

July 29, 1941.

E. P. SPAINE ET AL

2,250,973

THREAD-CUTTING MECHANISM FOR SEWING MACHINES

Filed Dec. 15, 1938

5 Sheets-Sheet 1

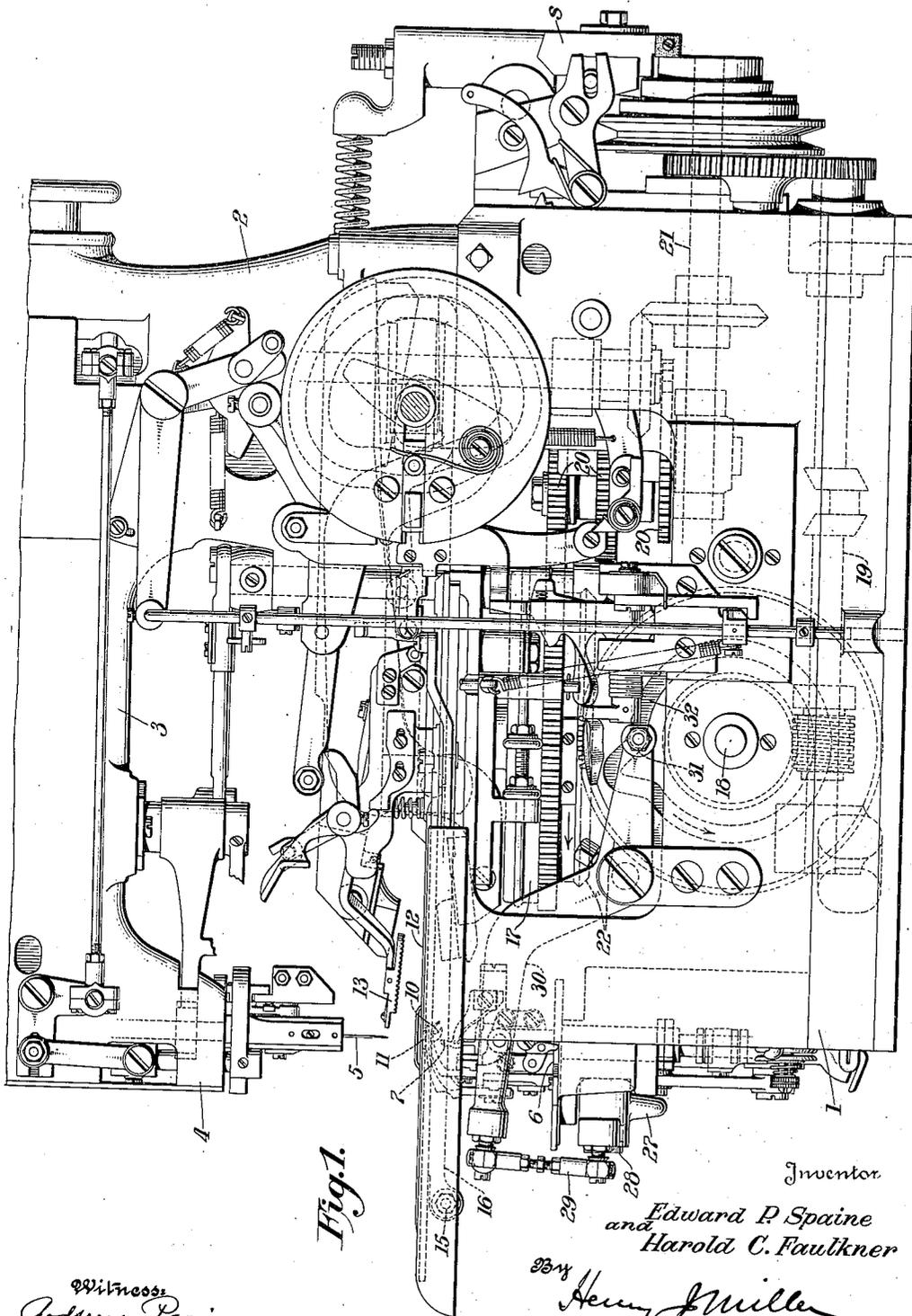


Fig. 1.

