

Oct. 17, 1933.

E. B. ALLEN

1,930,637

THREAD CUTTING MECHANISM FOR SEWING MACHINES

Filed July 16, 1931

8 Sheets-Sheet 1

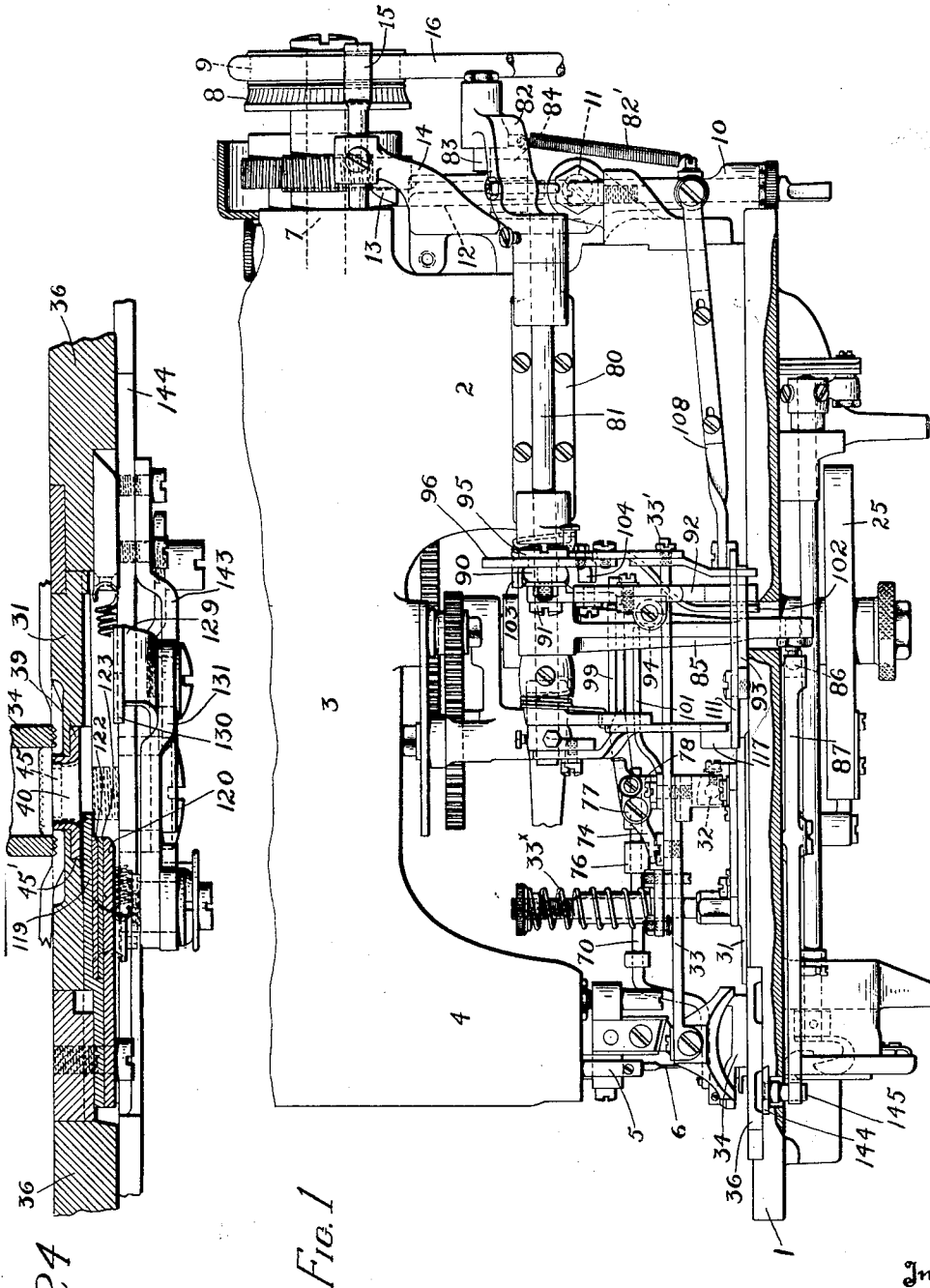


Fig. 24

Fig. 1

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Oct. 17, 1933.

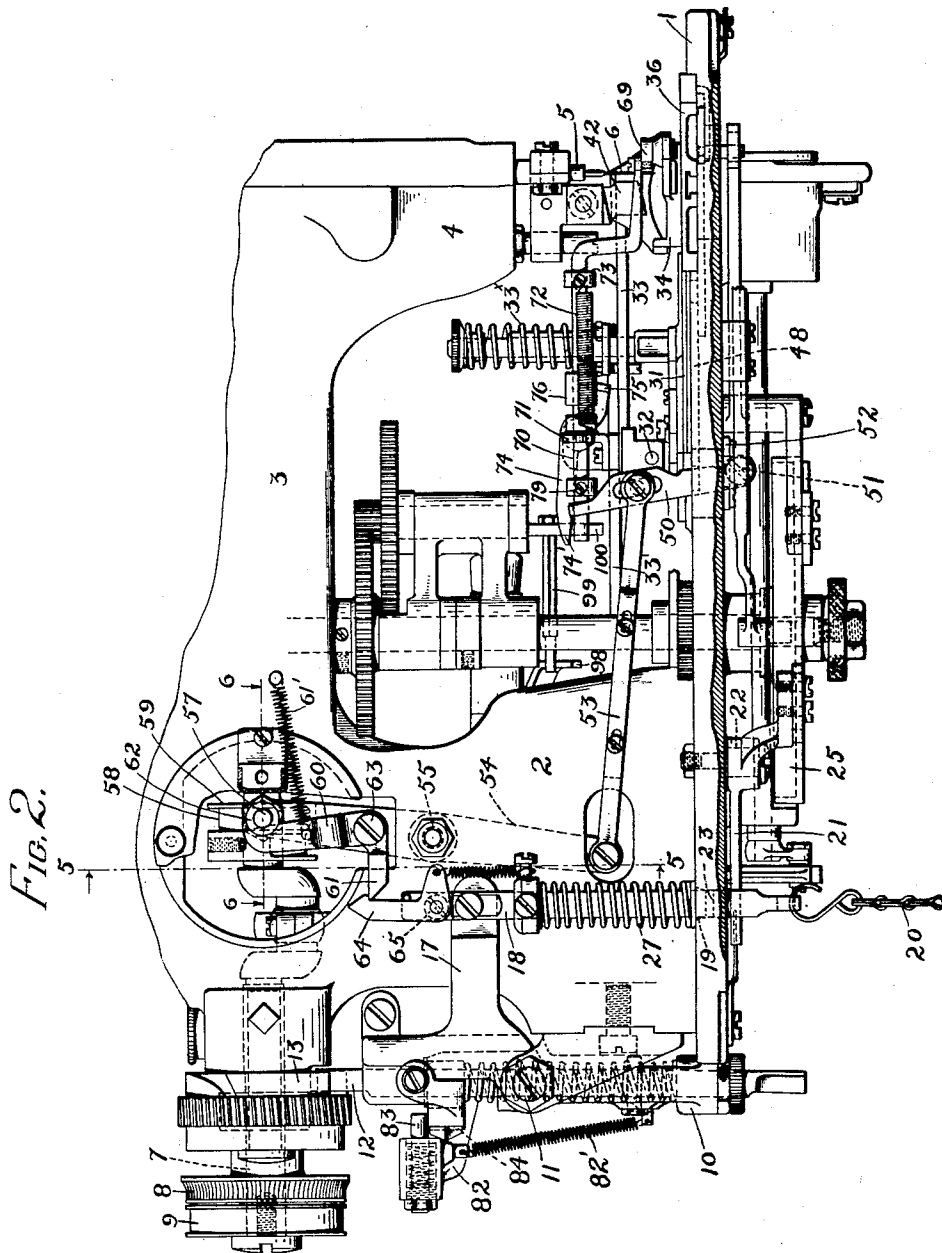
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8 Sheets-Sheet 2



