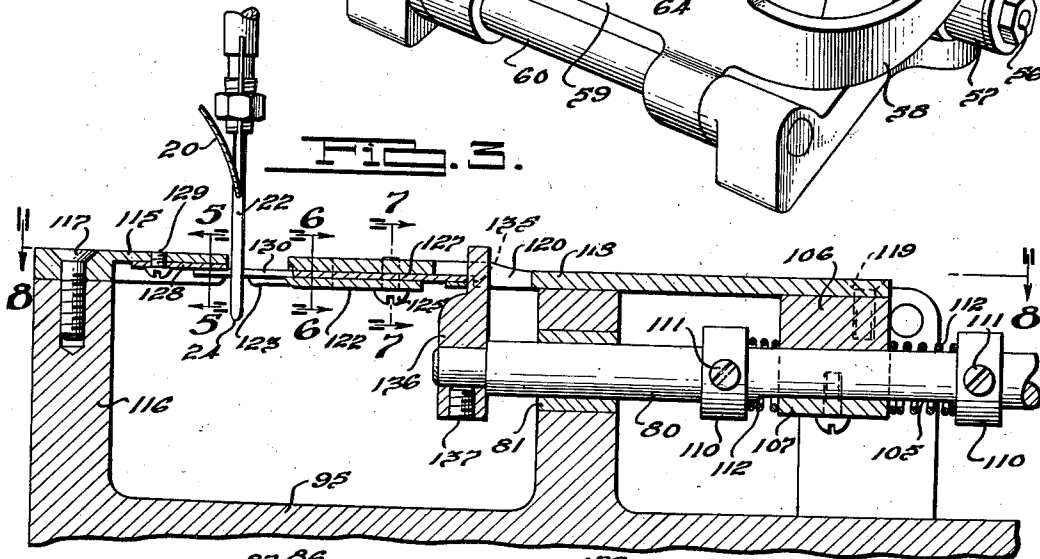
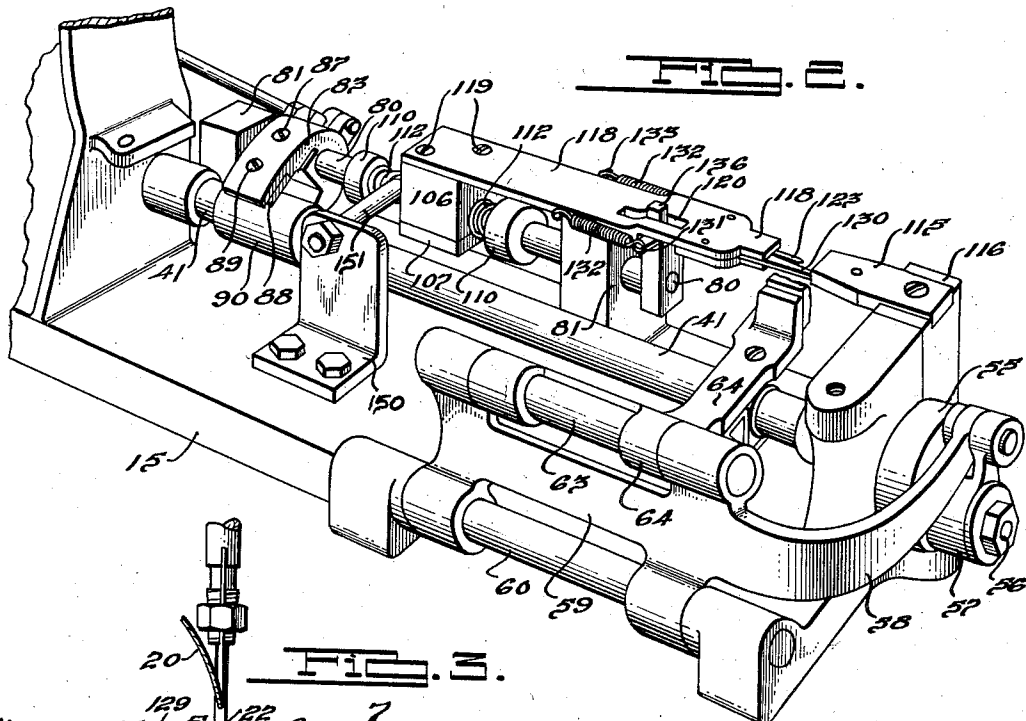


FIG. 5. FIG. 6. FIG. 7.

