

April 5, 1932.

E. B. ALLEN ET AL

1,852,634

THREAD CUTTING MECHANISMS FOR BUTTONHOLE SEWING MACHINES

Filed Feb. 27, 1930

4 Sheets-Sheet 1

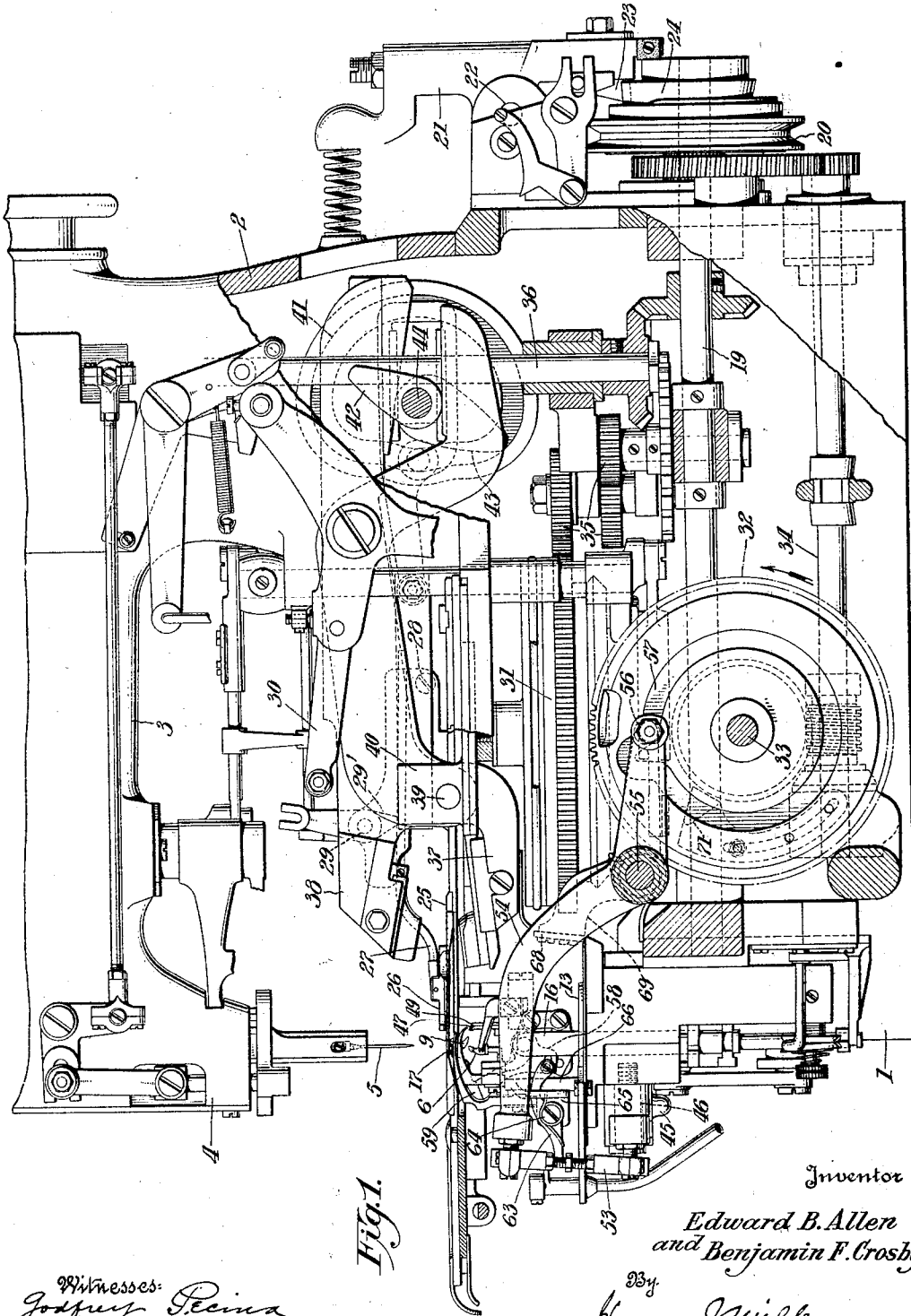


Fig. 1.

