July 4, 1939. E. P. SPAINE 2,165,016

TENSION-RELEASER FOR SEWING MACHINES

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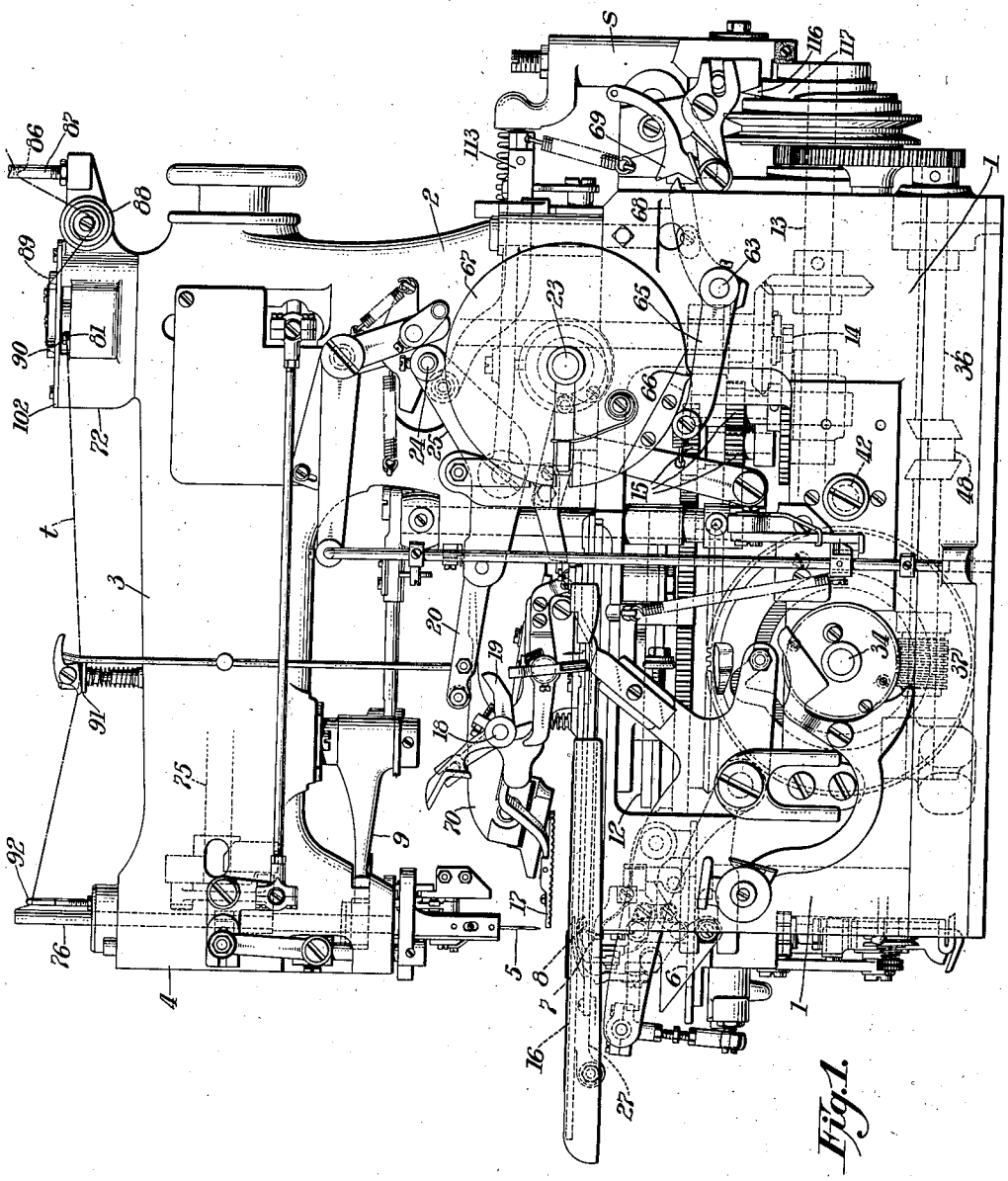


Fig. 1.

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TENSION-RELEASER FOR SEWING MACHINES