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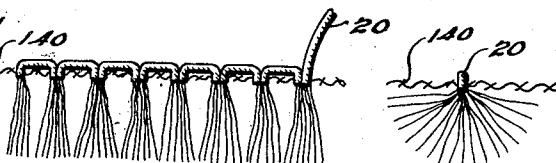
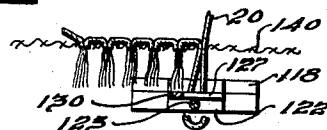
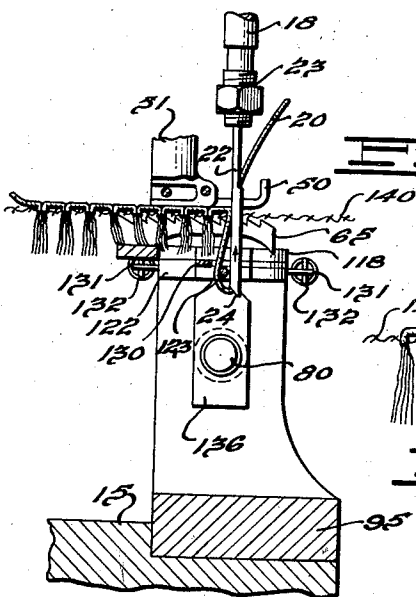
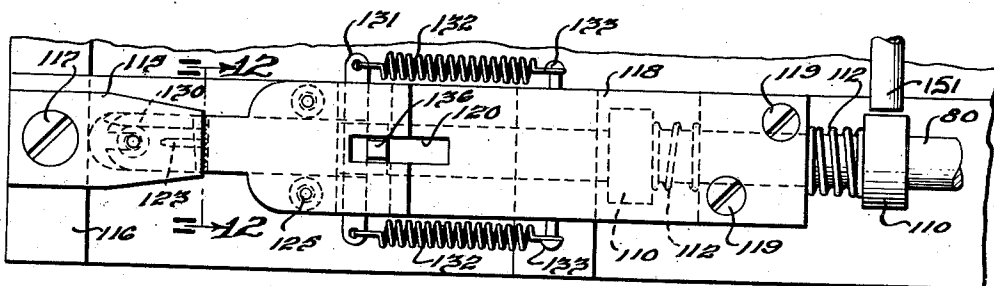
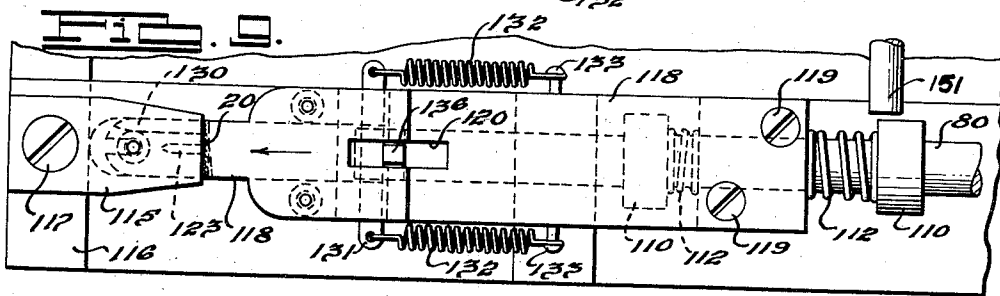
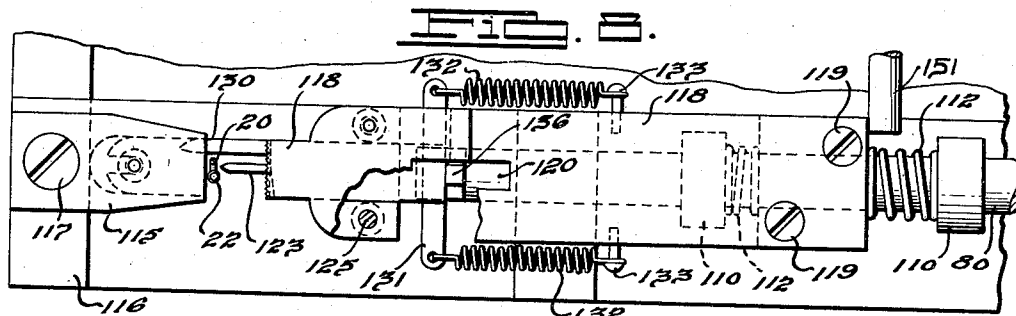
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,193,109