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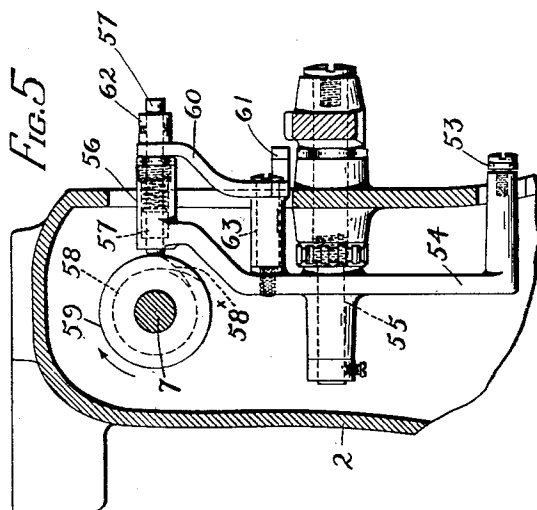
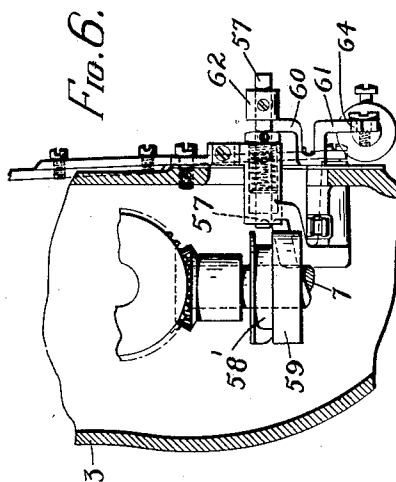
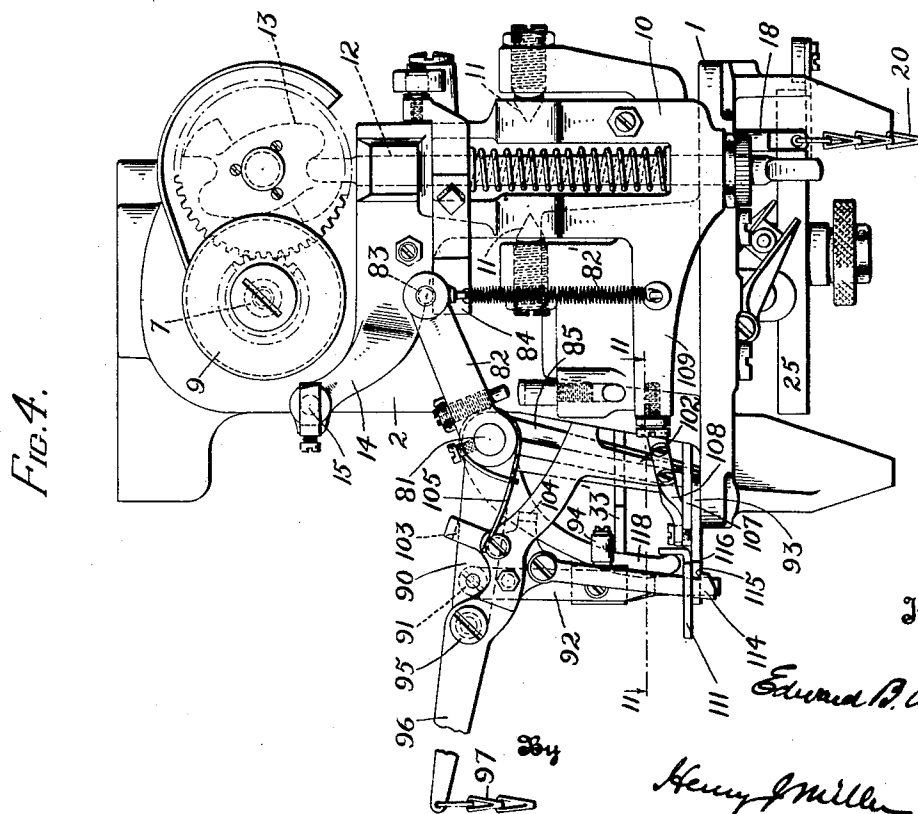
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Filed July 16, 1931

8 Sheets-Sheet 4



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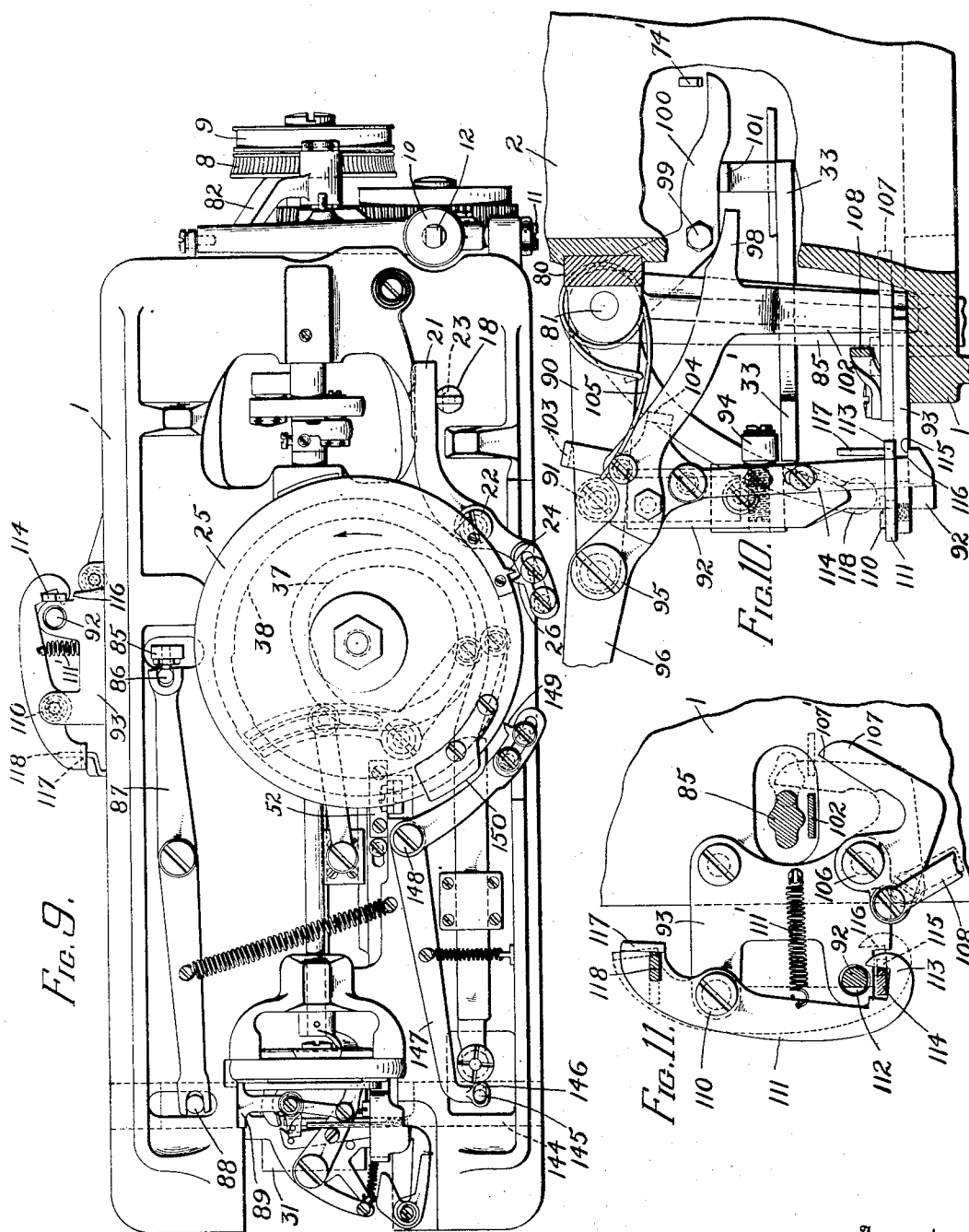
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THREAD CUTTING MECHANISM FOR SEWING MACHINES