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334  
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5 Sheets-Sheet 2

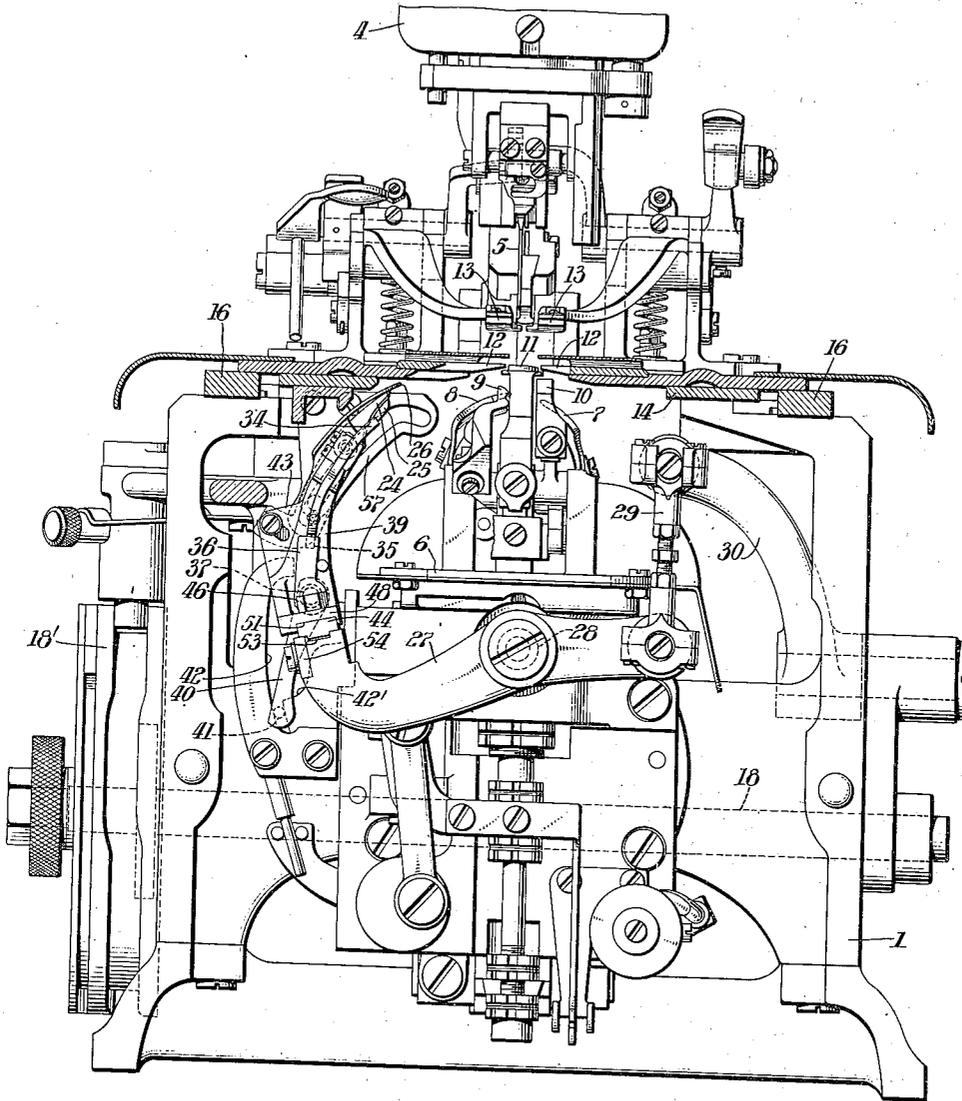


Fig. 2.