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4 Sheets-Sheet 2

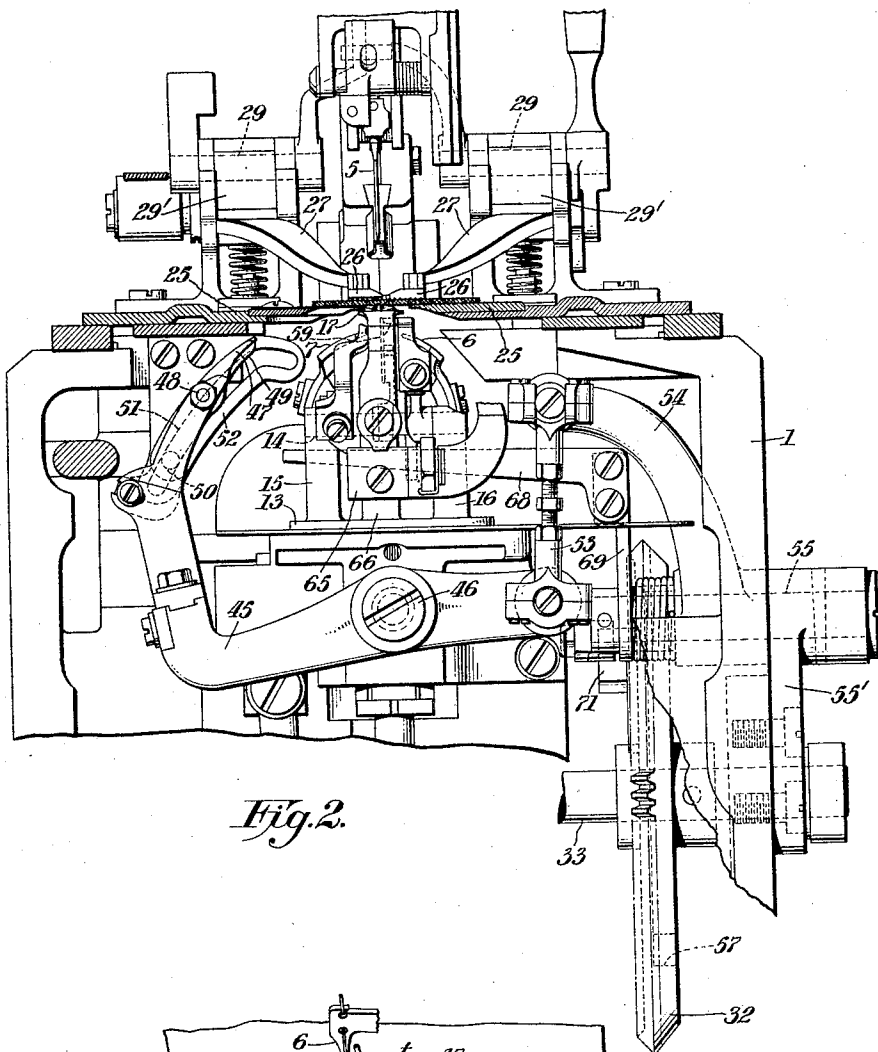


Fig. 2.

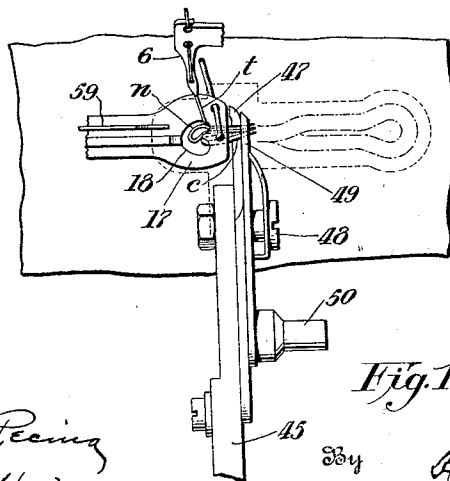


Fig. 10.