Filed July 16, 1931

8 Sheets-Sheet 5



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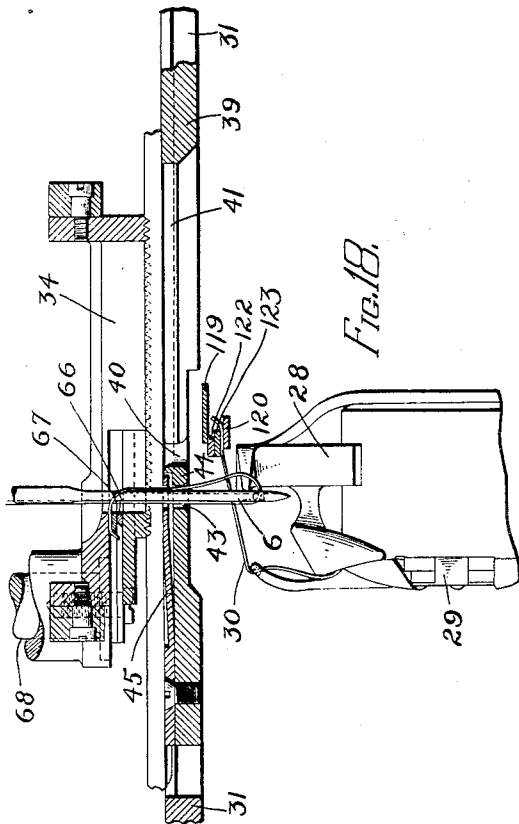
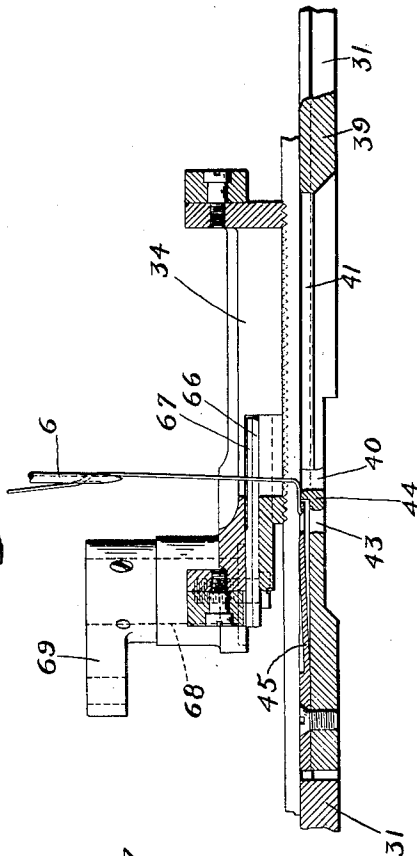
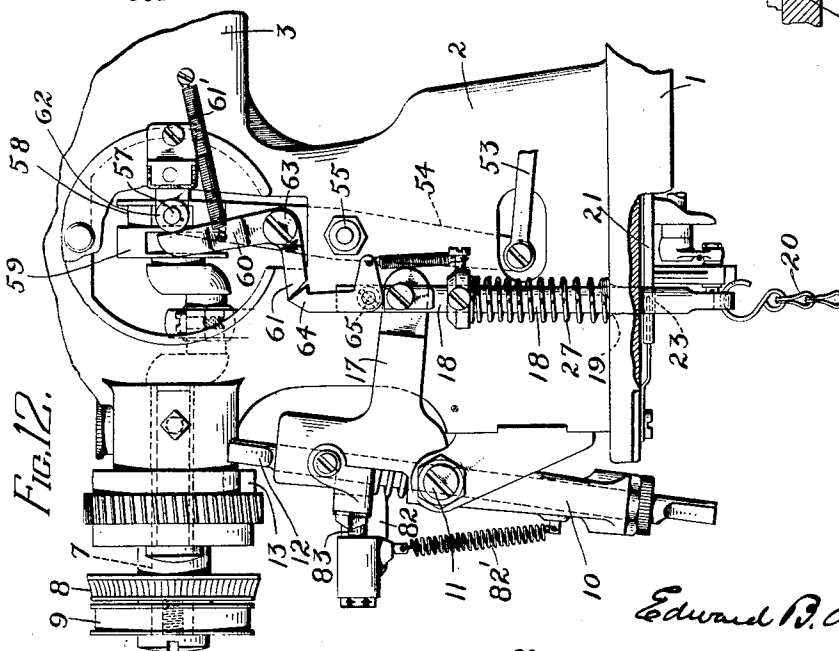
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THREAD CUTTING MECHANISM FOR SEWING MACHINES

Filed July 16, 1931

8 Sheets-Sheet 6



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1,930,637

THREAD CUTTING MECHANISM FOR SEWING MACHINES

Filed July 16, 1931

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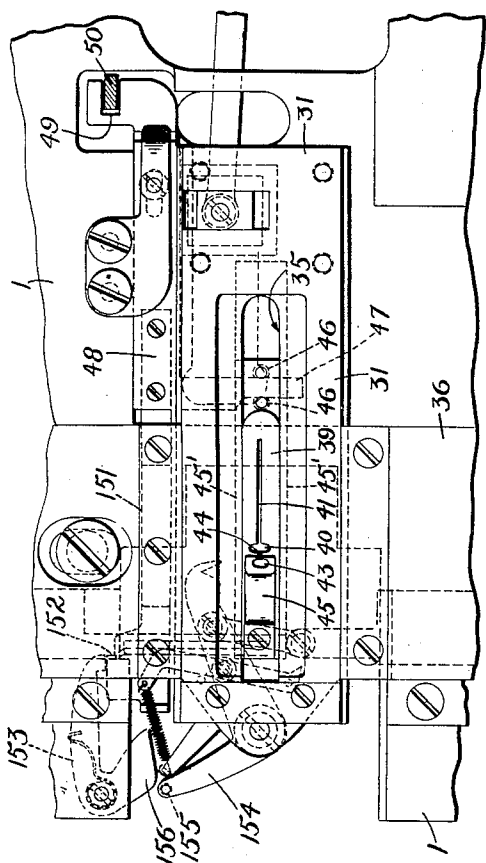


Fig. 13.

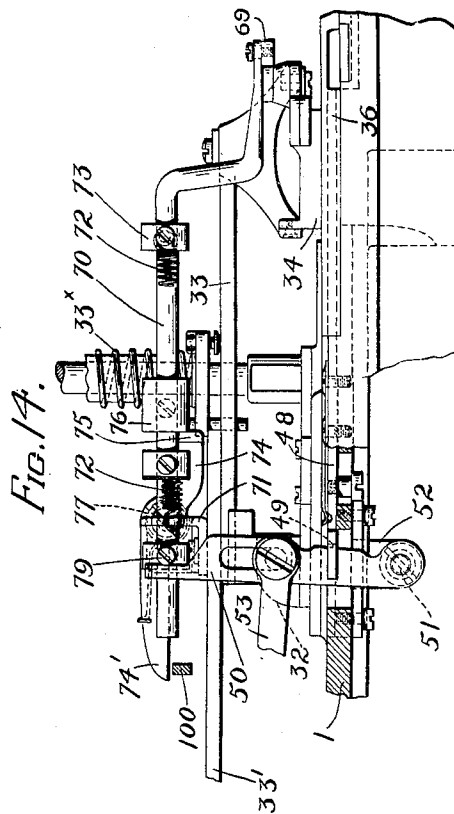


Fig. 14.

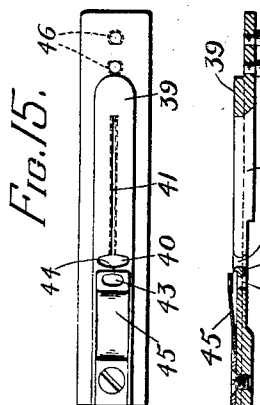


Fig. 15.

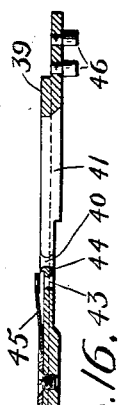


Fig. 16.