TUFTING MACHINE

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Application September 4, 1936, Serial No. 99,357

4 Claims. (Cl. 112—79)

This invention relates generally to an attachment for commercial sewing machines. More particularly it relates to a novel tufting mechanism arranged and adapted to be attached to commercial sewing machines of substantially conventional structure.

In order to obtain a better and more complete understanding of the specific type of apparatus to which the invention forming the basis of the present application relates, reference may be had to applicant's prior patents No. 1,892,161, issued December 27, 1932; and No. 1,912,560, issued June 13, 1933, upon which the invention of the present application is an improvement. By reference to these prior patents above mentioned, the distinguishing features, advancements and improvements of the invention disclosed in the present application will readily become clear.

It is a primary object of the present invention to provide a machine for forming a line of tufts on a fabric material for the purpose of creating an attractive and distinctive surface finish therefor.

The present invention contemplates the provisions of a machine adapted to accomplish this end, which machine has fewer moving parts and fewer parts generally than has heretofore been considered necessary in commercial machines of this general type.

Still further, the present invention contemplates the provision of an attachment adapted primarily for installation in conventional commercial sewing machines, which attachment is considerably simpler than the attachments heretofore known and available and in which the mechanism has been greatly simplified, thus eliminating compound moving parts such as have heretofore been considered necessary.

Yet another object of the present invention consists in the provision of an attachment adapted for use in connection with sewing machines of conventional commercial construction in which substantially less modification of the existing machine is required in order to satisfactorily install the improved attachment.

It is a still further object of the present invention to provide an attachment for use in connection with sewing machines, which is considerably more flexible in operation than attachments of this type as heretofore known and in which simplified mechanism is provided for varying the length of stitches, consequently providing substantial range in the number of stitches per inch which the machine is capable of producing.

Still further, the present invention contemplates a construction of this general character in which the mechanism has been so substantially simplified that a higher speed of twelve to fifteen hundred stitches per minute may satisfactorily be attained, while the structure contemplated by machines of this general type as now used are capable of forming only seven to eight hundred stitches per minute.

Yet another object of the present invention consists of the provision of an attachment for sewing machines of the type described above in which a substantially decreased number of mechanical movements is utilized and in which the necessary mechanical movements are in each instance considerably simplified.

Yet another object of the present invention consists in the provision of a machine of this general character which is so constructed and arranged that the normally necessary thread tensioning devices commonly used in sewing machines of this general character are eliminated.

Still further, the present invention contemplates the provision of a hollow needle for use in connection with machines of this generic type which in combination with the power mechanism serves to provide an exceedingly satisfactory resultant product.

Many other and further objects, advantages, and features of the present invention will become clearly apparent from the following specification when considered in connection with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is a side elevational view with parts in section and parts broken away illustrating in detail a commercial sewing machine of substantially conventional construction and having the improved attachment of the present invention embodied therein.

Fig. 2 is a fragmentary rear perspective view of the improved attachment mounted in the machine illustrating in detail the parts thereof and the cooperative relation therebetween.

Fig. 3 is a vertical longitudinal sectional view through the attachment mechanism shown in Fig. 2 illustrating in detail the construction and arrangement of parts thereof and showing the manner in which the stitching needle of the machine cooperates therewith.