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THREAD CUTTING MECHANISMS FOR BUTTONHOLE SEWING MACHINES

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4 Sheets-Sheet 3

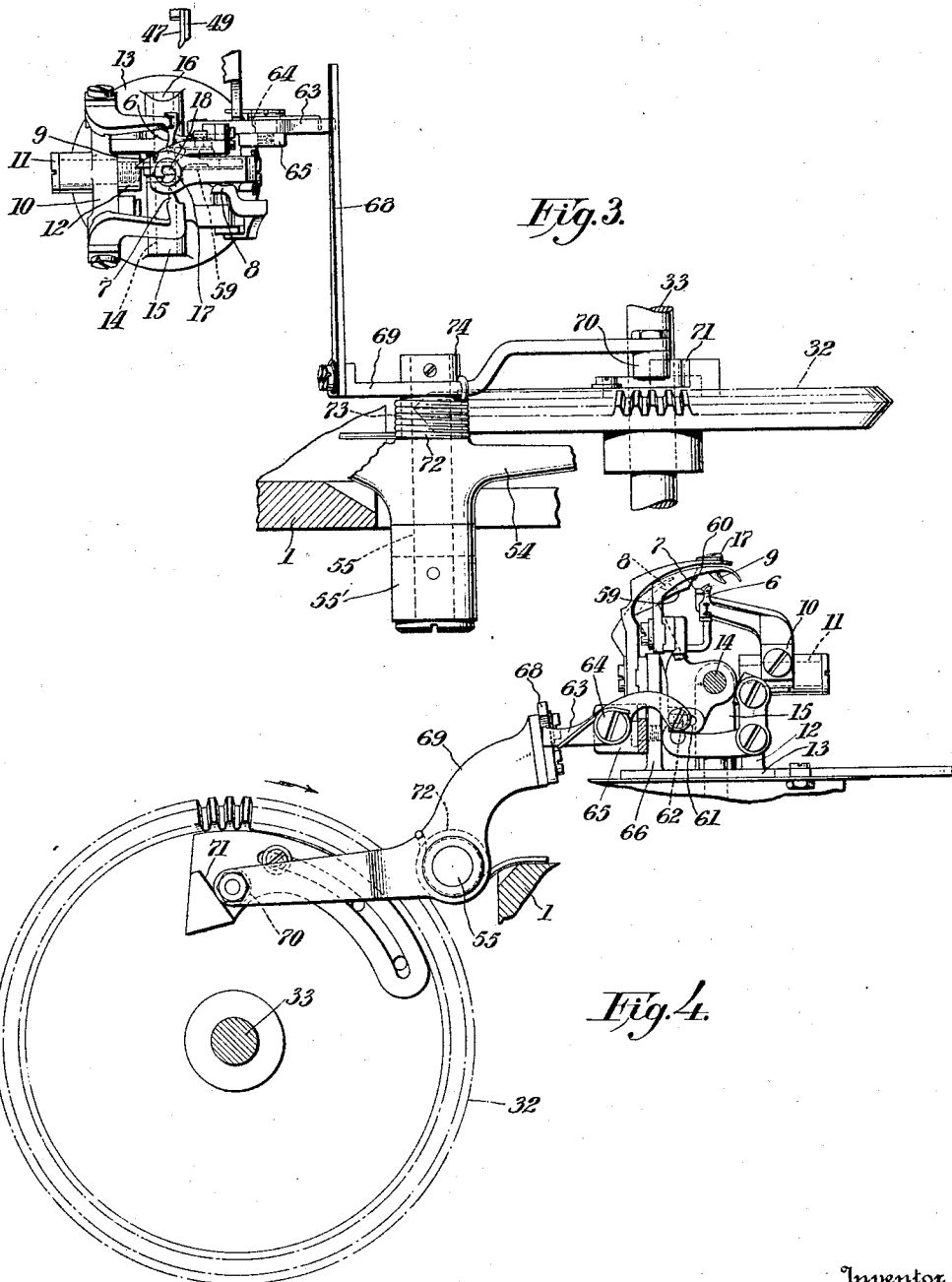


Fig. 4.