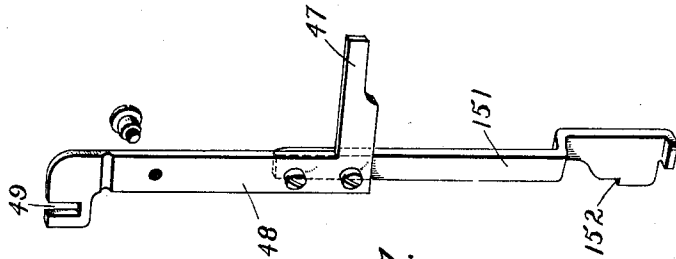


Fig. 17.

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THREAD CUTTING MECHANISM FOR SEWING MACHINES

Filed July 16, 1931

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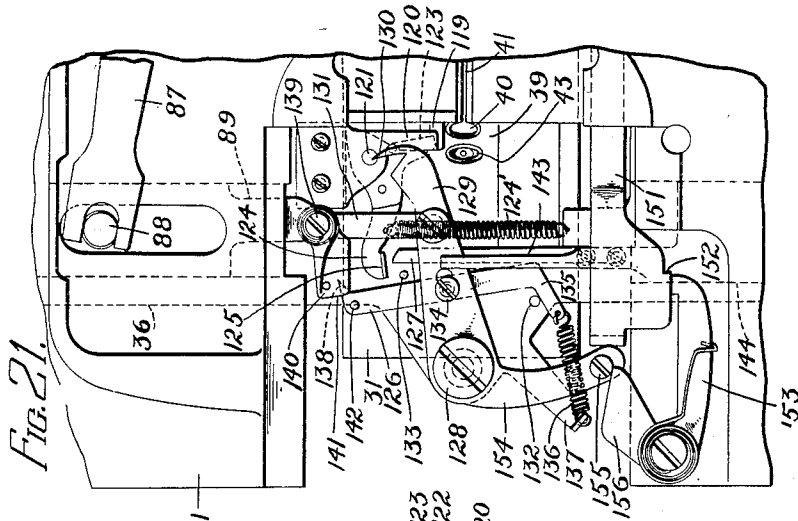


FIG. 21.

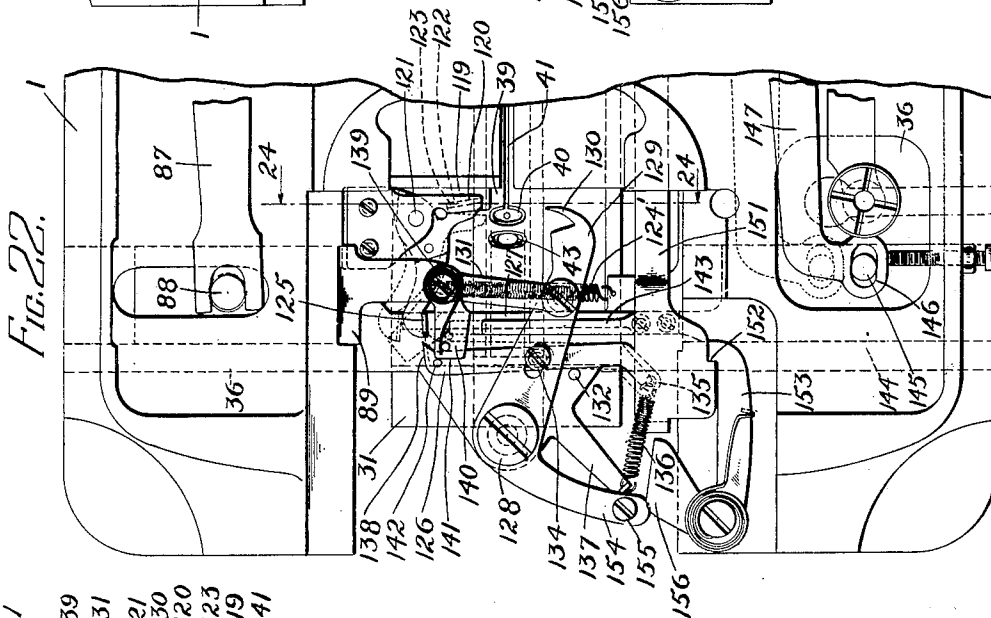


FIG. 22.

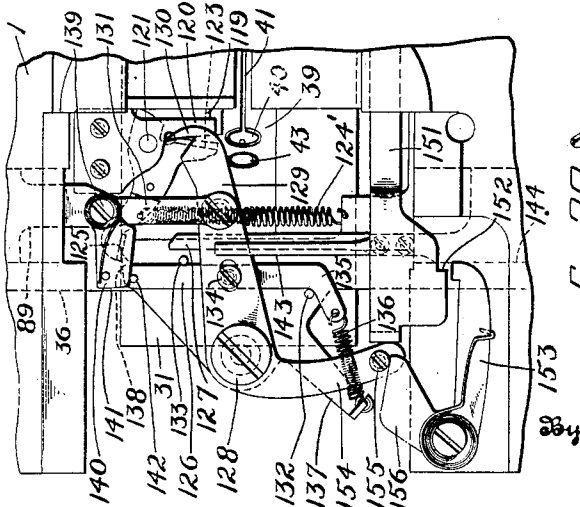


FIG. 20. 127

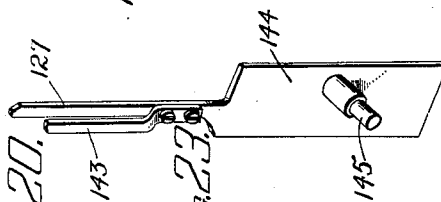


FIG. 23.

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1,930,637

THREAD-CUTTING MECHANISM FOR
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beth, N. J., a corporation of New Jersey

Application July 16, 1931. Serial No. 551,114

25 Claims. (Cl. 112—252)

This invention relates to sewing machines more particularly of the type adapted to sew a group of stitches and then come to rest. Machines of this type have commonly been provided with thread-cutting and thread-end holding devices of various kinds designed to cut the needle-thread at the end of a sewing operation and hold the beginning end of the needle-thread under control during the formation of the initial stitches of the next sewing operation. Devices which hold the beginning end of the needle-thread above the work until the initial stitches are formed have been objected to because the beginning end of the needle-thread shows on the upper or right side of the finished work. Devices which hold the beginning needle-thread-end below the work have been objected to, as heretofore constructed, because they have been arranged to clamp the thread-end against the under side of the needle-throat-plate and such thread-end is apt to be conspicuous in the finished work.

It is an object of the present invention to provide means for controlling the beginning end of the needle-thread in such a manner as to insure the shortest possible end of needle-thread on the under side of the finished work. Another object of the invention is to provide for the positive control of both the needle and under-thread of a two-thread sewing machine, so that every stitch from the beginning to the end of a sewing operation will be perfectly formed, while avoiding conspicuous thread-ends in the finished work. A further object of the invention is to provide certain safety devices to insure the proper cooperation of the working parts.

To the attainment of the ends in view the invention comprises the devices, combinations and arrangements of parts hereinafter described and particularly pointed out in the appended claims.

The features of the invention and the advantages attained thereby will be readily understood by those skilled in the art from the following detailed description of a preferred embodiment of the invention illustrated in the accompanying drawings, in which:—

Fig. 1 is a right side elevation of a button-hole sewing machine embodying the invention. Fig. 2 is a left side elevation of the machine. Fig. 3 is a horizontal section through the vertical member of the sewing machine gooseneck, showing the bed and work-clamp in plan. Fig. 4 is a rear end elevation of the machine. Fig. 5 is a vertical section on the line 5—5, Fig. 2. Fig. 6 is a horizontal section on the line 6—6, Fig. 2.

Fig. 7 is a perspective view of the barrel-cam shown in Figs. 5 and 6. Fig. 8 is a development of the barrel-cam shown in Figs. 5, 6 and 7. Fig. 9 is a bottom plan view of the machine. Fig. 10 is a section on the line 10—10, Fig. 3, showing the manually operated clamp-opening and thread-cutter tripping mechanism in locked condition, as when the machine is sewing; Fig. 4 showing these parts in unlocked condition, as when the machine is at rest.