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5 Sheets-Sheet 3

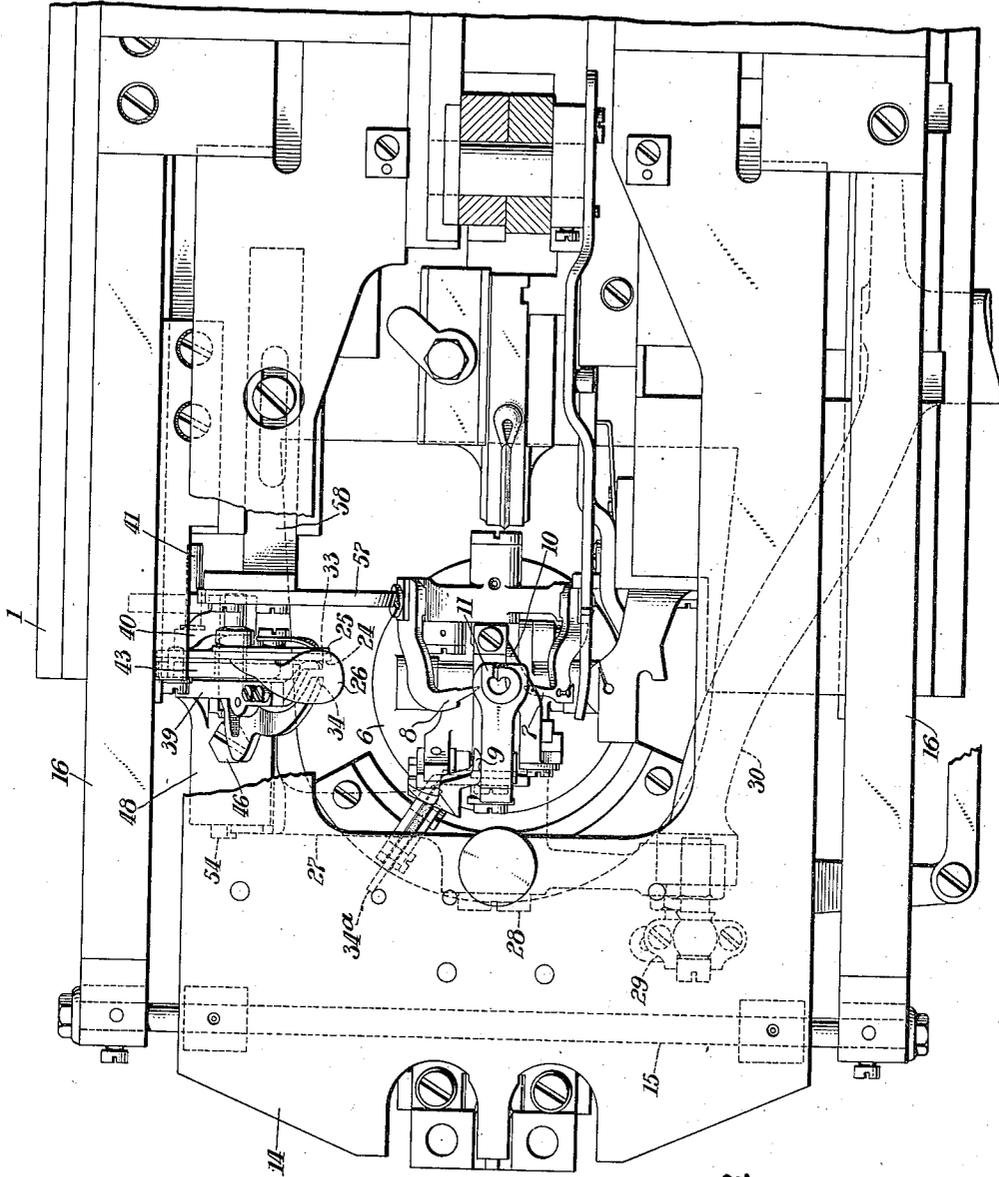


Fig. 3.