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THREAD CUTTING MECHANISMS FOR BUTTONHOLE SEWING MACHINES

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4 Sheets-Sheet 4

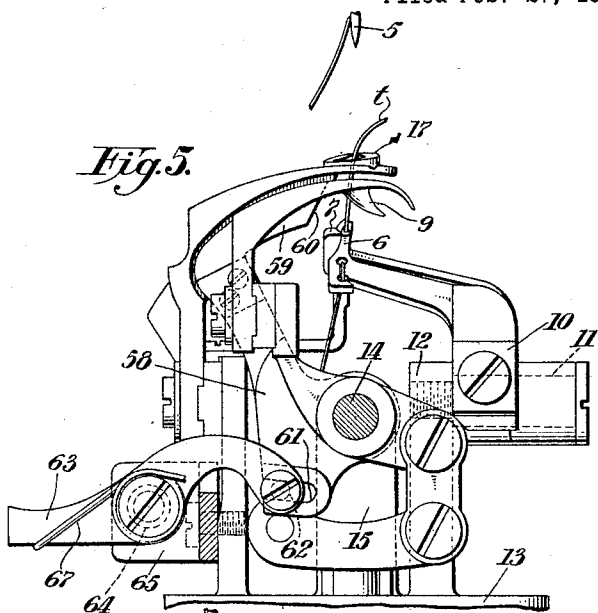


Fig. 5.

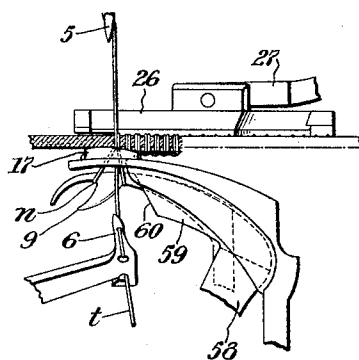


Fig. 6.

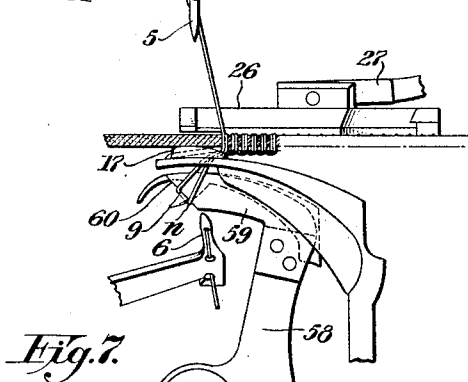


Fig. 7.

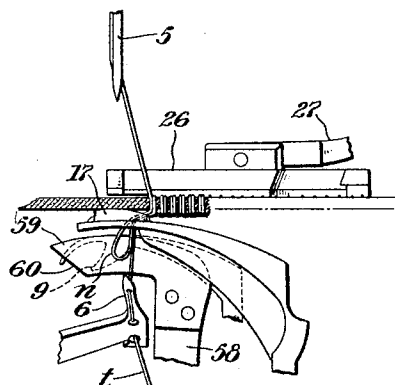


Fig. 8.

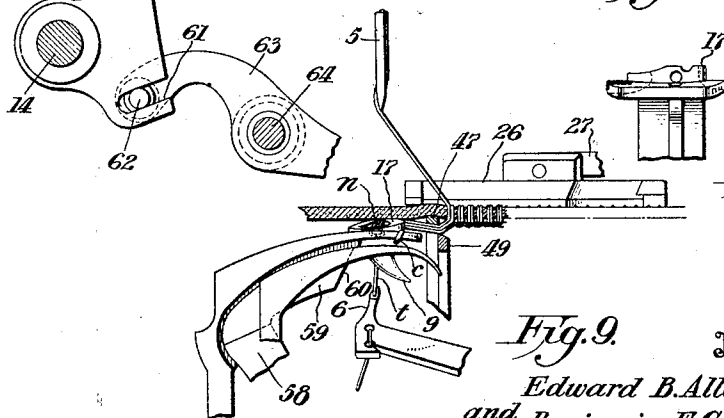


Fig. 9.

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UNITED STATES PATENT OFFICE

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THREAD-CUTTING MECHANISMS FOR BUTTONHOLE SEWING MACHINES

Application filed February 27, 1930. Serial No. 431,657.

This invention relates to thread-cutting mechanism for sewing machines, more particularly of the eyelet-end buttonhole type such as disclosed in the patent to E. B. Allen, No. 1,579,200, of April 6, 1926, and has for an object to reduce the wastage of needle-thread in the so-called waste loop of needle-thread which is severed at the underside of the work together with the under or looper thread and cord. Another object of the invention is to provide for the withdrawal of the thread of the last needle-thread loop from the range of action of the under stitch-forming devices so that such thread or loop, after being cut off, will not be "sewn in" or caught by the stitches of the next succeeding buttonhole.