Fig. 11 is a plan view of the clamp and thread-cutter lock on the line 11—11, Fig. 4. Fig. 12 is a fragmentary left side elevation, similar to Fig. 2, with the parts of the stop-motion device in running position. Fig. 13 is a plan view of the lower work-clamp plates and the movably mounted throat-plate of the machine.

Fig. 14 is a side elevation, similar to Fig. 2, with the parts of the needle-thread cutter in open or thread-end-releasing position. Fig. 15 is a plan view of the throat-plate. Fig. 16 is a longitudinal vertical section through the throat-plate. Fig. 17 is a perspective view of the throat-plate-shifting bar. Fig. 18 is a vertical sectional view of the upper work-clamp-foot and throat-plate, with the needle throwing out a thread-loop after its initial descent in a sewing period. Fig. 19 is a similar view with the needle at the end of its first up-stroke, showing the beginning needle-thread-end pinched against the under surface of the work by the movement of the throat-plate.

Fig. 20 is a bottom plan view of the manually operated bobbin-thread-cutting and -nipping mechanism, showing the bobbin-thread-cutter and -nipper opened to thread-receiving position and about to close. Fig. 21 is a similar view at a slightly later stage, showing the bobbin-thread-cutter and -nipper closed. Fig. 22 is a similar view at a still later stage, after recovery of the manually operated mechanism to its initial position, showing the bobbin-thread-cutter actuator-bar latched in ineffective position to prevent the opening of the bobbin-thread-nipper and the release of the bobbin-thread-end by a repetition of the operation of the manually operated work-clamp opening and bobbin-thread-cutting and nipper-actuating mechanism. Fig. 23 is a perspective view of the bobbin-thread-cutter and -nipper-opening bar with a safety latch release-bar secured to it. Fig. 24 is a section on the line 24—24, Fig. 22.

The invention is disclosed as embodied in a sewing machine of the type adapted to sew "straight" as distinguished from "eyelet-end" buttonholes. The machine frame is formed with

a bed 1 from which rises the vertical member 2 of the overhanging gooseneck 3 terminating in the head 4 in which is mounted the usual reciprocating and laterally vibrating needle-bar 5 carrying the needle 6.

The machine is driven by a main-shaft 7 carrying the usual tight and loose belt-pulleys, 8 and 9, respectively, and controlled by a stop-motion device, preferably constructed substantially in accordance with the disclosure of the Allen Patent No. 743,213, of Nov. 3, 1903, and the Allen and Myers application, Serial No. 272,416, filed Apr. 24, 1928. Such a stop-motion device comprises a tilting stop-motion lever 10 fulcrumed on the trunnion screws 11 and carrying an upwardly spring-pressed plunger 12, Fig. 4, cooperating with a notched stop-cam 13 geared to the main-shaft 7. The stop-motion lever 10 has a laterally extending arm 14, which carries a belt-shipper 15 arranged to guide the belt 16, Fig. 1, onto the tight pulley 8 when the stop-motion lever 10 is tilted to its inclined position, Fig. 12, to carry the upper end of the stop-plunger 12 laterally out of engagement with the notched stop-cam 13. The stop-motion lever 10 also has a forwardly extending arm 17 to which is connected a vertical pull-rod 18 extending downwardly through an aperture 19 in the bed 1 and having connected to its lower end a chain 20 connected to the usual starting pedal (not shown).

When the starting rod 18 is pulled down by the operator to start the machine, it is retained in its down position by the spring-pressed latch-lever 21 fulcrumed at 22 below the bed 1, which latch-lever enters a notch 23 in the side of the rod 18. At the end of a sewing period the usual tripping point 24, Fig. 9, on the feed-wheel 25, engages the point 26 on the latch-lever 21 and shifts such lever out of the notch 23, thereby releasing the starting rod 18 which is projected upwardly by the recovery spring 27, from the position shown in Fig. 12 to the position shown in Fig. 2, to stop the machine.

Cooperating with the needle 6, below the bed 1, is the usual oscillatory shuttle 28 carrying the thread-case 29, Fig. 18, for the bobbin-thread 30.

The work-clamp comprises the usual longitudinal slide-plate 31 on which is pivotally mounted at 32 the upper clamp-lever 33 carrying at its forward end the usual rectangularly apertured clamping foot 34 which clamps the work upon the plate 31 at the opposite sides of the central longitudinal slot 35 therein. The longitudinal slide-plate 31 is slidably mounted in ways in the cross-slide plate 36 which, in turn, is mounted in ways in the bed 1. The slide-plates 31 and 36 of the work-clamp are moved in the usual manner to place the stitches around the buttonhole by the usual feeding connections with the feed-wheel 25 which has in its upper face the longitudinal feed-cam-groove 37 and lateral feed-cam-groove 38. The work-clamp and its feeding means, as above described, is old in the art and is disclosed, for example, in the U. S. patent to Allen, No. 738,591, of Sep. 8, 1903, which has been developed to the modern form shown in the U. S. patent to Wood, No. 1,613,634, of Jan. 11, 1927.

Supported by the cross-slide plate 36 within the slot 35 of the longitudinal slide-plate 31 is the throat-plate 39 formed with the usual needle-aperture 40 and clearance slot 41 for the buttonhole cutting knife 42. Heretofore, as shown in the Wood Patent No. 1,613,634, the throat-plate has been screwed fast to the cross-slide plate. According to the present improvement I provide

an element which is movable relative to and in contact with the under side of the work, after the first needle-loop has been seized by the under thread mechanism, such element wiping across the path of the needle below the work to engage the beginning needle-thread-end and pinch it against the under surface of the work to hold such end under control during the formation of the initial stitches. As a preferred means to this end the throat-plate 39 has been provided with two separate and distinct needle apertures, the regular sewing aperture 40 and a first-stitch aperture 43. The cross-bar or bridge 44 between such apertures constitutes the thread-end holding means. This bridge may, in part, be constituted by a plate spring insert 45 having a needle-aperture in register with and constituting a part of the first-stitch aperture 43 in the throat-plate.

The throat-plate 39 is supported upon but may move relative to the cross-slide plate 36 in the guideways 45' provided in the longitudinal slide-plate 31, Fig. 24. When the machine is started, the throat-plate is in position for the needle to make its first down-stroke through the first-stitch aperture 43. The throat-plate is then shifted, as will be hereinafter explained, to register the regular sewing aperture 40 with the needle-path for the remainder of the sewing operation.

The throat-plate 39, Figs. 13-17 inclusive, carries two spaced depending pins 46 between which extends the transverse arm 47 rigid with the longitudinal slide-bar 48 mounted in the bed 1 and formed at its rearward end with a slot 49 entered by the vertical arm 50 fulcrumed at 51 on the bracket 52 screwed to the under side of the bed 1.

The arm 50 is shifted from the position shown in Fig. 2 to that shown in Fig. 14 to shift the throat-plate from the position shown in Fig. 18 to that shown in Fig. 19 by means of the link-connection 53 with the lower end of the lever 54 fulcrumed at 55 within the vertical hollow frame-member 2. The lever 54 is formed at its upper end with a boss 56, Fig. 5, in which is mounted the spring-pressed slide-bolt 57 adapted to enter the cam-groove 58 in the barrel-cam 59 on the main-shaft 7. The slide-bolt 57 is held out of the cam-groove 58 by engagement of one arm 60 of the bell-crank latch-lever 60, 61 under the collar 62 fixed to the slide-bolt 57. The bell-crank latch-lever 60, 61 is fulcrumed on the stud-screw 63 carried by the lever 54.