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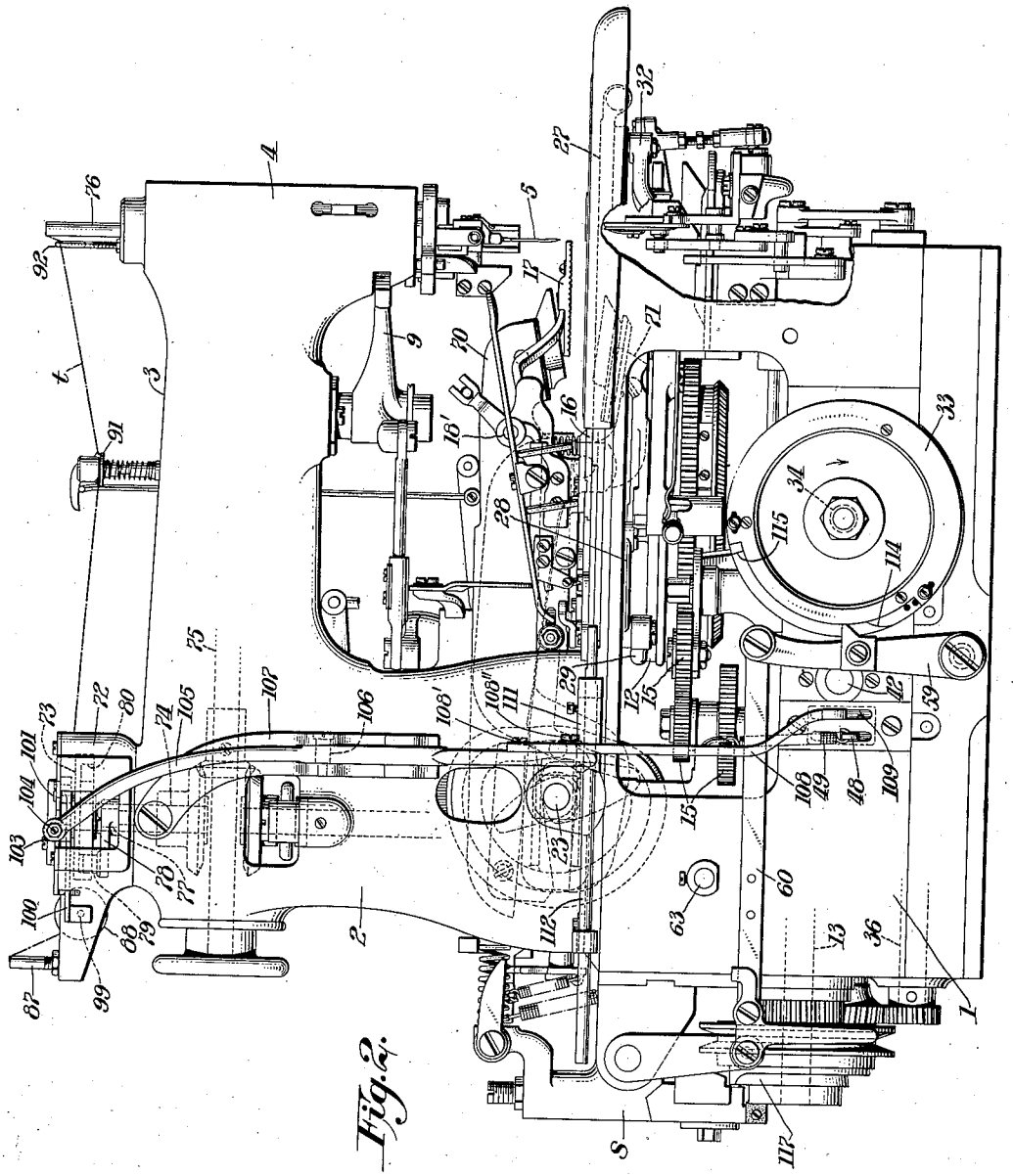


Fig. 2.

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TENSION-RELEASER FOR SEWING MACHINES

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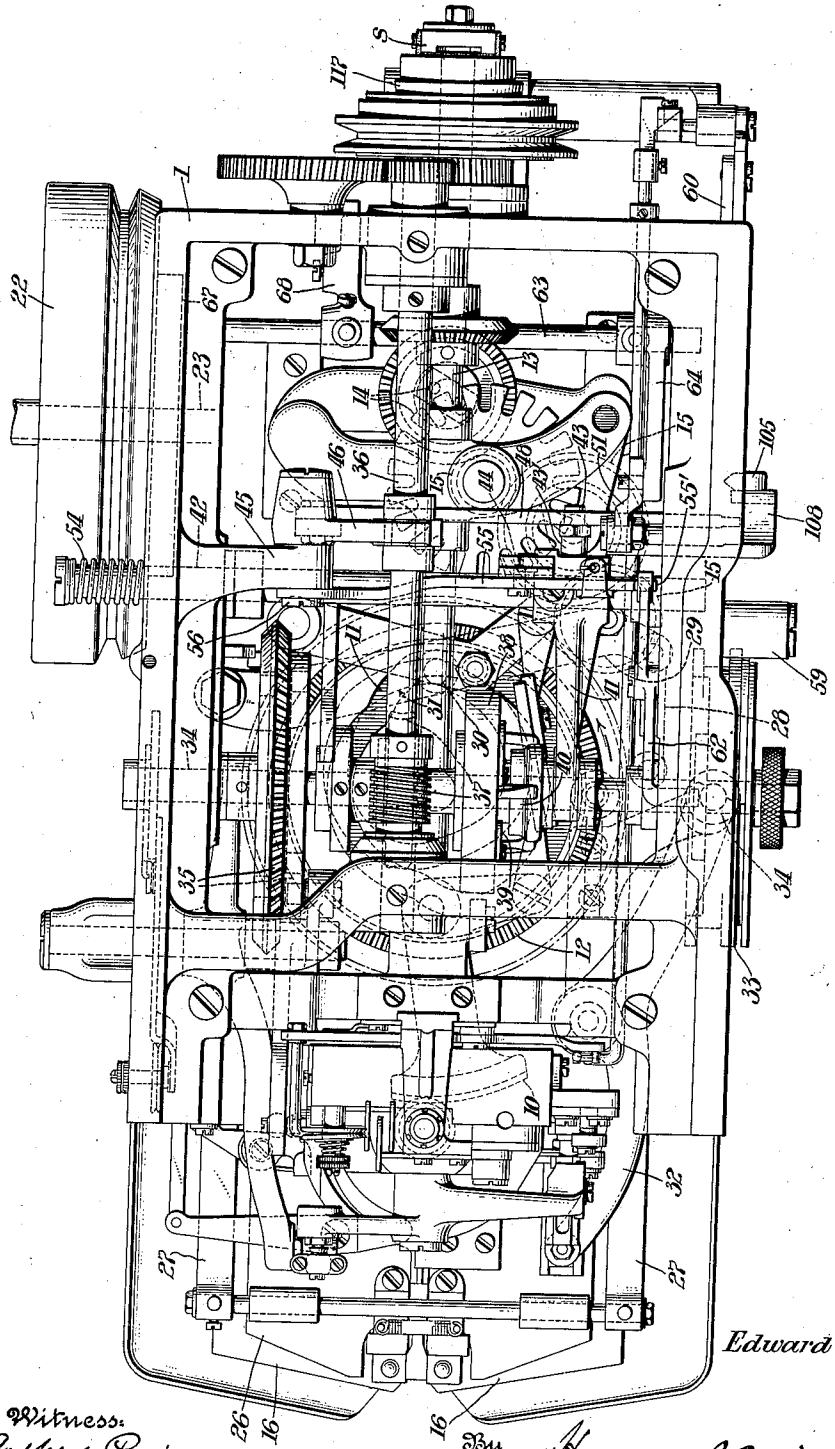


Fig. 3.