In a buttonhole sewing machine of the type under consideration, the last loop of needle-thread is normally retained by the under stitch-forming devices when the stitch-forming mechanism is brought to rest. Then a relative movement is provided between the stitch-forming mechanism and the work-clamp so that the buttonhole-cutter and thread-cutter may have room to operate on the clamped work without interfering with the stitch-forming mechanism.

In the device of the Allen Patent No. 1,579,200, the final movement of the work-clamp from sewing position to cutting position draws out a length of looper-thread and cord and also elongates or draws needle-thread into the last needle-thread loop retained by the under stitch-forming devices. After this elongated needle-thread loop is severed from the work, together with the looper-thread and cord, it is withdrawn as a waste loop from the under stitch-forming mechanism by a gripper mounted on the thread-cutter.

According to the present improvement, mechanism is provided for freeing the thread of the last needle-thread loop from the under stitch-forming devices before the final relative movement of the stitch-forming mechanism and work-clamp is completed, so that such final relative movement, instead of elongating a detained last needle-thread loop, will withdraw the freed thread of the last

needle-thread loop from the under stitch-forming devices before it is severed from the work. When the work-clamp reaches its final position and the threads are cut, the waste loop will be of minimum size and will be clear of the under stitch-forming mechanism.

In the accompanying drawings, Fig. 1 is a side elevation of a buttonhole sewing machine embodying the invention. Fig. 2 is a fragmentary front end elevation of the machine. Fig. 3 is a top plan view of the rotary turret member of the stitch-forming mechanism and associated cast-off actuating mechanism. Fig. 4 is an inside elevation of the parts shown in Fig. 3. Fig. 5 is a view of the turret at the beginning of a sewing operation, as shown in Fig. 1. Fig. 6 shows the parts as brought to rest by the stop-motion device at the end of a sewing operation. Figs. 7 and 8 show the operation of the cast-off on the detained needle-loop. Fig. 9 shows the waste loop of needle-thread being cut off, together with the cord and looper thread, after having been withdraw or disengaged from the loop-detainer. Fig. 10 is a bottom view of the parts shown in Fig. 9, and Fig. 11 is a front end view of the needle-throat member or "button".

The invention is disclosed as embodied in an eyelet end buttonhole sewing machine of the type disclosed in the patent to E. B. Allen, No. 15,324, reissued April 4, 1922. Such a machine comprises a frame having a rectangular or box-like bed 1 from one end of which rises the standard 2 carrying the bracket-arm 3 terminating in the needle-bar carrying head 4. The stitch-forming mechanism is constructed substantially in accordance with the disclosure of the Allen et al. Patent No. 1,372,473, of March 22, 1921, and comprises upper thread mechanism including the reciprocating and laterally vibrating needle 5 and under thread mechanism complementary to the needle 5 and including the thread-carrying looper 6, non-threaded looper 7 and their respective loop-detainers 8, 9 which may also properly be regarded as non-threaded loopers or thread-looping implements.

The loopers 6 and 7 are fixed to a carrier 10 which is fulcrumed to rock on the stud-screw 11 carried by the post 12 rising from the rotary turret 13. The loopers or loop-detainers 8, 9 are independently journaled on the horizontal bearing pin 14 supported at its opposite ends in the posts 15, 16, rising from the turret 13. The turret also carries the usual needle-throat member or button 17 having the needle-clearance aperture 18, Figs. 3 and 10, and the usual guiding apertures for the cord *c*.

The turret 13 and needle 5 are mounted as usual to rotate about a vertical axis. As the mechanism for so rotating the needle and turret is well known and described in the patents referred to, it will not be herein specifically pointed out.

The stitch-forming mechanism is operated as usual from the main sewing shaft 19 at the rear end of which is the usual belt-pulley 20 and stop-motion device which is constructed substantially in accordance with the disclosure of said Allen reissued patent and includes the tilting stop-motion lever 21 which is pivoted at 22 to a bracket on the bed 1 and carries the stopping tooth 23 adapted for cooperation in a well known manner with the stopping cam 24 to arrest the stitch-forming instrumentalities at the end of a buttonhole sewing operation with the needle 5 out of the work and with a loop of needle-thread on the looper or loop-detainer 9, as shown in Fig. 6.

