Nov. 17, 1931. E. P. SPAINE 1,832,665

CAM AND FOLLOWER MECHANISM

Filed Feb. 27, 1930 4 Sheets-Sheet 1

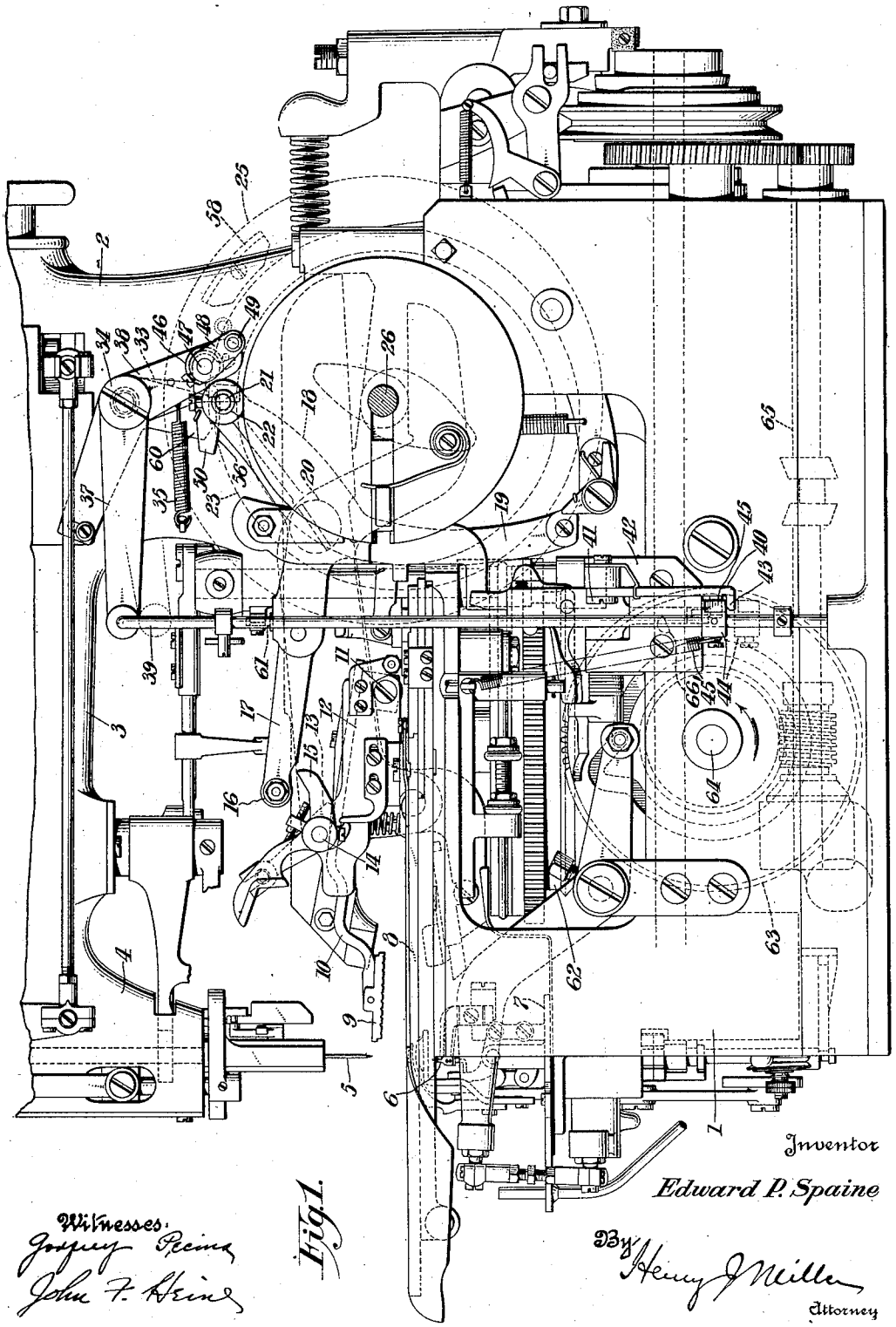

Fig. 1.

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CAM AND FOLLOWER MECHANISM

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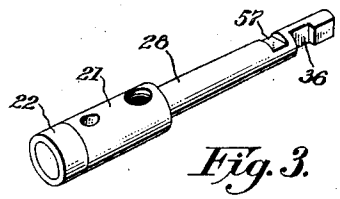

Fig. 3.

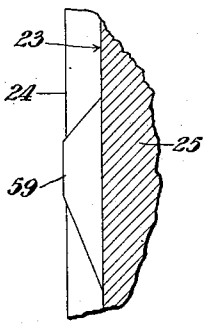

Fig. 4.