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TENSION-RELEASER FOR SEWING MACHINES

Filed April 26, 1938 5 Sheets-Sheet 4

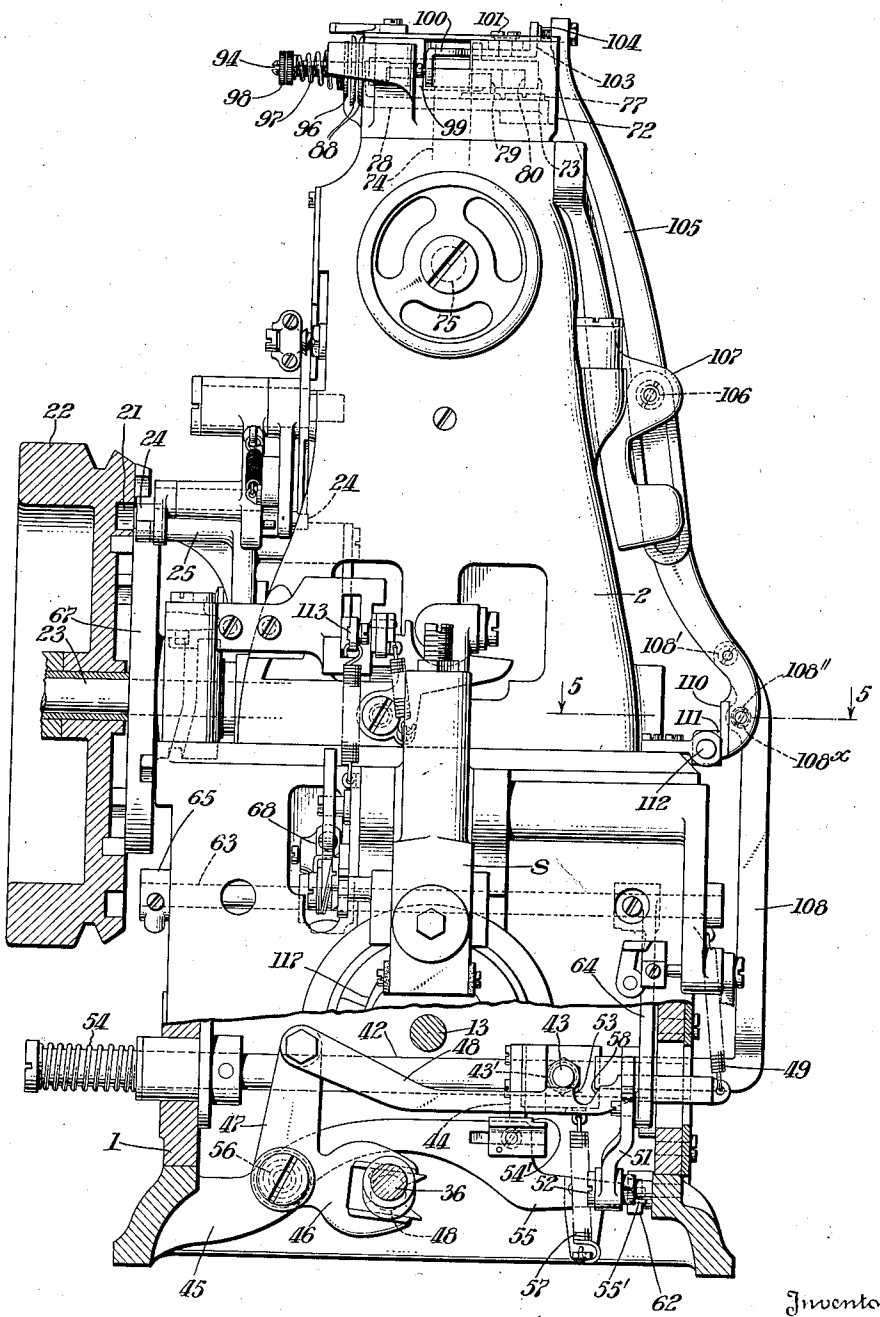


Fig. 4.

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TENSION-RELEASER FOR SEWING MACHINES

Filed April 26, 1938 5 Sheets-Sheet 5

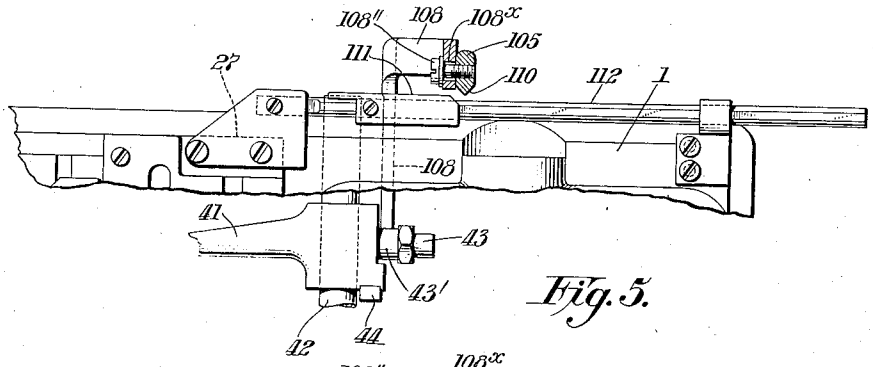


Fig. 5.

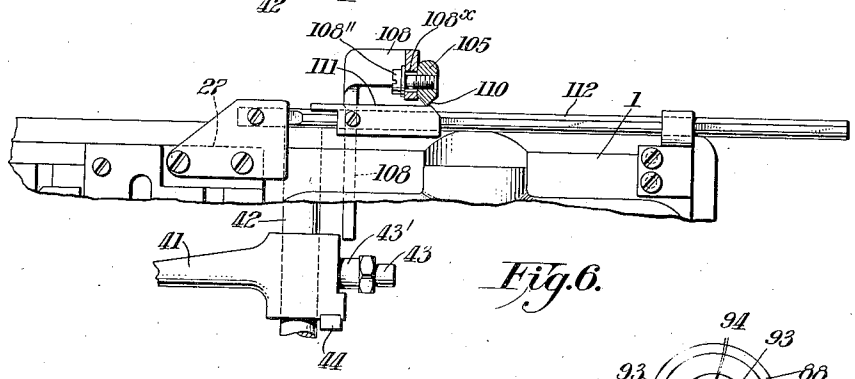


Fig. 6.