The work to be stitched is held in the usual work-clamp comprising the lower clamp-plates 25 and upper clamp-feet 26 carried by the clamp-arms 27 pivoted at 28 on the lower clamp-plates 25 and depressed to closed position by the cams 29' on the connected rock-shaft sections 29 which are automatically actuated by the clamp-closing lever 30, as disclosed in said Allen reissued patent, to clamp the work at the beginning of a buttonhole producing cycle.

The work-clamp is mounted to move over the bed 1 and, at the beginning of a buttonhole producing cycle, when the clamp is first closed, it occupies a position spaced rearwardly from the sewing point and known as "initial" or "buttonhole-cutting" or "thread-cutting" position. The work-clamp is first moved rapidly forwardly to carry the work from cutting to sewing position, whereupon the stitch-forming mechanism is started and the work-clamp is more slowly moved to place the stitches around the buttonhole. At the end of the sewing operation the stitch-forming mechanism is stopped in the position shown in Fig. 6 and the still closed work-clamp is rapidly moved rearwardly to its initial position. The movements of the work-clamp are derived as usual from the feed-wheel 31 which is rapidly driven prior and subsequent to sewing by a gear-wheel 32

on the cross-shaft 33 actuated through a suitable clutch-connection (not shown) by the constantly running rapid-feed shaft 34 geared to the belt-pulley 20. The feed-wheel 31 is more slowly driven during the sewing by the usual gear-connections 35 with the vertical shaft 36 which is driven by the main sewing shaft 19.

The machine is provided with the usual button-hole-cutting mechanism including the cutter levers 37, 38 fulcrumed at 39 on the travelling fulcrum-block 40 and actuated by the cutter-advancing and retracting cam 41 and cutter-closing cams 42, 43 on the usual cutter-shaft 44, which in the present instance is connected to be operated subsequent to the sewing operation, substantially in accordance with the disclosure of said Allen reissued patent; the buttonhole-cutter levers being advanced to cut the buttonhole after the closed work-clamp is returned to its initial position subsequent to the sewing operation.

The machine is equipped with thread and cord cutting mechanism constructed substantially in accordance with the disclosure of the Allen Patent No. 1,600,206, except that the present machine has no means for cutting the needle thread above the work but depends upon other means, to be described, to free the last or retained needle-loop from the under thread mechanism or loopers. The thread-cutting mechanism comprises the arm 45 pivoted on the stationary stud-screw 46 and rigidly carrying the upper blade 47 of a scissors device to which is pivoted at 48 the under blade 49 having a tail 50 entering the cam-groove 51 in the stationary cam-plate 52 which is so shaped as to drop or open the lower blade 49 as the scissors device advances, so that the upper blade 47 may enter between and separate the bunch of threads to be cut from the work, and then raise or close the lower blade 49 to sever the threads. The plane of action of the present thread-cutter is such that the threads and cord will be severed close to the last stitch when the work-clamp is in its initial or buttonhole-cutting position. The arm 45 is connected by the link 53 to the front end of the lever 54 which is fulcrumed to rock on the stationary stud-pin 55 fixed to the frame-bracket 55', Fig. 2, and has a follower roll 56 entering the thread-cutter actuating cam-groove 57 in the outer face of the gear 32 which connects the shaft 33 in one-to-one relation with the feed-wheel 31; the construction being disclosed in said Allen Patent No. 1,600,206.

The present machine, as far as described, is therefore a "cut-after" automatic eyelet-end buttonhole sewing machine having (1) stitch-forming mechanism such as disclosed in the Allen et al. Patent No. 1,372,473; (2) a work-clamp, clamp-closing and -opening mechanism, buttonhole cutting mechanism, stop-motion mechanism, rapid feed and

stitching-feed mechanism, such as disclosed in the Allen reissued Patent No. 15,324; (3) thread-cutting mechanism including the scissors device of the Allen Patent No. 1,579,200, without the waste needle loop gripper, and with the scissors actuating mechanism of the Allen Patent No. 1,600,206.

According to the present improvement, means are provided for freeing the detainer of the last needle loop from the thread of such loop before the rapid relative movement of the stitch-forming mechanism and work-clamp subsequent to sewing is completed, whereby such relative movement withdraws the thread of such loop from the under thread mechanism through the needle-hole in the needle-throat member before the threads and cord are severed by the scissors device. When the threads are subsequently severed, the thread of the last needle-loop which has already been withdrawn from the stitch-forming mechanism is cut off and drops away as waste.