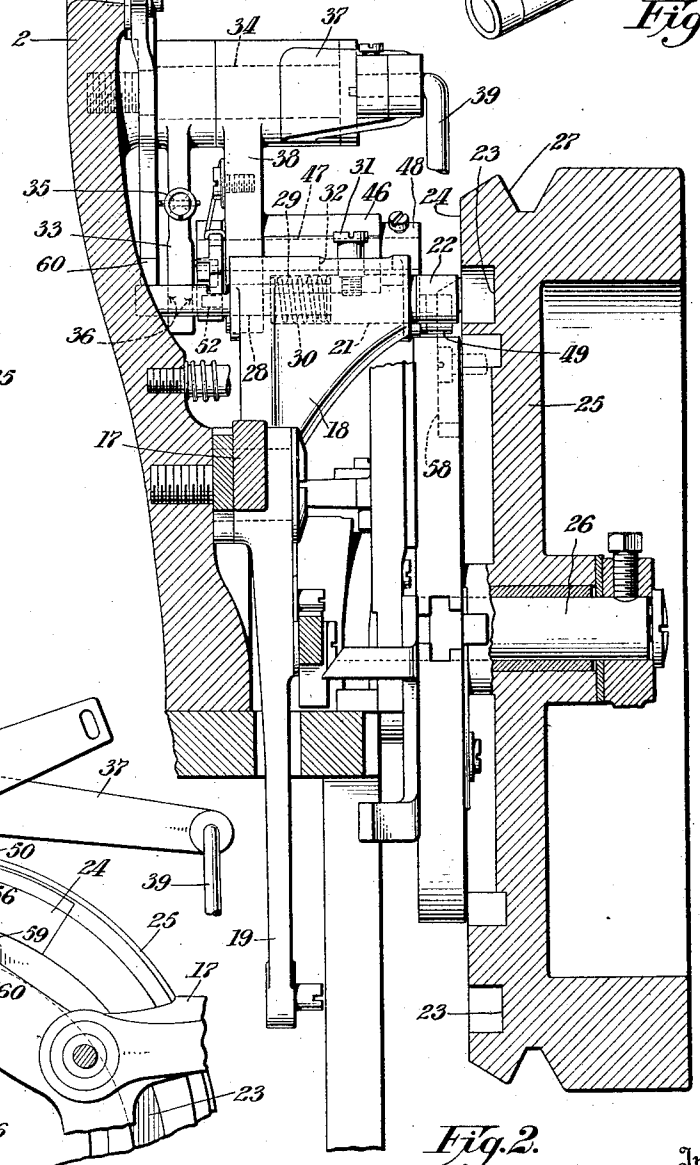

Fig. 2.

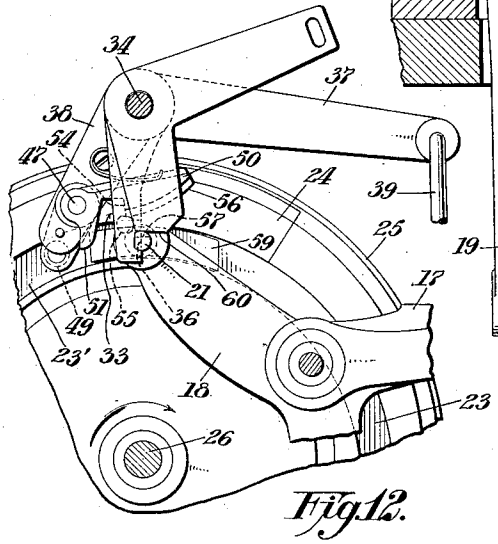

Fig. 12.

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CAM AND FOLLOWER MECHANISM

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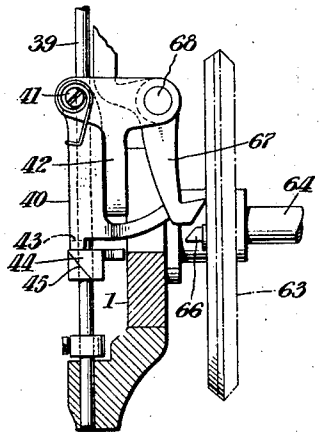

Fig. 7.

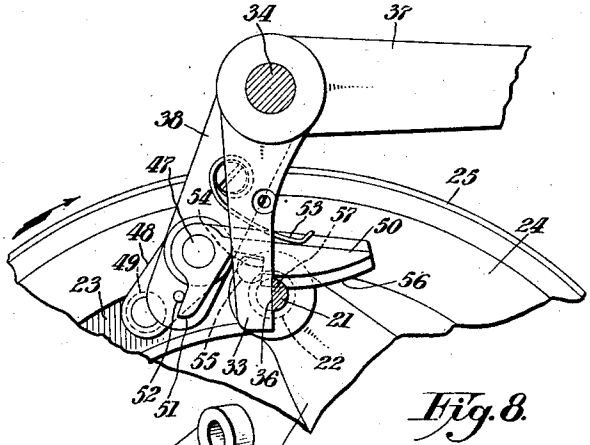

Fig. 8.