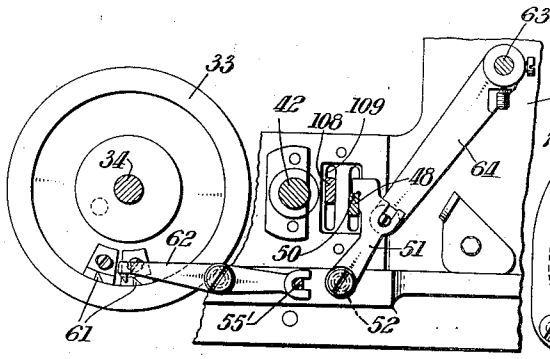


Fig. 8.

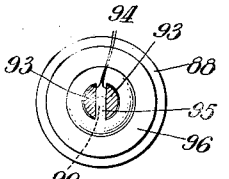


Fig. 7a

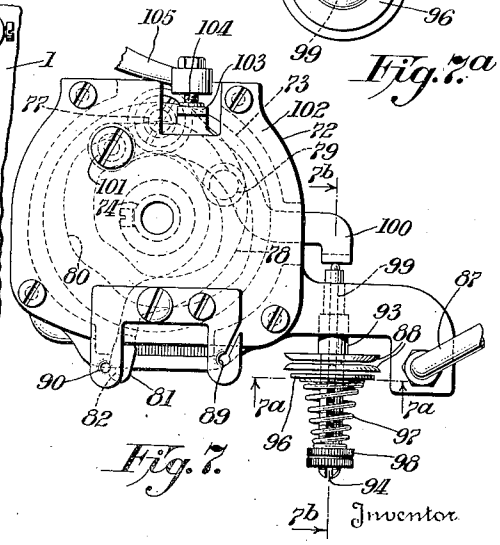


Fig. 7.

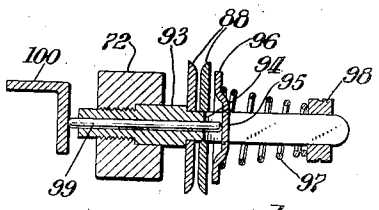


Fig. 7b

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UNITED STATES PATENT OFFICE

2,165,016

TENSION-RELEASER FOR SEWING MACHINES

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Application April 26, 1938, Serial No. 204,273

9 Claims. (Cl. 112—255)

This invention relates to sewing machines more particularly of the automatic buttonhole sewing type having stitch-forming mechanism, a stop-motion device for controlling its period of operation, a work-clamp, a feed-cam and connections for relatively moving the stitch-forming mechanism and work-clamp to sew about a buttonhole, buttonhole cutting mechanism arranged to cut the buttonhole in the work held by the work-clamp while the stitch-forming mechanism and work-clamp are out of sewing position relative to one-another, and rapid feed means for rapidly and relatively shifting the work-clamp and stitch-forming mechanism from their relatively separated buttonhole cutting relation into sewing relation with one-another.

In some machines the relative movement between the stitch-forming mechanism and work-clamp is attained by imparting a travelling movement to the work-clamp upon the machine bed. In other machines the desired relative movement is attained by mounting the stitch-forming mechanism in its own frame, known as a stitch-frame, and by imparting a travelling movement to the stitch-frame upon the machine bed.

It is essential to the proper formation of the stitches of the buttonhole overseam by the stitch-forming mechanism, that the needle-thread be subjected to a regulated tension and this is commonly done by leading the needle-thread from the supply-spool through a conventional tension-device mounted on the machine frame and comprising two circular tension-disks between which the thread runs, which disks are mounted on an arbor and pressed together by a bee-hive spring backed by a knurled thumb-nut.

It is desirable that the tension on the needle-thread be released after the sewing is completed, so that the needle-thread may run freely during the rapid work-feeding action which occurs at the end of a sewing operation to relatively move the stitch-forming mechanism and work-clamp out of sewing relation preparatory to a thread-cutting or buttonhole-cutting operation.

Heretofore, the release of the needle-thread tension has been attained automatically by a tension-releasing device actuated by the drop of the stop-tooth of the stop-motion device into the stop-notch of the usual stop-cam. A tension-releaser of this type is disclosed in U. S. Patent No. 1,333,594, of Mar. 16, 1920, and U. S. reissued Patent No. 15,324, dated Apr. 4, 1922.

A stop-motion-actuated tension-releaser, such as heretofore used, is found to put an objectionable load upon the stop-motion device, rendering the latter sluggish and uncertain in its operation. For this reason, attempts have been made to actuate the tension-releaser by the travelling movement of the work-clamp longitudinally of the machine bed in machines of the travelling work-clamp type. Tension-releasers actuated by the travelling movement of the work-clamp are disclosed in U. S. Patents No. 1,711,483, of May 7, 1928, and No. 1,807,577, of May 26, 1931. In these tension-releasers, the tension-release lever is actuated by an adjustable cam-block which is connected to travel with the work-clamp. As it is important that the release of the tension should not occur until after the completion of the last stitch of the buttonhole and should occur immediately after the last stitch has been completed, it follows that the tension-releasing cam-block on the work-clamp must be nicely adjusted or set for the particular length of buttonhole being sewn and, in a machine for sewing various lengths of buttonholes, the tension-release cam-block must be readjusted or reset every time the machine is changed to sew a buttonhole of a different length.