Fig. 4 is an enlarged fragmentary transverse sectional view taken substantially on the line 4—4 of Fig. 1 illustrating in detail the construction and arrangement of the parts of the improved mechanism.

Fig. 5 is an enlarged fragmentary transverse sectional view taken substantially on the line 5—5 of Fig. 3 illustrating in detail a portion of the cut-off mechanism.

Fig. 6 is an enlarged transverse sectional view taken substantially on the line 6—6 of Fig. 3 illustrating in detail the reciprocable members constituting the loop forming mechanism and cut-off mechanism.

Fig. 7 is an enlarged transverse sectional view taken substantially on the line 7—7 of Fig. 3, and similar to Figs. 5 and 6 illustrating in further detail the parts making up the loop forming and cut-off mechanism of the machine.

Fig. 8 is a fragmentary view with parts in plan and parts in section taken substantially on the line 8—8 of Fig. 3 illustrating in detail the loop forming mechanism and cut-off mechanism at the beginning of a stitch forming operation.

Fig. 9 is a plan view similar to Fig. 8 illustrating the manner in which the loop is planned prior to the actuation of the cut-off mechanism.

Fig. 10 is a longitudinal plan view similar to Figs. 8 and 9 illustrating in detail the operation of the cut-off mechanism and the manner in which the loop is severed.

Fig. 11 is an enlarged transverse sectional view taken substantially on the line 11—11 of Fig. 1 illustrating in detail the manner in which the loop forming mechanism and cut-off mechanism cooperate with the stitching needle of the machine in order to form the tufts of material.

Fig. 12 is a fragmentary sectional view similar to Fig. 11 illustrating in detail the actuation of the cut-off mechanism in the specific manner in which it engages the loops of fabric to be cut.

Fig. 13 is a fragmentary sectional view taken through a section of fabric which has been stitched by the mechanism of the present invention.

Fig. 14 is a fragmentary sectional view similar to Fig. 12 illustrating in detail one of the tufts and the manner in which the same may be spread out in order to achieve the desired decorative effect.

With more particular reference to the drawings and specifically to Fig. 1 thereof it will be seen that the sewing machine generally comprises a base 15 on which is rigidly mounted a needle supporting arm 16 which serves to support the needle and needle operating mechanism hereinafter described in detail. This arm 16 at its outer end carries a pair of guides 17 in which is reciprocably mounted a needle actuating shaft 18. This shaft 18 is provided with an eyelet 19 at its upper end adapted to receive a line of cord or thread 20 which passes downwardly along the shaft 18 to a needle 22 removably mounted in the lower end of the shaft 18 by means of a chuck 23 or similar releasable socket. As is clearly seen in Figs. 3 and 11 the needle 22 is of generally hollow cylindrical construction in its lower end and has its lower end cut off at an oblique angle to form a point 24 adapted to pierce the cloth being operated upon. The upper portion of the needle above the zone thereof which is adapted to enter the cloth is recessed to provide access to the hollow interior of the needle in such a manner that the cord 20 may be fed downwardly through the hollow interior of the needle thus protecting a portion of the cord from contact with the cloth during the piercing operation. The utility of this needle structure with relation to the apparatus of the present invention will become more clearly apparent hereinafter.