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5 Sheets-Sheet 4

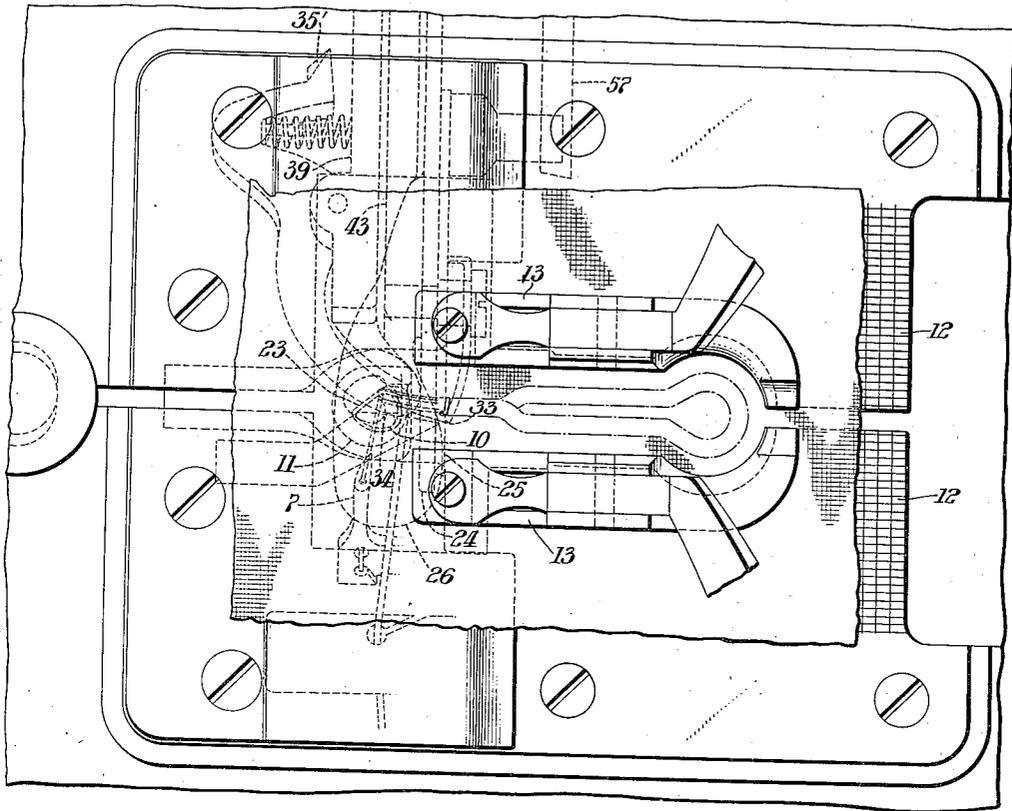


Fig. 1.

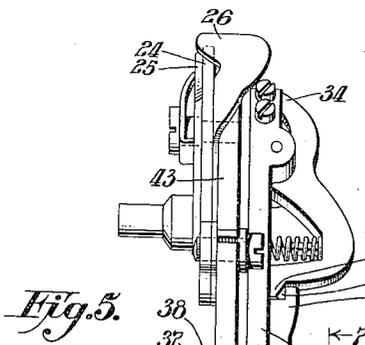


Fig. 5.

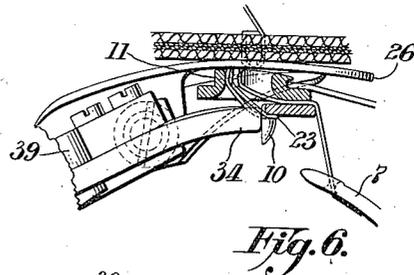


Fig. 6.

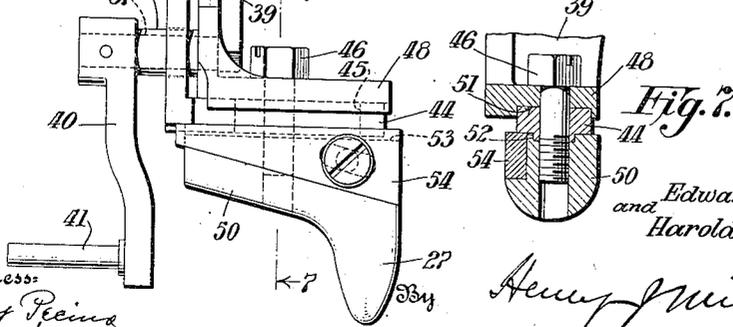


Fig. 7.

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5 Sheets—Sheet 5

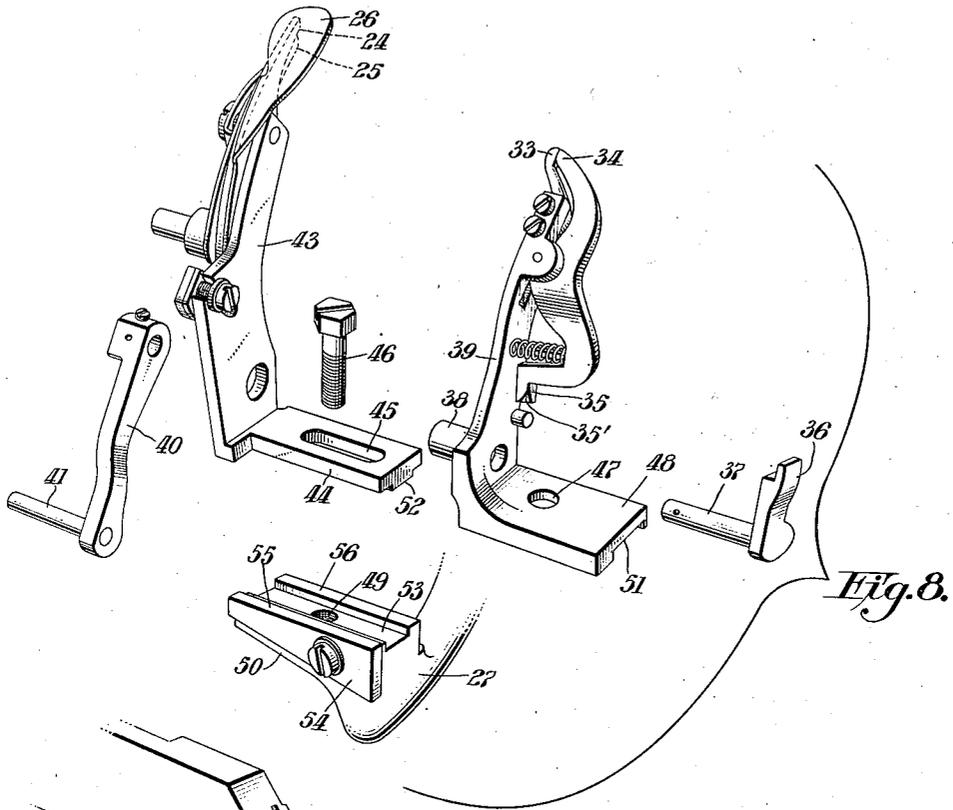


Fig. 8.