It has also been proposed, as disclosed in U. S. Patent No. 1,346,102, of July 13, 1920, to operate the tension-releaser and certain other mechanisms of a buttonhole-type sewing machine by means of an additional auxiliary shaft which is stationary during the preparatory and sewing stages of a buttonhole producing cycle and is tripped into action by the drop of the stop-tooth of the stop-motion device into the notch of the stop-cam. While the provision of this additional power-driven single-rotation auxiliary shaft which performs after the sewing period is completed, relieves the stop-motion to a large extent of the load of directly actuating the tension-releaser, it nevertheless adds to the load on the stop-motion device and considerably complicates the machine.

The present invention therefore has for an object to provide an automatic tension-releaser for a sewing machine of the buttonhole type which adds nothing to the load on the stop-motion device and does not require resetting when the machine is changed to sew a buttonhole of any length within the range provided for and yet which automatically releases the tension immediately after the last stitch of the sewing has been completed.

To the attainment of the ends in view provision is made, in a conventional buttonhole sewing machine having a feed-cam, a rapid feed shaft, and a clutch connection between said

feed-cam and rapid feed shaft, for actuating the tension-releaser by the movement of the rapid feed clutch-shifter which connects the rapid feed shaft to the feed-cam of the machine. Thus, the tension is released whenever the machine is rapid feeding and is restored when the rapid feed is thrown out. This mechanism is preferably combined with a cam-block on the work-clamp which moves under the tension-release lever during the latter part of the final rapid feed of the work-clamp from sewing position to buttonhole-cutting or initial position, to hold the tension released when the final rapid feed is thrown out, so that the tension will be held released when the machine comes to rest.

In the accompanying drawings, Fig. 1 is a right side elevation of a buttonhole type sewing machine embodying the invention. Fig. 2 is a left side elevation of the machine. Fig. 3 is a bottom plan view of the machine. Fig. 4 is a rear end elevation of the machine, partly in section. Fig. 5 is a horizontal sectional view through the tension-release lever, on the line 5—5, Fig. 4, at a period in a buttonhole producing cycle of the machine when the rapid-feed clutch-actuating slide-rod is shifted to rapid-feed throw-in position. Fig. 6 is a similar view of the parts after the slide is shifted to rapid-feed throw-out position at the completion of a buttonhole-producing cycle. Fig. 7 is a top plan view of the tension-releaser connections on top of the sewing machine bracket-arm. Figs. 7^a and 7^b are, respectively, sectional views on the lines 7^a—7^a and 7^b—^{b}, Fig. 7, and Fig. 8 is an inner face view of the pattern wheel of the machine showing the tripping points and latches for controlling the rapid-feed cross-slide-rod of the machine.

In the preferred embodiment of the invention illustrated, the machine frame comprises a hollow box-like bed 1 from one end of which rises the standard 2 of the overhanging bracket-arm 3 terminating in the head 4.

The stitch-forming mechanism is of the well known type embodying an upper endwise reciprocatory and laterally vibratory needle 5 and under thread mechanism constructed substantially in accordance with the disclosure of U. S. Patent No. 1,372,473, dated Mar. 22, 1921, and comprising a turret 6, Fig. 1, which is turnable about a vertical axis and carries threaded and nonthreaded loopers, the former of which is shown at 7, and a pair of loop-detainers one of which is shown at 8. The needle-actuating mechanism is also mounted to turn about a vertical axis coincident with the axis of the turret 6 and the usual turning movements are imparted to the upper needle and under looper mechanisms by the connected upper and lower sector gears 9 and 10, respectively, which are actuated in unison by the usual connections with the cam-groove 11, Fig. 3, in the feed-cam 12. This well known mechanism is more completely shown, for example, in U. S. Patents No. 1,162,207; Nov. 30, 1915; No. 15,324, reissued Apr. 4 1922, and No. 1,534,017, Apr. 21, 1925. The mechanism operates to rotate the stitch-forming devices in one direction during the sewing around the eyelet-end of a buttonhole and to reversely rotate the stitch-forming devices between sewing periods to restore them to initial position. The stitch-forming devices are actuated from the main sewing shaft 13 which also drives the feed-cam 12 in step-by-step fashion, during the sewing, through the well known pin-and-star-wheel drive 14, Fig. 3, and the usual train of gears 15, such as more completely shown in said U. S. reissued Patent No. 15,324.

The work-clamp is of the travelling type. It is first rapidly moved over the bed 1 to carry the work forwardly from initial or buttonhole-cutting position to stitching position, then more slowly moved in step-by-step fashion to place the stitches about the buttonhole, and then rapidly returned to initial position. It is constructed substantially in accordance with said U. S. reissued Patent No. 15,324 and comprises the lower clamp-plates 16 and upper clamping feet 17 which are depressed into clamping engagement with the work by a rocking movement of two connected coaxial rock-shaft sections 18, 18' to the former of which is connected an arm 19, Fig. 1, adapted to be depressed by the usual clamp-closing lever 20 actuated at the beginning of a buttonhole-making cycle by a cam groove 21, Fig. 4, in a continuously running pulley 22 loose on the bottonhole-cutter shaft 23. A slide-pin 24, carried by the rearwardly extending arm 25 of the clamp-closing lever, is permitted to enter the cam-groove 21 for one revolution of the pulley 22, whereupon it is ejected and latched in ejected position, as explained in U. S. Patent No. 1,832,665; Nov. 17, 1931; the present clamp-closing mechanism being constructed substantially in accordance with the disclosure in said U. S. Patent No. 1,832,665.

The clamp-plates 16 are carried by the cross-slide plate 26, Fig. 3, which, in turn, is carried by the longitudinal slide-frame 27 to which travelling movements are imparted by the link-connection 28, Fig. 3, with the longitudinal feed lever 29 having a follower 30 working in the longitudinal feed cam-groove 31 in the feed-cam wheel 12. The cross-slide plate 26 is shifted by the lever 32, Fig. 3, which has the usual connections with the feed-cam 12 and removable pattern-cam 33 on the cross-shaft 34 which is geared at 35, Fig. 3, to the feed-cam 12, so as to run with the latter. The present feed mechanism is constructed substantially in accordance with the disclosure of said U. S. reissued Patent No. 15,324.