The cord or thread 20 may be fed from a suitable supply ball or reel, not shown, directly to the eyelet 19 at the upper end of the needle shaft and it is noted that the conventional tensioning devices commonly used in sewing machines of this general character are not necessary in connection with the present apparatus. The needle operating arm has a casting 30 secured thereto which is pivotally connected by means of a link 31 with a bell crank arm 32 which serves to actuate the needle and effect vertical reciprocatory movement thereof. As is conventional in constructions of this general character the bell crank arm 32 is pivoted at a stationary point 33 on the stationary arm 16 of the apparatus and on the opposite side of the pivot 33 is provided with a pair of projecting arms 35 and 36, respectively. The arm 35 projects beyond the rear end of the machine and has rigidly mounted therein a ball member 37 to which the upper end of a pitman shaft 38 is universally connected as is conventional in the art. The machine as a whole is adapted to be driven by means of a belt, not shown, passing over a pulley 40 which is secured to the end of a longitudinally extending shaft 41 rotatably mounted in suitable bearings in the base frame 15 of the machine. Adjacent the pulley 41 is mounted a ball member 44 the peripheral surface of which is generally spherical and which serves to provide means for connecting the lower end of the pitman 38. Consequently it will be apparent that rotation of the shaft 41 serves to effect reciprocation of the arm 35 of the bell crank 32 and consequent vertical reciprocation of the needle shaft 18 and needle 22 which is carried thereby. As is conventional in constructions of this general character the eccentricity of the ball member 40 is sufficient to produce a stroke of the desired length and pass the needle 22 through the fabric being operated on the predetermined amount required.

The arm 16 carries a vertically adjustable foot member 50 secured to the lower end of a vertically movable shaft 51 which may be conveniently adjusted to raised or lowered position in order to engage the upper surface of the fabric passing through the machine and cooperate with the mechanism hereinafter described for effecting a positive feed of the fabric material through the machine at a predetermined desired rate. The feeding mechanism for feeding the fabric through the machine includes a generally circular wheel 55 secured to the forward end of the shaft 41. This wheel 55 has a crank arm 56 projecting therefrom which crank arm is eccentrically mounted with respect to the axis of rotation of the shaft 41. The crank arm 56 has pivotally mounted thereon a link 57 to the opposite end of which is pivotally connected a projecting arm 58 integrally formed with a reciprocable frame 59 pivotally mounted upon a longitudinally extending shaft 60 secured to the base frame 15 of the machine generally.

The frame 59 serves to support a longitudinally extending shaft 63 which has journaled thereon a fitting 64 which projects over the shaft 41 and is provided at its forward end with a toothed fabric engaging member 65 adapted to normally lie in a position immediately beneath the foot member 50. As is clearly seen by reference to Fig. 1 the foot member 50 comprises a pair of portions which extend on either side of the needle 22 and the feed member 65 may likewise be bifurcated to provide a pair of portions cooperating with the complementary portions of the foot

member 50. A cam member 70 is rigidly secured to the shaft 41 at the point over which the fitting 64 passes and this cam member will consequently effect a vertical reciprocation of the fabric engaging portions 65 which are mounted on this fitting as the shaft 41 is rotated. A plane surfaced table 75 is rigidly mounted with respect to the machine and is provided with suitable apertures therein adjacent the foot member and fabric engaging portions of the feed member in order that as the vertical reciprocation of the feed member is effected by the cam 70 these serrated feed members will be moved to a position slightly above the plane of the table surface. It will be apparent due to the action of the crank 56 and frame 59, that as the shaft 41 is rotated the fitting 64 will be reciprocated in a transverse plane as well as in a vertical plane consequently providing a substantially rectilinear movement of the serrated fabric engaging members 65 which are secured to the fitting 64. This rectilinear movement serves to effect the feed of fabric material over the table 75 as the shaft 41 is rotated due to the engagement of the serrated feed members 65 with the under-surface of the cloth. It will be seen that the cloth is urged into engagement with these members by the resiliently mounted foot member 50.

The above described construction is substantially conventional in sewing machines now in commercial use and has been described in detail only in order that a more complete understanding of the present invention may be obtained.

The apparatus of the present invention includes a longitudinally disposed axially reciprocable shaft 80 which is mounted in suitable bearings 81 and which serves to actuate the mechanism hereinafter described in detail. It will be apparent that the bearings 81 are integrally formed on a framework 95 which has a longitudinally extending flat base portion adapted to be removably mounted upon the base 15 of the machine. This removable mounting may conveniently be effected by means of dowel pins 97 extending into the complementary apertures in the member 95 in the base 15 and these two members may be rigidly secured together by means of suitable cap screws 98 passing upwardly through suitable apertures in the base member 15 and threadably received in the member 95. Consequently it will be apparent that the improvements of the present invention constitute a unitary attachment which may be easily and conveniently applied to a sewing machine of substantially conventional construction.