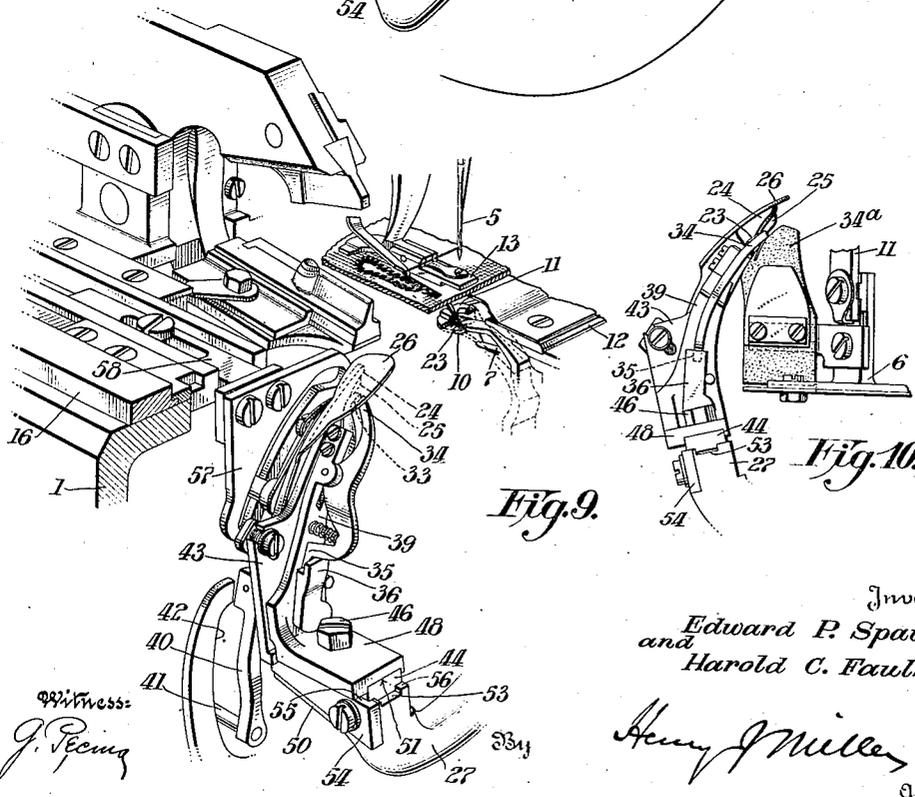


Fig. 9.

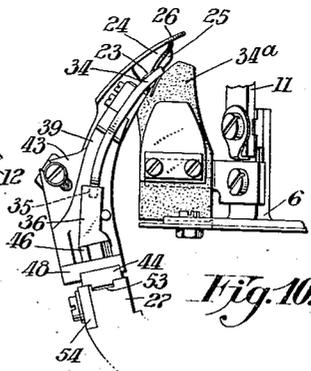


Fig. 10.

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# UNITED STATES PATENT OFFICE

2,250,973

## THREAD-CUTTING MECHANISM FOR SEWING MACHINES

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Application December 15, 1938, Serial No. 245,908

9 Claims. (Cl. 112-252)

This invention relates to sewing machines, more particularly of the buttonhole sewing type having stitch-forming mechanism and work-holding means which are relatively movable to bring the work and sewing instrumentalities into and out of sewing relation and in which said relative movement out of sewing relation draws out a length of thread from the needle-throat member of the stitch-forming mechanism. In these machines it is customary to provide a stop-motion device to control the period of operation of the stitch-forming mechanism and the stitch-forming mechanism is brought to rest in a definite position with the needle out of the work and with a loop of needle-thread retained by one of the under thread-looping devices.