When the machine is at rest, the arm 61 of the bell-crank latch-lever 60, 61 is engaged by the catch 64, Fig. 2, fulcrumed at 65 on the starting rod 18. A down-pull on the rod 18 to start the machine causes the catch to withdraw the arm 60 of the bell-crank latch-lever from the collar 62, thereby releasing the slide-bolt 57 which is projected by its spring into the dwell-portion 58' of the cam-groove 58 at the point 57', Fig. 8. In the down-motion of the starting rod 18, the catch 64 first swings the bell-crank latch-lever 60, 61, to release the slide-bolt 57 for cooperation with the cam-groove 58 and then wipes past the arm 61 and releases the bell-crank latch-lever 60, 61 which is pulled by its spring 61', Fig. 12, into engagement with the side of the collar 62 and is ready to engage under the collar 62 when the slide-bolt 57 is finally ejected from the cam-groove 58 and hold the slide-bolt 57 in ejected position. Compare Figs. 2 and 12.

When the slide-bolt is first projected into the cam-groove 58 it dwells for a certain period while the needle makes its first down-stroke and throws

out a loop for the shuttle 28. As soon as the needle is out of the work, the inclined part 58'' of the cam-groove engages the slide-bolt 57 and rocks the lever 54 to shift the throat-plate from first-stitch-receiving position, Fig. 18, to regular sewing position, Fig. 19. After the shift is effected, the inclined bottom wall 58* at the end of the cam-slot 53 ejects the slide-bolt 57 to inoperative position where it is held by the latch-lever 60, 61 until the next sewing operation is started.

At the beginning of a sewing operation the needle-thread end is held nipped above the work by a thread-cutting and -nipping device in the upper work-clamp foot 34. This device is constructed substantially in accordance with the disclosure of the Allen Patent No. 385,310, of Apr. 21, 1908. It comprises the usual superposed thread-cutting and -nipping blades 66, 67, Figs. 18 and 19, which are carried by the vertical shaft 68 to the upper end of which is fixed a crank-arm 69 to which is connected the forward end of a rod 70, Fig. 14, slidably supported in the bracket 71 on the upper work-clamp lever 33. A spring 72, anchored at one end to the bracket 71 and connected at its opposite end to a collar 73 on the rod 70, yieldingly urges the cutter and nipper blades 66, 67, to closed position. The blades are held cocked or set in open position, Fig. 14, by a spring-pressed latch-lever 74, the forward laterally extended end 75 of which engages the collar 73 on the rod 70. The latch-lever 74 is fulcrumed at 77, Fig. 3, on the bracket 78 screwed to the upper clamp-lever 33. The upper end of the vertical throat-plate shifting arm 50 is arranged to engage a lateral stud-pin 79 on the rod 70 and open the needle-thread-cutter and -nipper and release the beginning needle-thread-end just after the shuttle 28 takes the first needle-thread loop and has partially drawn out such loop, so that the shuttle in its continued motion will draw down the beginning needle-thread-end to the under side of the work.

Mounted at the side of the frame-member 2 is a bracket 80 in which is journaled the stop-motion-controlled rock-shaft 81 to the rear end of which is fixed the arm 82 carrying the spring-pressed plunger 83. When the stop-motion lever 10 is moved by the spring 27 from running position, Fig. 12, to stopping position, Figs. 2 and 4, an arm 84 on the stop-motion plunger 12 first engages the end of the plunger 83 and moves the latter endwise in the arm 82. When the stop-cam 13 depresses the plunger 12, the arm 84 is carried below the plunger 83 which is projected over the arm 84. When the plunger 12 rises into the stop-notch in the cam 13, the arm 84 rises and raises the plunger 83 to the position shown in Fig. 4, thereby rocking the shaft 81. This mechanism is substantially the same as that disclosed in the Allen Patent No. 385,310, previously referred to.

In the present machine, the rocking motion imparted to the shaft 81 by the final rise of the stop-motion plunger 12 into the stop-notch of the stop-cam 13 is utilized only to release the needle-thread-tension device, not shown, and to operate a work-clamp and thread-cutter actuator locking mechanism to be described.

Fulcrumed upon and movable relative to the rock-shaft 81 is a bell-crank lever the vertical arm 85 of which extends downwardly through an opening in the bed 1 and carries a ball 86 embraced by the forked end of a lever 87 the opposite forked end of which embraces a stud-

pin 88 depending from the slide-bar 89 which actuates the bobbin-thread-cutting and -nipping mechanism to be described. The outwardly extending arm 90 of the bell-crank lever, 85, 90, has connected to it at 91 a vertically depending bar 92 the cylindrical lower end of which is guided in a bracket 93 screwed to the bed 1. This vertical bar 92 carries a roller-stud 94 which overhangs the tail-piece 33' of the upper work-clamp lever 33 and is adapted to depress the latter and raise the clamp-foot 34 to release the work; the front end of the clamp-lever 33 being normally depressed by the usual clamp-closing spring 33*.

Fulcrumed on the stud-screw 95 at the free end of the bell-crank lever-arm 90 is the manually operated lever 96 to the free end of which is connected a pedal-chain 97. The lever 96 has an extension 98, Fig. 10, disposed under the stud 99 on a lever 100 free on the supporting rock-shaft 81 and extending under the tail or trigger 74' of the spring actuated needle-thread-cutter and -nipper closing bar 70. The lever 100 rests upon an arm 101 screwed to the upper clamp-lever 33. The lever 96 also has a downward extension 102 paralleling the bell-crank lever arm 85 for a purpose to be described. The lever 96 has a lost-motion connection with its supporting arm 90 and is capable of a limited rocking motion upon and relative to the arm 90. To this end the lever 96 is formed with arms 103 and 104, Figs. 1 and 4, extending, respectively, over and under the lever-arm 90. A spring 105 normally biases the lever 96 upon the lever-arm 90 to cause the upper extension 103 to engage the arm 90, under which condition the lower extension 104 is spaced from such arm. When the operator exerts a down-pull upon the chain 97 to raise the work-clamp for removal of the work, the first action will be to rock the lever 96 relative to the lever-arm 90, without moving the latter. This preliminary motion of the lever 96 will cause the extension 98 to lift the stud 99 and raise the lever 100 into tripping engagement with the tail 74' of the thread-cutter and -nipper release latch 74. The needle-thread will therefore be cut and nipped before the clamp-foot 34 is raised to release the work. When, in the down-motion of the lever 96, the extension 104 engages the lever-arm 90, the relative motion between the levers 96 and 90 will be arrested and the lever-arm 90 will be pulled-down to open the work-clamp through the operation of the roller-stud 94 on the tail 33' of the clamp-lever 33.

There is provided a safety device to prevent starting the machine until after the work-clamp has been closed and the needle-thread-cutter and -nipper tripping devices 98, 100 restored to initial position, Fig. 10. To this end there is fulcrumed at 106 on the bracket 93, Fig. 11, a lever 107 which is connected by a link 108 to an arm 109 integral with the stop-motion lever 10. The lever 107 has an inclined portion 107' which will strike the arm 102 in the position the latter occupies when the clamp-opening and thread-cutter operating pedal is depressed, and block the movement of the stop-motion lever 10 to its tilted or running position until pressure upon the clamp-opening pedal is relieved. The connection 107 constitutes an interlock between the starting pedal and the clamp-opening pedal, and prevents both pedals from being depressed at the same time.

A safety lock is also provided for the levers 90 and 96 to prevent possible manual operation of these parts during the brief interval between the shift of the stop-motion lever to stopping posi-

tion and the final stoppage of the main-shaft, by the up-motion of the stop-plunger 12 into the notch of the stop-cam 13. To this end there is fulcrumed on the bracket 93 at 110, a latch-lever 111 which in its dotted line position, Fig. 11, enters a lock-notch 112 in the rod 92 depending from the clamp-opening lever 90. The lever 111 has a hooked extension 113 which embraces the locking bar 114 pivotally connected at its upper end to the lever 96 and formed at its lower end with a locking shoulder 115 adapted to hook under the edge 116 of the bracket-plate 93, as shown in Fig. 10. The latch-lever 111 is formed at its forward end with an upstanding ear 117 adapted to be engaged by the lower end of a lever arm 118 fixed to the stop-motion controlled rock-shaft 81.