The shaft 80 has rigidly secured thereto a guide block 83 which is locked against relative rotation with respect to the shaft 80 by means of a set screw 84. The guide block 83 has preferably integrally formed therewith a pair of substantially parallel extending arms 85 which are adapted to lie on either side of the main rotary drive shaft 41. The body of the guide block is preferably slotted to provide a recess 86 and has extending through the block an adjusting set screw 87 which due to the inherent resiliency of the material from which the block is formed may be used for the purpose of adjusting the position of the arms with respect to each other within a relatively narrow range. The inner surfaces of the arm 85 are recessed to provide seats for removably mounted hard metal inserts 88 which may be retained in position in their seats by means of set screws 89. These hard metal inserts are adapted to engage the peripheral

surface of a hard metal collar 90 locked in position co-axially on the shaft 41 by means of a set screw 91.

From the foregoing description it will be apparent that due to the fact that the block 83 is locked against rotation with respect to the shaft 80 and that the arms of this block engage diametrically opposite points on the periphery of the collar 90 which is secured to the shaft 41 this block 83 serves to prevent any rotational movement of the shaft 80 in its bearings and at the same time serves to permit relatively friction free axial movement of the shaft 80. Further it will be clear that the set screw 87 may be adjusted in order that the hard metal inserts 88 will snugly engage the periphery of the collar 90. It will be seen that due to the fact that during the operation of the machine the shaft 41 and consequently the collar 90 are constantly rotated the longitudinal movement of the hard metal inserts over the surface of this collar will be relatively friction free thus permitting free longitudinal movement of the shaft 80 in its bearings and at the same time positively precluding rotation of this shaft about its axis. Further it will be apparent that adjustment of the screw 87 provides convenient means for maintaining the inserts snugly in engagement with the peripheral surface of the collar 90 and further due to the removable mounting of the inserts they may be conveniently replaced from time to time as may be necessary.

Longitudinal movement of the shaft 80 is effected by means of a pitman rod 100 which is universally connected to a ball member 101 rigidly secured to the block 83 as is clearly seen in Fig. 4. The opposite end of this pitman may be universally secured to a corresponding ball member 102 providing a universal connection for the opposite end of the pitman rod 100 with the projecting arm 36 of the actuating bell crank 32. Consequently it will be apparent that as rotation of the shaft 41 takes place producing pivotal movement of the bell crank 32 longitudinal movement of the shaft 81 will take place throughout a predetermined limited range.

The longitudinal central zone of the shaft 80 has the under-surface thereof flattened at 105 as is clearly seen in Fig. 3. A block 106 is adapted to partially surround the shaft 80 at this point and has a plate 107 secured to the lower surface thereof which plate is adapted to engage the flattened surface 105 and prevent relative rotational movement of the block 106 with respect to the shaft 80. The plate 107 is secured in position by means of suitable cap screws 109 threadably received by the block and when secured in position serves to closely engage all surfaces of the shaft 80 in the longitudinal central zone thereof. A pair of collars 110 are locked on the shaft by means of set screws 111 and mounted in axially spaced positions on either side of the block 106. Helical compression coil springs 112 are preferably confined between each of these collars 111 and the block 106 in order to resiliently position the same between the two collars thus permitting limited longitudinal movement of the block 106 with respect to the shaft 80 which longitudinal movement is resiliently limited by one or the other of the springs 112. This construction affords a lost motion connection between the shaft 80 and the block 106 at the same time precluding relative rotational movement between these members.