The rapid feed of the work-clamp from buttonhole-cutting position to sewing position and return is effected by the usual constantly running rapid feed drive-shaft 36, which through a worm-and-gear reduction 37, Fig. 3, drives the live element 38 of a clutch, the driven element 39 of which is fast on the cross-shaft 34. It will be understood by referring to said U. S. reissued Patent No. 15,324 that the withdrawal of the cone 40 from the driven clutch-element 39 effects engagement of the driving and driven clutch-elements 38, 39, while projection of the cone 40 toward the driven clutch-element 39 effects the de-clutching of the parts 38, 39. The cone 40 is actuated by the usual arm 41 rigidly mounted on the endwise slidable rod 42 and carrying the lateral pin 43 and latching block 44, Fig. 4.

As disclosed in U. S. Patent No. 1,548,815, Aug. 11, 1925, there is mounted in the base 1 on the bracket 45, Fig. 4, a continuously rocking bell-crank lever 46, 47, the forked arm 46 of which embraces a crank 48 on the rapid feed shaft 36. Pivoted on the arm 47 is a single reciprocating bar 48 the free end of which has connected to it a spring 49, which pulls the bar upwardly against the seat 50 of the latch 51, Fig. 8, pivoted at 52 on the bed 1. The bar 48 reciprocates idly when held down by the latch 51. When the latch 51 is swung on its pivot 52 to release the bar 48, the latter is drawn upwardly by the spring 49 and the shoulder 53, Fig. 4, engages the pin 43

and pushes the slide-rod 42 to the right against the resistance of the recovery spring 54 to withdraw the cone 40 from the clutch element 39 and effect the coupling of the rapid feed shaft 36 to the cross-shaft 34 to drive the feed-cam 12 at its rapid rate. When the slide-rod 42 is pushed to clutch-engaging position, it is held there by engagement of the shoulder 54', Fig. 4, on the lever 55 with the latch-block 44; the lever 55 being biased upwardly about its fulcrum 56 by the spring 57. Thus, the lever 55 and shoulder 54' act as a spring-latch to hold the slide-rod 42 in clutch-engaging or rapid feed position. During the return movement of the bar 48 the inclined shoulder 58, Fig. 4, engages the pin 43 and causes the bar 48 to be depressed sufficiently to be re-engaged in idling position by the latch-lever 51.

The pattern wheel 33, Fig. 2, which is removably carried by the cross-shaft 34, operates the usual stop-motion device S through the lever 59 and link 60 to control the period of action of the stitch-forming mechanism. The pattern wheel 33 also carries, on its inner face, the tripping points 61, Fig. 8, which tilt the lever 62 and control the throwing out of the rapid drive for the feed-wheel 12. The lever 62 is forked at one end to embrace the end 55' of the latch-lever 55. Hence, when the lever 62 is tilted by one of the tripping points 61, the latch-lever 55 is depressed and the slide-rod 42 released, whereupon the spring 54 on the slide-rod 42 acts to shift the slide-rod 42 from rapid feed running position, Fig. 5, to rapid feed stopping or declutching position, Figs. 6 and 4.

The controlling mechanisms for initiating the rapid feed prior and subsequent to the sewing period are substantially the same as those disclosed in U. S. Patent No. 1,548,815 and comprise the rock-shaft 63, Figs. 8 and 1, having an arm 64 engaging the latch 51, another arm 65 adapted to be depressed by a cam 66 on the cutter shaft clutch-disk 67, and a third arm 68 adapted to be elevated by the pawl 69 actuated by the stop-motion device S.

The present machine is of the cut first type, that is, it cuts the buttonhole before stitching it. The buttonhole-cutting mechanism is constructed substantially in accordance with the disclosure of said U. S. Patent No. 1,548,815 and embodies the travelling buttonhole cutter levers 70, 71, Fig. 2, which are given their customary travelling and closing-and-opening movements by suitable cams on the cutter-shaft 23 to which a single rotation is imparted prior to stitching by the continuously rotating pulley 22 acting through a one-revolution clutch.

The present machine has mounted on top of the standard and bracket-arm a housing 72 for a take-up cam 73 which is mounted on a shaft 74 driven by the top-shaft 75 which actuates the needle-bar 76 in the usual manner. Pivotally mounted at 77 in the housing 72 is the take-up lever 78 carrying a follower roll 79 which enters the take-up cam-groove 80. The take-up lever has at its free end 81 a thread-eye 82 which acts upon the needle-thread *t* between the tension-device and the hollow needle-bar 76 through which the needle-thread *t* runs to the needle 5. As shown in Fig. 1, the needle-thread *t* runs from the supply through the guide-hole 86 in the post 87, thence between the disks 88 of the tension-device, thence up through the fixed guide-hole 89 and down through the fixed guide-hole 90 and through the take-up thread-eye 82, thence forwardly through the open thread-nipper 91 and under the fixed guide-hook 92 to and down through the hollow needle-bar 76 to the needle 5. The tension-device is conventional and, in addition to the two tension-disks 88, comprises the arbor 93 on which the tension-disks 88 are mounted. The arbor has a diametrical slot 94 at one end to pass the diameter bar 95 of the pressure head 96 against which one end of the beehive spring 97 rests; the other end of such spring being engaged by the adjustable thumb-nut 98. The arbor 93 has in its unslotted end an axial hole to admit the tension-release pin 99 which, at times, engages the diameter bar 95 of the pressure-head 96 and pushes the latter away from the tension-disks 88 to release the tension on the needle-thread *t*. The tension-release pin 99 is in position to be engaged by one end of the lever 100, Fig. 7, fulcrumed at 101 on the under side of the cover 102 for the take-up housing 72. The lever 100 has at one edge a bent up tongue 103 in position to be engaged by the head of the screw 104 adjustably threaded into the upper end of the tension-release lever 105 which is fulcrumed at 106 to a bracket 107 mounted on the left side of the bracket-arm standard 2. The tension-release lever 105 has fastened to its lower end an L-shaped extension 108, Fig. 4, which enters a guide-slot 109, Fig. 2, in the side-wall of the bed 1 and terminates in position for engagement by the shank-portion 43', Figs. 5 and 6, of the lateral pin 43 carried by the rapid feed clutch controlling slide-rod 42 previously described.