Mounted on the bearing-shaft 14 is a carrier 58 to which is fixed a loop-shedder or cast-off blade 59 having at its free end an inclined loop-engaging edge 60. The blade 59 is made thin and is disposed to work in a path closely adjacent the path of movement of the loop-detainer 9 and at that side of the detainer 9 from which the detained needle-loop extends upwardly through the needle-throat member 17. The carrier 58 is formed with a slot 61 which is entered by a pin 62 on a lever 63 fulcrumed on the stud-screw 64 carried by a bracket 65 fixed to the needle-throat supporting post 66, Fig. 2, on the turret 13. A recovery spring 67 acts upon the lever 63 to yieldingly retain the cast-off 59 in retracted position.

When the stitch-forming mechanism is started, the turret 13 is in the position shown in Figs. 1 and 5, and the lever 63 extends forwardly or toward the left, which is the position of the turret when sewing down the first side of the buttonhole. In sewing around the end of the buttonhole the turret is turned 180° or into the position shown in Figs. 3, 4 and 6, which is the position of the turret when sewing down the return or second side of the buttonhole. When the sewing operation is completed and the stop-motion device 21 acts to stop the stitch-forming mechanism, the turret remains in the same position shown in Figs. 3, 4 and 6 and the last needle thread loop *n*, Fig. 6 is detained by the under thread looping implement or detainer 9.

In this position of the turret 13, the lever 63 is positioned under the laterally extending arm 68 of a lever 69 fulcrumed to rock on the stationary stud-pin 55 and having a follower roll 70 which is in position to be struck and upwardly deflected by a cam-member 1 screwed to the inner face of the gear-wheel 32. The extension 68 of the lever 69, in its

down motion, engages and rocks the lever 63 thereby projecting the cast-off member 59 forwardly, whereupon its inclined front end 60 engages the needle-loop *n*, Fig. 7, and slides it off of the detainer-horn 9, so that said loop *n* is freed from the under thread looping mechanism, as shown in Fig. 8. The lever 69 is provided with a recovery spring 72 which is coiled about its hub 73, Fig. 3. The collar 74 retains the independently movable levers 69 and 54 on the supporting pin 55.

During the return of the work-clamp from sewing position to initial or buttonhole cutting position, the loop *n* is drawn upwardly through the needle clearance aperture 18 in the needle-throat member 17 but is still preferably pinched between the under side of the work and the top-face of the needle-throat member, about as shown in Fig. 9, so that the thread of the loop *n* will be held in a bunch with the looper-thread *t* and cords *c*, Fig. 10, for severance by the thread-cutter 47, 49, operating in the usual manner.

The invention is not to be understood as limited to the use of a cast-off 59 but consists of means, broadly, for freeing the thread of the last needle-thread loop from the looper or loop-detainer before the final relative movement of the stitch-forming mechanism and work-clamp is completed, in combination with other means for cutting off the bunch of needle- and looper-threads and cord below the work and close to the last stitch.

Nor is the invention limited to a "cut-after" buttonhole sewing machine; the order of cutting and stitching being immaterial to the invention.

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

1. A buttonhole sewing machine having, in combination, stitch-forming mechanism including upper thread mechanism and under thread mechanism, a turret carrying said under thread mechanism, a stop-motion for controlling the period of operation of the stitch-forming mechanism, said under thread mechanism operating to detain a loop of needle thread below the work when the stitch-forming mechanism is brought to rest, a work-clamp, clamp-closing means, means for relatively moving the stitch-forming mechanism and closed work-clamp subsequent to the stitching period, thereby drawing out a length of under thread, means mounted on said turret for freeing the thread of the detained needle loop from the under thread mechanism before the relative movement of the stitch-forming mechanism and work-clamp subsequent to the stitching period is completed, and means for severing the under thread and the freed thread of the needle loop below the work and close to the last stitch.