A stationary gripping jaw 115 is rigidly

mounted upon a projection or post 116 formed on the base 95 adjacent the needle of the machine. The face of this jaw member 115 lies closely adjacent the path of the needle and serves to cooperate with a movable jaw member 118 which comprises a relatively long flat strip rigidly secured by means of set screws 119 to the upper surface of the block 106. This movable gripping jaw 118 is slightly offset in its central portion and has a generally rectangular slot 120 formed centrally thereof, the purpose and function of which will hereinafter become more clear. Secured to the underside of the forward end of the jaw member 118 is a plate 122 which at its forward end carries a projecting finger 123 which is adapted to enter between the needle and the thread carried by the needle in order to form a loop of such thread as the needle moves upwardly in its path. The plate 122 is secured in spaced relation to the underside of the jaw member 118 by means of a pair of cap screws 125 thus providing a channel-way or recess in which slides a cutter blade 127. This cutter blade is adapted to cooperate with a fixed cutter 128 permanently secured to the lower side of the jaw member 115 by means of a screw 129. The forward edge of this cutter bar is cut off at a slight angle throughout a substantial portion of its forward face in order to obtain an effective shearing action as it cooperates with the stationary cutter 128 and is provided with a forwardly projecting finger 130 which slidably engages the under surface of the stationary cutting blade 128 in order to preclude the possibility of the cutting edges of these members coming into engagement in abutting relation. The rear end of the movable cutter 127 has secured thereto a transversely extending member 131 the ends of which extend outwardly beyond the sides of the gripping member 118 and serve to provide means for mounting a pair of springs 132, the opposite ends of which springs are anchored on suitable pins 133 rigidly mounted in the sides of the member 118. It will be seen that the springs 132 serve to maintain the movable cutter member 127 in retracted position with respect to the gripper member at all times except when this cutter is positively moved as hereinafter described.

It will be seen by reference to Figs. 3 and 8 to 10, inclusive, that the rear end of the movable cutter member 127 terminates at a point substantially centrally of the slot 120 formed in the gripping member 118 and that the offset portion of the gripping member 118 provides a shoulder 135 on the lower side of this member which shoulder serves to provide an abutment limiting rearward movement of the cutter member with respect to the gripping member 118. An actuating finger 136 is rigidly secured to the forward end of the shaft 80 by means of a suitable set screw 137 and as is clearly seen in Fig. 3 this actuating finger extends upwardly through the slot 120 in a position where it may conveniently engage the rear end of the cutter blade 127.

In addition a bracket 150 is secured to the bed of the apparatus which bracket carries a rigidly projecting stop arm 151 which is adapted to project into the path of movement of the block 106 and limit rearward movement thereof.

The operation of the apparatus is substantially as follows: A section of fabric material 140 on which it is desired to produce the tufted effect by use of the present machine is fed into the machine and will automatically be fed under-

neath the needle by means of the feed mechanism described above as is conventional in sewing machines of this general character. As the shaft 41 is rotated the needle will descend piercing a hole in the cloth 140 and carrying a loop of the thread 20 therethrough. The mechanism of the attachment described above is also actuated by the needle actuating arm 32 and as the needle starts its upward movement it will be seen that the shaft 80 will be moved forwardly toward the needle by means of the pitman shaft 103 which, as has been described above, is connected to the projecting arm 36 of the actuating bell crank 32. Forward movement of this shaft 80 serves to cause the finger 123 to pass closely adjacent the needle 22 and this finger is so actuated that it is adapted to enter between the needle and the section of thread which passes out of the end of the needle. Consequently as upward movement of the needle takes place the loop of thread will be retained on the under surface of the cloth. It will be seen that as further forward movement of the shaft 80 with respect to the needle takes place the movable gripping jaw 118 will be urged toward the stationary jaw 115 by means of the spring 112 which serves to provide a resilient lost motion connection between the block 106 and the shaft 80.

The mechanism is preferably so timed that these jaws will not come into engagement until the needle has risen sufficiently far to be out from between these jaws. Upon engagement of the jaws the lower end of the loop of thread will be firmly gripped therebetween thus virtually preventing further relative movement of the jaws 118 and 115. Consequently the spring 112 will be compressed upon further movement of the shaft 80 in a direction toward the needle thus effecting relative movement between the shaft 80 and the jaw member 118. Inasmuch as the actuating finger 136 is carried by the shaft 80 a relative forward movement of this finger will take place in the slot 120 and effect a relative forward movement of the cutting blade 127 to sever the tip from the loop of thread which, as has been described above, is gripped between the jaw members 118 and 115. These jaws are retained in overlapping relation at all times by means of the projecting portion 130 on the movable jaw member which slidably engages the under surface of the stationary cutter blade 128. After the movable cutter blade 127 has been moved forwardly sufficiently far to sever the tip of the loop of thread the first half of the cycle of movement is substantially complete.