When the stop-motion lever 10 is tilted to running position, Fig. 12, the arm 84 is carried inwardly beyond the end of the plunger 83 and the spring 82', Fig. 4, pulls the arm 82 downwardly and rocks the shaft 81, thereby moving the arm 118 outwardly from full line to dotted line position, Fig. 11, and permitting the latch-lever 111 to be shifted by its spring 111' to dotted position in which it engages the lock-notch 112 in the rod 92 and holds the lock-shoulder 115 of the bar 114 under the edge 116 of the plate 93. Thus the levers 90 and 96 and hence the work-clamp and needle-thread cutter release mechanisms are both safely locked until the machine comes to rest with the needle at its highest point.

The bobbin-thread-cutting and -nipping mechanism is constructed substantially in accordance with the disclosure of the Allen application, Serial No. 400,763, filed Oct. 19, 1929, with the addition of a safety latch to prevent the opening of the bobbin-thread-cutter and -nipper blades by a repetition of the operation of the clamp-opening mechanism. The mechanism comprises spaced stationary cutter and nipper blades, 119, 120, respectively, between which are pivoted at 121 the movable cutter and nipper blades, 122, 123, respectively. The cutter-blade 119 has extending laterally therefrom an actuating arm 124 formed with a downturned lip 125 affording a striking face for engagement by the cutter-operating push-bars 126, 127.

As the bobbin-thread-cutter and -nipper is positioned and has a range of action slightly at one side of the needle path, it will not of itself catch the under thread. Means are therefore provided to carry the under thread into the range of action of the device. For this purpose there is pivoted at 128 on the cross-slide plate 36 a bobbin-thread-engaging arm 129 the free end of which is formed with a thread-catching hook 130 which carries the bobbin-thread laterally between the open jaws of the thread-cutting and -nipping device. The arm 129 is actuated by a link-connection 131 with the slide-bar 89 which is connected to the clamp-opening mechanism.

Slidably mounted on the under side of the cross-slide plate 36 between the guide-pins 132, 133, is the push-bar 126 previously referred to, which carries a screw 134 passing through a slot in the thread-catching arm 129. The tail 135 of the push-bar 126 is inclined to the left, Fig. 20, and is connected by a spring 136 to an arm 137 rigid with the cross-slide plate 36. The nose 128 of the push-bar 126 is inclined to the right and is adapted to engage the lip 125 of the thread-cutter arm 124 and open the thread-cutter to the position shown in Fig. 20, (which is near its fully open position), during the thread-bending move-

ment of the thread-catching arm 129. During the slight further and final movement of the arm 129, the inclined tail 135 of the push-bar 126 engages the guide-pin 132, Fig. 20, and is deflected to the right, thus swinging the push-bar 126 about the guide-pin 133 as a fulcrum and disengaging its nose 128 from the lip 125, whereupon the spring 124' quickly swings the thread-cutter and -nipper blades 122, 123, to closed position, Fig. 21.

Pivoted on the screw-connection 139, between the link 131 and the slide-bar 89, is a spring-pressed latch 140 the free end-wall 141 of which is engaged by the pin 142 on the push-bar 126, Fig. 22, after an initial actuation of the push-bar 126 and holds such push-bar away from the lip 125 so that it cannot re-engage such lip and open the thread-nipper after such nipper has caught the bobbin-thread-end, even though the work-clamp be repeatedly opened and closed in the introduction of work to the work-clamp.

At the beginning of the next sewing operation and after the initial stitches have been formed, the nipped bobbin-thread end is released by movement of the push-bar 127 from full line to dotted line position, Fig. 22, during which movement the end of the push-bar 127 engages the lip 125 and opens the thread-cutter and -nipper blades. There is a second push-bar 143, Fig. 23, secured to the push-bar 127. The push-bar 143 engages the latch 140 and shifts its end-wall 141 out of engagement with the pin 142 after the initial stitches have been formed, thus restoring the push-bar 126 to operative relation with the lip 125 of the thread-cutter and -nipper blades. The push-bars 127 and 143 are formed at the inner end of the slide-bar 144 from which depends a stud-pin 145 entering a slot 146 in one end of a lever 147 fulcrumed at 148 below the bed 1 and carrying an adjustable cam-follower nose 149 which is engaged by the bobbin-thread nipper-opening cam 150 on the feed-wheel 25 which, of course, is driven in the usual manner and makes one-complete revolution per buttonhole-producing cycle.

The throat-plate-shifting slide-bar 48 is provided with an extension 151 which is formed with a shoulder 152 engaged by the spring-pressed catch 153, Fig. 22, when the throat-plate 39 is shifted to regular sewing position after the first descent of the needle. This catch 153 locks the throat-plate in sewing position. At the end of a sewing operation, the manual operation of the clamp-opening mechanism causes the arm 154 which is rigid with the bobbin-thread-bender arm 129 to swing from the position shown in Fig. 22 to that shown in Fig. 21, during which movement the screw-pin 155 on the arm 154 engages the cam-shaped tail 156 of the latch 153 and swings such latch to release it from the shoulder 152, following which the end of the arm 154 engages the end of the slide-bar extension 151 and shifts the latter rearwardly to the position shown in Fig. 21, thus returning the throat-plate 39 to first-stitch-receiving position.

Operation

The cycle of operations is as follows: The machine being at rest, the work-clamp and needle-thread cutter operating levers are unlocked by the arm 111, as shown in Fig. 4 and in full lines in Fig. 11. The needle-thread end is held by the needle-thread-end nipper 67 above the work. The bobbin-thread end is held by the nipper-blades 120, 123, as shown in Fig. 13. The movable throat-plate is in its rearward position with its

first-stitch aperture 43 in register with the needle 6.

After placing work in the work-clamp, the operator pulls down on the starting rod 18 to tilt the stop-motion lever 10 to running position, Fig. 12. This motion causes the catch 64 to engage and swing the bell-crank latch-lever 60, 61 to release the plunger 57 which enters the cam-groove 58 in the barrel-cam 59 on the main-shaft and receives one back and forth movement. The first part 58' of the cam-groove is a dwell producing portion which gives the needle time to make its first descent and present its loop to the shuttle 28. As soon as the needle rises out of the work, the inclined part 58'' of the cam 58 starts to move the plunger 57 and its carrier lever 54 to open the upper thread-nipper and release the needle-thread-end, at the same time shifting the throat-plate 39 from first-stitch position to regular sewing position. The shuttle 28, in its continued movement, pulls down the released needle-thread-end and the usual take-up (not shown) draws this end to a final position between the spring plate insert 45 and the under surface of the work, Fig. 19. The latch 153 locks the throat-plate shifting bar 48, 151 in its forward position.

After three or four stitches have been sewn, the cam 150 on the feed-wheel 25 actuates the slide-bar 144 to release the bobbin-thread from the bobbin-thread-nipper and reset the bobbin-thread-cutter and -nipper operating push-bar 126.

At the end of the sewing operation, the final rise of the stop-motion plunger 12 into the notch of the stop-cam 13, rocks the shaft 81 which functions only to release the needle-thread tension (not shown) and to shift the clamp-lock 111 to full line position, Fig. 11, to unlock the work-clamp and needle-thread-cutter release mechanism.

The operator now exerts a down pull on the lever 96. The first motion rocks the lever 96 upon and relative to the lever 90 to release the needle-thread-cutter and -nipper by tripping the latch 74. A further movement shifts the latch 153 to release the needle-throat shifting bar 151. A still further movement causes the arm 154 to engage and return the bar 151 to its rearward position and at the same time the under-thread-cutting and -nipping mechanism is actuated. In the operation of the under-thread-cutting and -nipping mechanism, the pull exerted on the bobbin-thread by the thread-catching hook 130, draws down the severed end of needle-thread, just before the bobbin-thread is severed. The inclined tail 135 of the bobbin-thread-cutter actuator-bar 126 causes such bar to swing sufficiently to permit the end wall 141 of the safety latch 140 to drop into position, Fig. 21, to prevent reopening of the under-thread-nipper by repeated operations of the clamp-lifter. During the down-motion of the clamp-lifter lever 90, the roller-stud 94 depresses the tail 33' of the work-clamp lever 33 and raises the clamp-foot 34 to release the work.