Two screws 108' and 108'' are preferably used to fasten the L-shaped extension 108 to the tension-release lever 105. The screw 108' is a pivot-screw about which the extension 108 may be swung or adjusted relative to the lever 105; the screw 108'' being a holding screw to maintain the adjustment. As shown in Figs. 5 and 6, the holding screw 108'' passes through an enlarged hole or slot 108^{x} in the extension 108 which permits of the relative adjustment of the two parts about the screw 108' as a pivot. The tension-release lever 105 also has on it a cam-follower nose 110 which, at times, is engaged by a tension-releasing cam-block 111 adjustably mounted on the rod 112 connected to the longitudinal slide-frame 27 of the work-clamp.

Operation

When the machine is at rest, the work-clamp occupies an initial position displaced rearwardly of the sewing position, as shown in Figs. 1 and 2. In this "at rest" position of the machine and work clamp, the cam-block 111 which travels with the latter, occupies a position under the follower nose 110 on the tension-release lever 105, Fig. 6, and thus holds the tension open on the needle-thread. At this time the rapid feed is not in operation and the rapid feed clutch-controlling slide-rod 42 is in the "throw-out" position, shown in Fig. 6, in which the free end of the tension-release lever extension 108 is spaced from the pin 43 on the slide-rod 42.

When the machine is started, the clamp-closing lever 20, receives its usual rocking impulse from the pulley 22 and closes the work-clamp. On the recovery impulse of the clamp-closing lever 20, the push-rod 113, Fig. 1, connected thereto trips the buttonhole-cutter clutch into operation and the buttonhole cutter shaft 23 is driven through one revolution by the pulley 22 to cut the buttonhole at a position spaced from sewing position. At the close of the single revolu-

tion of the cutter-shaft 23, the cam 66 thereon acting upon the arm 65 on the rock-shaft 63 effects the tripping of the latch 51 and the push-bar 48 engages the lateral pin 43 on the slide-rod 42 and shifts the latter to rapid feed "throw-in" position, shown in Fig. 5. In this position the pin 43 engages the tension-release lever extension 108 and takes over from the cam-block 111 the duty of holding the needle-thread tension open. The work-clamp is now rapidly fed from button-hole-cutting position to sewing position, during which movement the travelling cam-block is carried out from under the follower nose 110 on the tension-release lever 105, as shown in Fig. 5. When the work-clamp arrives at sewing position, one of the tripping points 61 on the inner side of the pattern-wheel 33 engages the lever 62 and trips the latch-lever 55, to release the slide-rod 42 which is immediately shifted by its spring 54 to rapid feed "throw-out" position, Fig. 6. This "throw-out" movement of the slide-rod 42 carries its lateral pin away from the tension-release lever extension and restores the tension on the needle-thread. At the same time or immediately thereafter, the cam 114 on the feed-wheel 33 acts upon the lever 59 and link 60 to throw-in the stop-motion device S and start the sewing mechanism. The sewing now proceeds about the buttonhole with the normal tension on the needle-thread. When the sewing is completed, the peripherally adjustable shoulder 115 on the pattern-wheel 33 releases the lever 59 and the stop-motion S is thrown out and stops the sewing mechanism.

As the stopping tooth 116 of the stop-motion S drops into the usual stop-notch of the stop-cam 117, the conventional pawl device 69, Fig. 1, engages and lifts the arm 68 on the rock-shaft 63 and again trips the latch 51 to start the rapid feed to carry the work-clamp back to its initial position. When the slide-rod 42 is pushed to rapid feed "throw-in" position, Fig. 5, the tension-disks 88 are immediately opened by engagement of the pin 43 with the tension-release lever extension 108. But this release of the tension does not occur until after the completion of the last stitch with the last needle-thread loop safely retained by the horn 8 of the needle-loop detainer on the turret which has seized such loop from the non-threaded looper, not shown, of the under stitch-forming devices. The needle-thread *t* is thus free to run to and through the needle-eye during the rapid shift of the work-clamp from sewing position to initial position, without laterally straining the needle.

It will be observed that the load on the stop-motion device S is not increased by the present tension-releaser; the drop of the stop-tooth 116 having nothing more to do than to actuate the arm 68, as heretofore, to trip the final rapid-feed into action. The power for actuating the tension-releaser is now derived from the conventional rapid feed shaft 36, through the endwise reciprocating push-rod 48. Nothing has been added to complicate the machine further than the tension-release lever extension 108. It will be understood that, the machine may be changed over to sew a buttonhole of different length, by substituting for the pattern-wheel 13 another pattern-wheel having differently positioned stop-motion-controlling shoulders and rapid feed throw-out tripping points and, when so changed, the release of the tension on the needle-thread at the proper time will be taken care of automatically without special adjustment of any parts of the tension-releaser mechanism.

The invention is not to be understood as limited in its application to a "cut-first" buttonhole machine or to a machine for sewing eyelet-end buttonholes.

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

1. In a sewing machine of the buttonhole type, stitch-forming mechanism including a reciprocatory thread-carrying needle, a needle-thread tension-device, a work-clamp, a feed-wheel and connections to relatively move the stitch-forming mechanism and work-clamp into and out of sewing relation and to sew about a buttonhole, a rapid feed-wheel drive, a rapid feed clutch connected between said rapid feed-wheel drive and said feed-wheel, a tension-releaser, and controlling means for said rapid feed clutch connected to operate said tension-releaser.