This complete severance will occur at substantially the same time as the needle reaches its maximum height. As the needle starts to descend the shaft 80 will move rearwardly disengaging the movable cutter from its stationary blade and permitting the rear end of this movable cutter blade to seat against the shoulder 135 at which time further rearward movement of the shaft 80 will serve to effect a disengagement of the gripping jaws 118 and 115 and as the needle descends further the parts will be moved to substantially the position shown in Fig. 3. The descent of the needle serves to pierce a second hole and bring down another loop of thread which will be acted upon in substantially the manner described above. It will be noted that the gripping jaw 127 remains engaged until the needle reaches substantially the point where it is adapted to enter between the jaws and consequently these jaws serve to aid in retaining the

thread in position and maintain one end of the thread anchored during a large portion of the downward movement of the needle, consequently greatly aiding in pulling the thread through the hollow needle to form the next loop.

It will be clear that the block 106 is also mounted on the shaft 80 and that relative rotational movement of this block with respect to the shaft is virtually precluded. Likewise it will be apparent that the bifurcated member 83 serves to preclude any possible relative rotational movement of the shaft 80 about its axis, consequently maintaining the parts in accurately aligned relation at all times, yet facilitating relative longitudinal or axial movement thereof.

It will be appreciated that the above described embodiment of the invention is merely illustrative of the generic inventive concept presented. Many other and further modifications thereof falling within the scope of the invention as defined in the subjoined claims will become clearly apparent to those skilled in the art.

What is claimed is:

1. Tuft forming mechanism adapted for attachment to a sewing machine, including a base member, a stationary gripping jaw mounted on said base member adjacent the needle of said machine, a stationary cutter mounted adjacent said jaw in a substantially horizontal plane, a longitudinally movable shaft carried by said base member, means for axially reciprocating said shaft synchronously with the movement of the needle of said machine, a movable gripping jaw adapted to cooperate with said stationary jaw and a movable cutter also disposed in a substantially horizontal plane adapted to cooperate with said stationary cutter, said movable cutter and jaw connected to said shaft and adapted for actuation thereby.

2. Tuft forming mechanism adapted for attachment to a sewing machine including a base

member, cooperating jaws on said base member adjacent the needle of said machine, cooperating cutter plates likewise mounted on said base member immediately beneath said jaws and movable independently thereof, said cutter plates being disposed in a generally horizontal plane, a longitudinally disposed shaft for actuating said jaws and cutters, and means connecting said shaft to said machine to operate the same synchronously therewith.

3. An attachment for sewing machines having an actuating arm for effecting vertical reciprocation of the needle thereof, said attachment mechanism including a supporting base, a stationary jaw on said base adapted to be positioned adjacent the needle of the machine with which the apparatus is associated, a cutter secured directly to and immediately beneath said jaw, a shaft mounted for longitudinal reciprocation in said base member, a movable gripping jaw carried by said shaft and adapted to engage said stationary jaw, a cutter carried by said movable jaw member and adapted to cooperate with the stationary cutter carried by said stationary jaw and means interconnecting said shaft with the needle actuating arm of said machine to effect reciprocation thereof synchronously with the movement of the needle of said machine.

4. An attachment for sewing machines comprising means for forming a loop of thread, a pair of relatively movable jaws adapted to grip and hold said loop of thread, means for effecting relative movement of said jaws to grip said loop, cutting mechanism comprising a pair of cooperating cutters having their edges disposed in substantially horizontal planes, one of said cutters being reciprocally mounted with respect to one of said jaws and means for actuating said gripping means, said last mentioned means also serving to actuate said cutting knives.

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