Having thus set forth the nature of the invention, what I claim herein is:—

1. The combination with a reciprocating needle and work-feeding means, of means below the work for drawing down the beginning end of the needle-thread, and means for pinching said end against the under surface of the work.

2. The combination with a reciprocating needle, work-feeding means, and a needle-thread-cutter and -nipper above the work, of means

for opening said cutter and nipper in the initial reciprocation of the needle, means for drawing down the released beginning needle-thread-end, and means for pinching said end against the under surface of the work.

3. The combination with a reciprocating needle and work-feeding means, of thread-end holding means in engagement with the under surface of the work and movable across the path of the initial descent of the needle after the needle has risen.

4. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle and complementary loop-taking means, of means operating before the second descent of the needle to hold the beginning end of the needle-thread against the under surface of the work.

5. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, complementary loop-taking means, and a throat-plate, of means for moving said throat-plate relative to the work after the initial descent of the needle, to hold the beginning end of the needle-thread against the under surface of the work.

6. In a machine adapted to sew a group of stitches and then come to rest, the combination with a reciprocating needle, complementary loop-taking means, a stop-motion device, means movable relative to and in contact with the under surface of the work, following the initial descent of the needle and the drawing down of the beginning end of the needle-thread, to hold such thread-end against the under surface of the work during the formation of a succeeding stitch.

7. In a sewing machine, a reciprocating needle, a work-holder, a stop-motion mechanism, a needle-thread cutting and -nipping device disposed above the work, means for closing said device at the end of a sewing period, means for opening said device during the initial reciprocation of the needle in the next sewing period, means below the work for drawing down the beginning needle-thread-end after it is released by said device, and means operative before the second descent of the needle to hold such end against the under surface of the work.

8. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, a work-holder, means for relatively moving the stitch-forming mechanism and work-holder to sew a group of stitches, a stop-motion device for arresting the machine at the end of a sewing period, and means operating before the second descent of the needle to hold the beginning end of the needle-thread against the under side of the work.

9. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, of a throat-plate having a plurality of needle apertures, and means for moving said throat-plate relative to the work after the initial descent of the needle through one of said apertures to register another of said apertures with the needle-path.

10. The combination with a reciprocating needle, of a throat-plate having a plurality of openings for passage of said needle, and means for relatively moving said throat-plate and the work in a direction parallel to a line connecting said openings;

11. In a sewing machine, a needle-throat member having a plurality of needle openings and a spring insert between said openings for yield-

ingly holding the beginning needle-thread-end against the under surface of the work.

12. A sewing machine having a reciprocating needle, and a throat-plate having an element movable across the path of the needle and relative to the work after the initial descent of the needle, to pinch the needle-thread against the under surface of the work.

13. In a sewing machine, the combination with a reciprocating needle, of a throat-plate having a plurality of entirely separate and distinct openings for receiving said needle.

14. In a sewing machine, the combination with a reciprocating needle, a loop-taker, a stop-motion device, and a needle-thread-cutter and nipper, of a cam and follower device and connections movable during the initial reciprocation of the needle to first open said cutter and nipper and subsequently hold the beginning end of the needle-thread against the under surface of the work.

15. In a buttonhole sewing machine, stitch-forming mechanism including a reciprocating needle, a work-clamp, means for relatively moving the stitch-forming mechanism and work-clamp to sew around a buttonhole, a needle-throat-member having a plurality of needle-clearance apertures one of which is in register with the needle-path when the machine is started, means operated by a moving part of the machine for shifting said needle-throat-member after the initial descent of the needle to register the other needle-clearance aperture with the needle-path, manually operated bobbin-thread-cutting and -nipping mechanism, and means operated by said mechanism for restoring the needle-throat member to initial position.

16. In a buttonhole sewing machine, a bed, a cross-slide plate mounted on said bed, a longitudinal slide-plate mounted on said cross-slide plate and formed with a slot, and a needle-throat plate mounted in said slot and movable relative to said cross and longitudinal slide-plates.

17. In a sewing machine, a reciprocating needle, a loop-taker, a bobbin, a work-holder, a stop-motion device, manually operated means for opening the work-holder to release the work, a bobbin-thread-cutter and nipper, an actuator for said cutter and nipper connected to be operated by said manually operated work-holder opening means, and means for preventing re-engagement of said cutter and nipper by said actuator after an initial actuation of said cutter and nipper.

18. In a sewing machine, a reciprocating needle, a loop-taker, a bobbin, a work-holder, a stop-motion device, manually operated means for opening the work-holder to release the work, a bobbin-thread-cutter and nipper, an actuator for said cutter and nipper connected to be operated by said manually operated work-holder opening means, a latch for preventing re-engagement of said cutter and nipper by said actuator after an initial actuation of said cutter and nipper, and means actuated by a moving part of the machine for tripping said latch in the ensuing sewing operation to re-establish operative relation of said actuator to said cutter and nipper.

19. In a sewing machine, a frame including a bed and a gooseneck rising therefrom, stitch-forming mechanism including a needle, a work-clamp, means for relatively moving the stitch-forming mechanism and work-clamp to sew a group of stitches, a main-shaft journaled in said gooseneck, a stop-motion device for controlling

the period of operation of said main-shaft, a needle-thread cutter, a stop-motion-controlled rock-shaft mounted upon and exteriorly of said gooseneck in parallelism with said main-shaft, a clamp-opening lever fulcrumed at one end upon and movable relative to said rock-shaft, a manually-operated lever fulcrumed on the free end of the clamp-opening lever and having an inwardly and downwardly extending arm for operating the needle-thread cutter, and a lost-motion connection between said levers, whereby the needle-thread cutter will be operated before the clamp-opening lever is moved.

20. In a sewing machine, a frame including a bed and a gooseneck rising therefrom, stitch-forming mechanism including a needle, a work-clamp, means for relatively moving the stitch-forming mechanism and work-clamp to sew a group of stitches, a main-shaft journaled in said gooseneck, a stop-motion device for controlling the period of operation of said main-shaft, a needle-thread cutter, a stop-motion-controlled rock-shaft mounted upon and exteriorly of said gooseneck in parallelism with said main-shaft, a clamp-opening lever fulcrumed at one end upon and movable relative to said rock-shaft, a manually-operated lever fulcrumed on the free end of the clamp-opening lever and having an inwardly and downwardly extending arm for operating the needle-thread cutter, a lost-motion connection between said levers, whereby the needle-thread cutter will be operated before the clamp-opening lever is moved, means for locking said manually-operated lever and said clamp-opening lever while the machine is sewing, and means connected to said rock-shaft for unlocking said levers when the machine comes to rest.

21. In a buttonhole sewing machine, a bed, a cross-slide-plate mounted on said bed, a longitudinally slotted longitudinal slide-plate mounted on said cross-slide-plate, a reciprocatory needle, a throat-plate carried by said cross-slide-plate within the slot in said longitudinal slide-plate, a clamp-foot, and means for shifting said throat-plate relative to said cross-slide-plate.

22. In a sewing machine, the combination with a reciprocatory and laterally vibratory needle, and a loop-taker, of a throat-plate for supporting the work against the penetrative thrusts of the needle, and means for moving said throat-plate transversely of the plane of vibration of said needle.

23. In a buttonhole sewing machine, a throat-plate having a needle-receiving aperture and a knife-receiving slot, and means for moving said throat-plate in a direction lengthwise of said knife-receiving slot.

24. In a sewing machine, in combination, a reciprocatory needle, a loop-taker, a throat-plate intermediate said needle and loop-taker, a stop-motion device and automatic means for moving said throat-plate after the first penetrative thrust of the needle in the formation of the initial stitches, said means remaining stationary during the remainder of the sewing period.

25. In a sewing machine, the combination with stitch-forming mechanism including a reciprocatory needle, a throat-plate, and an upper work-clamp foot, of means for drawing down the beginning end of the needle-thread and means for nipping the drawn down end of the needle-thread between the throat-plate and work-clamp foot.

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