2. In a sewing machine of the buttonhole type, stitch-forming mechanism including a reciprocatory thread-carrying needle, a needle-thread tension-device, a work-clamp, a feed-wheel and connections to relatively move the stitch-forming mechanism and work-clamp into and out of sewing relation and to sew about a buttonhole, a rapid feed-wheel drive, a rapid feed clutch connected between said rapid feed-wheel drive and said feed-wheel, a tension-releaser, and a movable clutching and declutching element for the rapid feed clutch connected to operate said tension-releaser.

3. In a sewing machine of the buttonhole type, a frame including a bed, stitch-forming mechanism including a reciprocatory thread-carrying needle, a needle-thread tension-device, a work-clamp movable on said bed, a feed-wheel and connections to move the work-clamp into and out of sewing position and to sew about a buttonhole, a tension-release lever, a cam-block movable on the machine bed with the work-clamp and positioned to hold said lever in tension-releasing position when the machine comes to rest and to move out of engagement with said lever during the first rapid feed movement of the work-clamp from initial position to sewing position, a rapid feed-wheel drive, a rapid feed clutch connected between said drive and feed-wheel, and controlling means for said rapid feed clutch arranged to control said tension-release lever to restore the tension on the needle-thread immediately prior to the beginning of the sewing operation and to release the tension on the needle-thread at the completion of a sewing operation.

4. A sewing machine of the buttonhole type having, in combination, stitch-forming mechanism including a reciprocatory needle, a thread-tension device, a work-clamp, a main sewing shaft connected to drive the stitch-forming mechanism, a feed-wheel connected to impart the travelling movements to the work-clamp, a driving connection between the sewing shaft and the feed-wheel to drive the latter comparatively slowly during a sewing period, a rapid feed shaft and a clutch connection between the latter and the feed-wheel to more rapidly drive the feed-wheel prior and subsequent to a sewing period, to carry the work-clamp rapidly from initial position to sewing position and return, clutch-operating means deriving power from the rapid feed shaft for throwing in and throwing out the clutch connection between the rapid feed shaft and feed-wheel, and a thread-tension releaser actuated by said clutch-operating means.

5. A sewing machine of the buttonhole type having a frame including a hollow rectangular box-like bed, a bracket-arm standard rising from one end of said bed, stitch-forming mechanism including a reciprocatory needle, a thread-tension device, a main sewing shaft for the stitch-forming mechanism, a work-clamp having travelling movements over the machine bed, a feed-wheel connected to impart to the work-clamp its travelling movements, a step-by-step driving connection between the main sewing shaft and feed-wheel to drive the latter during a sewing period, a rapid feed shaft, and a clutch connection between the latter and the feed-wheel to more rapidly drive the feed-wheel prior and subsequent to sewing to shift the work-clamp from initial position to sewing position and return, automatic clutch-operating means including a slide-rod extending crosswise of the machine bed, and a thread-tension releaser actuated by movement of said slide-rod.

6. A buttonhole type sewing machine having a frame formed with a hollow bed, a standard rising from one end of said bed and a bracket-arm carried by said standard, stitch-forming mechanism, a work-clamp, a thread-tension device carried by the bracket-arm, feeding mechanism for relatively moving the stitch-forming mechanism and work-clamp into and out of sewing relation and to sew about a buttonhole, a rapid feed shaft, a clutch connection between the rapid feed shaft and said feeding mechanism to drive the latter at its rapid rate during the periods of a buttonhole-producing cycle when the work-clamp and stitch-forming mechanism are being relatively moved into and out of sewing relation, a clutch-operating slide-rod mounted in the machine bed, automatic means to move said slide-rod to start and stop the rapid feed, a tension-release lever mounted on the bracket-arm and having a downwardly extending arm, and an L-shaped extension secured to said arm and extending downwardly alongside said bed and thence to a position to be engaged and operated by movement of said slide-rod.

7. In a sewing machine of the buttonhole type, a frame including a bed, stitch-forming mechanism including a reciprocatory thread-carrying needle, a needle-thread tension-device, a work-clamp movable on said bed, a feed-wheel and connections to move the work-clamp into and out of sewing position and to sew about a buttonhole, a tension-release lever, means movable with the work-clamp and positioned to hold said lever in tension-releasing position when the machine comes to rest and to release said lever during the first rapid feeding movement of the work-clamp and before the work-clamp arrives at sewing position, a rapid feed-wheel drive, a rapid feed clutch between said drive and feed-wheel, and controlling means for said rapid feed clutch arranged to take over the control of said tension-release lever during the first rapid feeding movement of the work-clamp and release said lever at the completion of said first rapid feed movement of the work-clamp to restore the tension on the needle-thread for the ensuing sewing period.

8. In a buttonhole sewing machine having a needle-thread tension device, a tension releasing element, stitch-forming mechanism, a stop-motion device therefor and a work-clamp, with rapid feed mechanism to relatively move the stitch-forming mechanism and work-clamp into and out of sewing relation and a clutch and automatic clutch-controlling means to throw the rapid feed mechanism into and out of operation, the improvement which consists in connecting the tension releasing element so that it will be operated by the rapid feed clutch-controlling means to restore the tension on the needle-thread when the rapid feed mechanism is thrown out of operation immediately prior to the starting of the stitch-forming mechanism and to release the tension on the needle-thread when the rapid feed mechanism is thrown in immediately following the stopping of the stitch-forming mechanism.

9. In a sewing machine of the buttonhole type having stitch-forming mechanism, a thread-tension device, a work-clamp, a feed-wheel and connections to relatively move the stitch-forming mechanism and work-clamp into and out of sewing relation and to sew about a buttonhole, a rapid feed-wheel drive, a rapid feed-clutch with automatic controlling means to connect the feed-wheel to the rapid feed-wheel drive to rapidly and relatively move the stitch-forming mechanism and work-clamp into and out of sewing relation, the provision of a tension releaser connected to be operated by the rapid feed-clutch controlling means to restore the tension on the sewing thread when the rapid feed is thrown out at the beginning of the sewing period and to release the tension when the rapid feed is thrown in at the end of the sewing period, with other means to hold the tension released when the rapid feed is finally thrown out at the end of a buttonhole producing cycle.

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