In these machines the work is held in a work-clamp which, at the beginning of a buttonhole producing cycle, occupies a position spaced from sewing position and known as buttonhole cutting position. After the work is presented to the clamp a rapid-feed relative movement is effected between the work-clamp and stitch-forming mechanism in a direction lengthwise of the machine bed to bring the work and stitch-forming devices into sewing relation. The automatic stop-motion device is then shifted to start the stitch-forming mechanism and the rapid-feed is thrown out. The stitching feed, which runs with the stitch-forming mechanism, continues the relative travelling movement at a slower rate as the sewing proceeds down the first side, around the eye-end, and back along the return side of the buttonhole. When the sewing reaches a point on the return side of the buttonhole even with the first stitch the stitch-forming mechanism is stopped by the action of the stop-motion device and the rapid-feed is reconnected to rapidly feed the work-clamp and stitch-forming mechanism relatively to starting position. The total longitudinal travel of the work-clamp, in a travelling work-clamp machine, or of the stitch-frame in a travelling stitch-frame machine, is fixed for all lengths of buttonholes. If the machine is set up or adjusted to make a short buttonhole, the rapid-feed longitudinal travel is longer and the stitching-feed longitudinal travel is shorter and vice versa. It will be understood from the foregoing exposition that, when the machine finally comes to rest, the position of the waste needle-thread loop retained by one of the under thread-looping devices is fixed and invariable for all lengths of buttonholes. The position of the last stitch in the work, close to which the thread-lengths drawn out from the needle-

throat member are to be cut, is variable and depends upon the particular length of buttonhole which the machine is set up or adjusted to produce.

Such machines have been provided with a thread-cutter and a thread-gripper movable transversely of the direction of length of the buttonhole, after the thread-lengths have been drawn out from the needle-throat member, to sever the thread-lengths close to the last stitch and to seize for removal the waste-loop of needle-thread retained by the under thread-looping device.

When the machine is changed to sew a buttonhole of a different length, the position of the last stitch, at the time the drawn out threads are to be cut, is altered, but the position of the waste-loop retained by the under-thread looping device is fixed for all lengths of buttonholes.

The present invention has for an object to provide a sewing machine of the type in question with thread-trimming means which may be easily and simply adjusted without disturbance of the fixed longitudinal position of the waste-loop removing means so that both means may perform their functions in harmony with the other mechanisms of the machine when sewing buttonholes of any length within the range which the machine may be set up or adjusted to produce.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the accompanying drawings, Fig. 1 is a right side elevation of a buttonhole sewing machine embodying the invention. Fig. 2 is a front end elevation of the machine bed, with the lower work-clamp plates in section. Fig. 3 is a plan view of the machine bed, with the work-clamps removed. Fig. 4 is a plan view of portions of the work-clamp surrounding the field of sewing operations. Fig. 5 is a left side elevation of the thread-trimmer and waste-loop gripper. Fig. 6 is a vertical section through the needle-throat member taken transversely of the length of the buttonhole at the time of the cutting of the drawn out thread-lengths and the gripping of the waste needle thread loop. Fig. 7 is a section on the line 7-7, Fig. 5. Fig. 8 is a disassembled perspective view of the thread-cutter and waste-

loop gripper. Fig. 9 is a perspective view of the parts adjacent the field of operations on the work at a time immediately prior to the advance of the thread-trimmer and waste-loop gripper, and Fig. 10 is a view showing the wiper element on the turret in position to brush the waste-loop from the then open gripper.

The present machine, which embodies the invention, has a frame including the hollow rectangular bed 1, standard 2, overhanging bracket-arm 3 and a head 4 which sustains the usual end-wise reciprocatory and laterally vibratory needle 5 of the stitch-forming mechanism. The stitch-forming mechanism also includes the usual under thread-looping devices which are carried by the turret 6 so that they, as well as the needle, may be turned about a vertical axis in sewing around the eye-end of a buttonhole. The under thread looping devices include the threaded looper 7, non-threaded looper 8, and the two loop-detainers 9 and 10. The detainer 10 is the one which takes the needle-thread loop from the non-threaded looper 8 and holds it spread for entry by the needle. This stitch-forming mechanism is preferably built substantially in accordance with the disclosure of the Allen et al. U. S. Patent No. 1,372,473, of Mar. 22, 1921. This same loop detainer 10 is the one which detains the last needle loop. The turret carries the usual needle-throat member 11 through which the needle 5 reciprocates and through which the several thread-lengths leading to the last stitch in the work are drawn out by the final rapid-feed movement after the buttonhole has been stitched. This action is disclosed in the Allen U. S. Patent No. 1,579,200, of Apr. 6, 1926.