2. In a buttonhole sewing machine, the combination with stitch-forming mechanism

having a predetermined period of action and operating when brought to rest to detain a loop of needle-thread below the work, a work-clamp, clamp-closing means, and means for relatively moving the stitch-forming mechanism and closed work-clamp after the sewing operation is completed, thereby drawing out a length of under thread, of a non-cutting cast-off device for disengaging said loop of needle-thread from the stitch-forming mechanism below the work before the relative movement of the stitch-forming mechanism and work-clamp subsequent to the sewing operation is completed, and means below the work for severing the needle and under threads close to the last stitch.

3. In a buttonhole sewing machine, the combination with stitch-forming mechanism having a predetermined period of action and operating when brought to rest to detain a loop of needle-thread below the work, a work-clamp, clamp-closing means, and means for relatively moving the stitch-forming mechanism and closed work-clamp after the sewing operation is completed, thereby drawing out a length of under thread, a needle-loop cast-off device inactive during the sewing, means for actuating said cast-off device after the stitch-forming mechanism has come to rest and before the ensuing relative movement between the stitch-forming mechanism and work-clamp is completed, and means below the work for severing the under thread and cast-off loop of needle thread close to the last stitch.

4. In a buttonhole sewing machine, in combination, stitch-forming mechanism including a needle, a rotary turret, a needle-throat member, threaded and non-threaded loopers carried by said turret, a stop-motion device for controlling the period of operation of the stitch-forming mechanism, one of said loopers operating to detain a loop of needle-thread when the stitch-forming mechanism is brought to rest, means mounted on said turret for sliding said detained loop off of said one of said loopers, said means being inoperative during the period of operation of the stitch-forming mechanism.

5. In a sewing machine, in combination, stitch-forming mechanism, a stop-motion device therefor, said stitch-forming mechanism including a reciprocating needle and complementary loop-taker, said loop-taker detaining a loop of needle thread when brought to rest by the stop-motion device, and cast-off means inoperative during the sewing for sliding said detained loop off of the beak of the loop-taker while the latter is held stationary.

6. In a buttonhole sewing machine, stitch-forming mechanism including a needle, a rotary turret, and thread-looping devices carried by said turret, a loop-engaging member on said turret but having no operative con-

nection with the stitch-forming mechanism, an actuator mounted on said turret and connected to said loop-engaging member, said actuator including an arm extending outwardly from said turret, and a cam-operated lever overhanging and adapted to engage and depress the outer end of said arm to actuate said loop-engaging member when the stitch-forming mechanism is stationary.

7. In a buttonhole sewing machine, stitch-forming devices including upper thread mechanism and under thread mechanism, a stop-motion device for controlling the period of operation of the stitch-forming mechanism, a turret carrying said under thread mechanism, said under thread mechanism comprising a threaded looper, a non-threaded looper, and a pair of oscillatory loop-detainers, a loop-engaging device mounted coaxially with said loop-detainers and inactive during the sewing, an actuating lever mounted on said turret, and a pin-and-slot connection between said actuating lever and said loop-engaging device.

8. In a sewing machine, stitch-forming devices comprising upper thread mechanism and under thread mechanism, a stop-motion device, said under thread mechanism including a downwardly inclined loop-detaining horn, and a cast-off device adapted to push a detained loop off of said horn while the latter is stationary.

9. A buttonhole sewing machine having, in combination, stitch-forming devices including upper thread mechanism and under thread mechanism, a rotary turret carrying said under thread mechanism, a stop-motion device for controlling the period of operation of the stitch-forming devices, said under thread mechanism operating to detain a loop of upper thread when the stitch-forming devices come to rest, a work-clamp, a feed-wheel and connections for relatively moving the stitch-forming devices and work-clamp, a cross-shaft, a gear wheel on said cross-shaft connected to drive said feed-wheel prior and subsequent to the sewing period, a lever, a cam on said gear-wheel for actuating said lever, and means mounted on said turret and actuated by said lever for freeing the under thread mechanism from said detained upper thread loop.

In testimony whereof, we have signed our names to this specification.

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BENJAMIN F. CROSBY.

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CERTIFICATE OF CORRECTION.

Patent No. 1,852,634.

Granted April 5, 1932, to

EDWARD B. ALLEN ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 75, for the word "withdraw" read withdrawn; page 2, line 85, after "advanced" insert the words and closed; page 3, line 63, for "cam-member 1" read cam-member 71, and page 4, line 104, claim 9, for the misspelled word "stich" read stitch; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3rd day of May, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.