The work-clamp comprises the usual lower work-clamping plates 12, 12 and upper clamp feet 13, 13. The work-clamp is carried by the usual cross slide plate 14 which slides laterally of the machine bed 1 on the cross rod 15 of the longitudinal slide frame 16 slidable in ways longitudinally of the machine bed. The work-clamp is given its longitudinal travel and lateral components of its feeding movement by suitable lever-connections with the main feed-cam 17 mounted in the bed of the machine and driven at a rapid rate prior and subsequent to the sewing period by the cross rotary shaft 18 which receives power from the rapid-feed shaft 19 through an automatically controlled clutch (not shown). The feed-cam 17 is more slowly driven during the sewing operation by a suitable gear train 20 actuated from the main sewing shaft 21, the period of operation of which is controlled by the stop-motion device *s*, all in the manner more fully described in the Allen U. S. Patent No. 15,324, reissued Apr. 4, 1922. The total longitudinal travel of the work-clamp, determined by the feed-cam 17 is fixed for any length buttonhole. The work-clamp is carried part of this total travel by the rapid feed mechanism and over the remainder by the slower stitching feed mechanism; the length of the buttonhole depending upon the points in the cycle at which the stop-motion device *s* is thrown into and out of operation to start and stop the stitch-forming mechanism. The feed-cam 17 is geared one-to-one to the cross rotary shaft 18 by the gears 22. It is the cross shaft 18 which carries the removable and replaceable pattern wheel 13' disclosed more fully in said Allen reissued patent, which controls the stop-motion device *s*.

At the completion of a buttonhole sewing operation the stitch-forming mechanism is stopped

and a loop 23 of needle-thread is retained by the under thread-looping device or detainer 10, Fig. 9. The rapid-feed is then automatically thrown into action and the work-clamp is carried rapidly back to its initial position, spaced from sewing position. During this travel of the work-clamp, threads and cord are drawn out of the needle-throat member 11 and lie in contact with the under surface of the work, as described in said Allen U. S. Patent No. 1,579,200.

These thread-lengths are cut close to the last stitch by a scissors thread-trimmer preferably constructed substantially in accordance with the disclosure of the Spaine U. S. Patent No. 2,070,029 of Feb. 9, 1937, and including the upper scissors blade 24, under scissors blade 25, and spatulate pilot nose 26, all carried by the carrier-lever 27 fulcrumed at 28 on the machine bed-frame and connected by the link 29 to the actuating lever 30 which has a cam follower 31 riding in the cam-groove 32 in the vertical gear 22 on the cross rotary shaft 18.

Also carried by the lever 27, in close association with the scissors device, is the waste-loop remover or gripper comprising the laterally fixed jaw 33 and spring-pressed movable jaw 34 having a tail 35 which is controlled by the latch 36 on the rock-shaft 37 journaled in the bushing 38 on the gripper jaw shank 39 and having pinned to it a lever 40 having a rearwardly extending follower pin 41 which is controlled in its movements by the cam-edges 42, 42'. When the latch 36 is swung in one direction by the abruptly curved upper portion of the cam-edge 42, as the scissors and gripper are advanced to the position shown in Figs. 4 and 6, the gripper lever 34, 35 is released and immediately springs shut to grip one leg of the waste-loop 23 on the detainer 10. When the scissors are retracted, the gripper removes the waste-loop from the under thread looping devices and, near the end of the retracting movement of the scissors and gripper, the follower pin 41 is shifted by the abruptly curved lower portion of the cam-edge 42' and caused to rock the shaft 37 in a direction to swing the latch 36 toward the tail 35 of the gripper lever, which is beveled at 35', Fig. 8, so that the latch 36 may ride onto it and open the gripper jaw 34, thereby releasing the waste-loop. Mounted on the turret is a leather wiper blade 34<sup>a</sup>, Fig. 10, which stands vertically in a position to wipe the under side of the open gripper during the reverse or return rotation of the turret following a buttonhole sewing period, as shown in Fig. 10, and drag the waste-loop 23 out of the then open gripper.

In the device of the Spaine U. S. Patent No. 2,070,029, the scissors and gripper devices were mounted on opposite sides of a single shank element which, in turn, was mounted on the pivoted carrier-lever which determined their paths of motion.

According to the present improvement, the scissors and gripper devices are each carried by its own respective shank device or sub-carrier and the two shank devices or sub-carriers are mounted on the carrier-lever in such fashion that, by loosening a single screw, the scissors device may be shifted laterally on the carrier-lever to register its path of movement with a point, in the thread-length to be cut, close to the last stitch, without shifting or disturbing the path of movement of the gripper which remains fixed and invariable.

Referring to Fig. 8, the scissors blades 24,

25 and pilot nose 26 are mounted on the sub-carrier or shank 43 having the lateral foot 44 formed with an adjustment clearance slot 45 for the holding screw 46 which is passed first through the hole 47 in the lateral foot 48 of the gripper sub-carrier or shank 39 and then is screwed into the threaded hole 49 in the foot 50 of the lever 27. The scissors shank-foot 44 fits in the groove 51 in the under face of the gripper shank-foot 48 and has on its under face a rib 52 which fits in the groove 53 in the carrier-lever foot 50. The wedge-plate 54 at one side of the carrier-lever foot 50 may be adjusted longitudinally of itself to slightly vary the radius of the arcuate path of movement of the pilot nose 26. This wedge-plate is mounted in a recess in the lever foot 50 and the shank feet 44, 48 are clamped upon its upper edge 55 and the fixed edge 56 at the opposite side of the grooves 53 by the clamp screw 45. The cam-plate 57 which closes and opens the scissors is mounted on the bar 58 for adjustment longitudinally of the bed 1, to follow the position of adjustment of the scissors on the carrier-lever 27.

It will be understood that the machine may be re-set to sew a different length buttonhole by replacing the pattern wheel 13' with another pattern wheel having the stop-motion-controlling points differently positioned thereon, as contemplated within the disclosure of said Allen re-issued Patent No. 15,324.

Having thus set forth the nature of the invention what we claim herein is:

1. In a thread-cutting mechanism, a carrier-lever, a thread-gripper having a shank with a laterally extending foot secured to said carrier, lever, and a thread-cutter having a shank with a laterally extending foot paralleling the laterally extending foot of said thread-gripper and secured to said carrier-lever for adjustment thereon independently of said thread-gripper.

2. In a thread-cutting mechanism, a carrier-lever, a thread-gripper secured to said carrier-lever, and a thread-cutter having a slotted laterally extending foot, the securing means for said thread-gripper including a fastening screw which passes through the slot in the foot of said thread-cutter, thereby permitting adjustment of the latter independently of said thread-gripper.

3. In a thread-cutting mechanism, a pivoted carrier-lever, a thread-gripper mounted on said carrier-lever and having a fixed path of operation, a thread-cutter shiftably mounted on said carrier-lever independently of said thread-gripper and having a variable path of operation, and means to operate said thread-cutter in its various operative paths.

4. In a thread-cutting mechanism, a carrier-lever having a supporting foot, a thread-cutter having a shank with a slotted supporting foot mounted on the supporting foot of said carrier-lever, and a thread-gripper having a shank with

a supporting foot overlying the foot of said thread-cutter shank, and fastening means passing through the feet of said thread-gripper and thread-cutter to clamp them upon the foot of said carrier-lever.

5. In a thread-cutter for sewing machines, a thread-cutter, a sub-carrier therefor, a thread-gripper, a sub-carrier for said thread-gripper, and a main carrier on which said sub-carriers are detachably mounted and on which the thread-cutter sub-carrier is shiftable to different operative positions relative to the thread-gripper sub-carrier.

6. In a buttonhole sewing machine of the type having work-holding means and stitch-forming mechanism including a needle and under thread mechanism which retains a loop of needle-thread at the end of a button-hole sewing period, the work-holding means and stitch-forming mechanism having a relative movement at the end of a sewing period to draw out a length of thread, and in which a thread-cutter is provided to cut the length of drawn out thread, and a thread-gripper is provided to seize and remove the waste-loop of needle-thread retained by the under thread mechanism, the improvement which consists in providing separate sub-carriers for said thread-cutter and thread-gripper, and a main carrier on which the sub-carriers are mounted, so that the thread-cutter may be adjusted on the main carrier to various working positions independently of the thread-gripper, to vary the point at which the thread-length is cut without disturbing the position at which the gripper is set to seize the waste-loop of needle-thread.

7. In a thread-cutting mechanism for sewing machines, a frame, a carrier-lever having a fixed path of operative movement on and relative to said frame, a textile thread gripper mounted on said carrier-lever, and a textile thread cutter also mounted on said carrier-lever, said thread cutter being adjustable on said carrier-lever laterally of the path of movement of the latter and relatively to said thread gripper.

8. In a thread-cutting mechanism for sewing machines, a frame, a carrier mounted for operative movement on and relative to said frame, a textile thread gripper mounted on said carrier, and a textile thread cutter mounted on said carrier for adjustment independently of said thread gripper.

9. In a sewing machine, the combination with stitch-forming mechanism, of a thread cutter and a thread gripper, a movable carrier for said thread cutter and thread gripper by which they are advanced from a retracted to an operative position adjacent the stitch-forming mechanism, said thread cutter being adjustable on said carrier relative to said thread gripper.

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