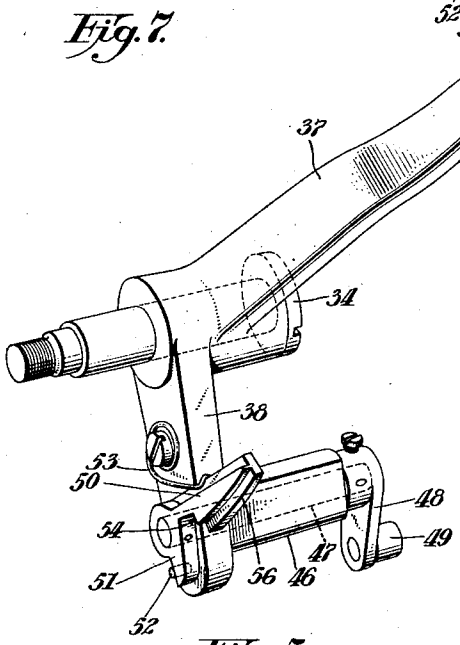

Fig. 5.

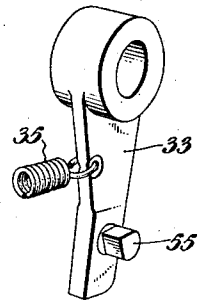

Fig. 6.

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CAM AND FOLLOWER MECHANISM

Filed Feb. 27, 1930 4 Sheets-Sheet 4

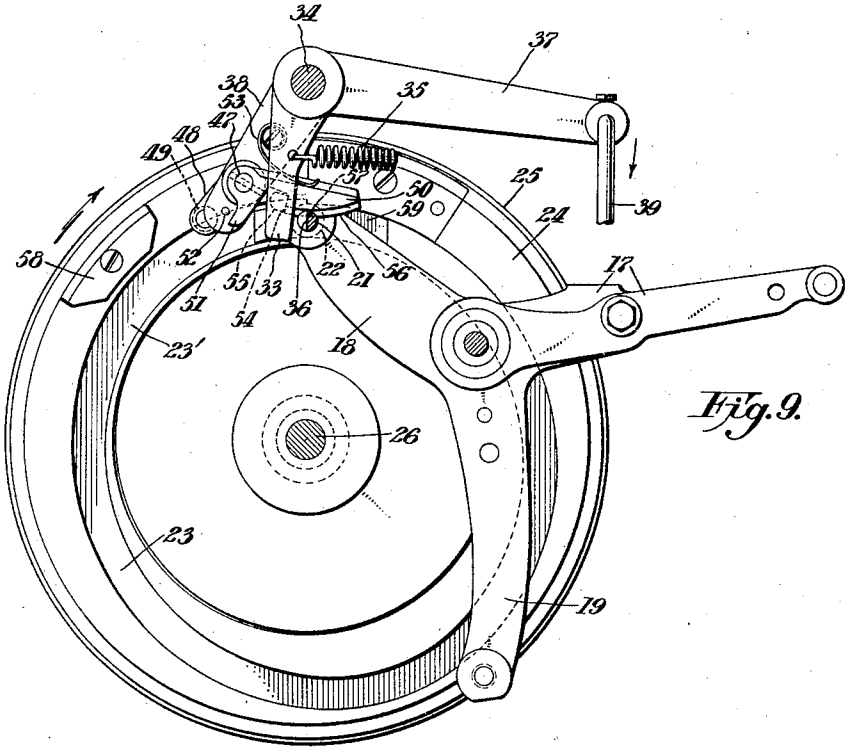

Fig. 9.

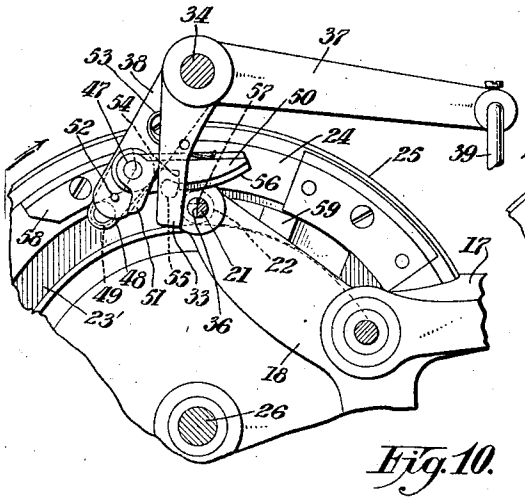

Fig. 10.

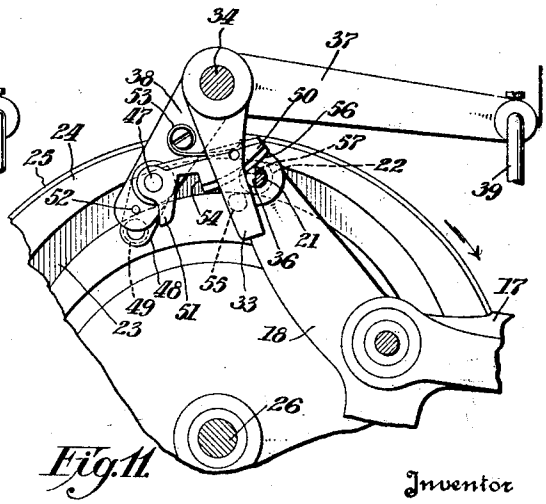

Fig. 11.

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1,832,665

UNITED STATES PATENT OFFICE

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CAM AND FOLLOWER MECHANISM

Application filed February 27, 1930. Serial No. 431,717.

This invention relates to cam and follower mechanisms of the type wherein the cam runs continuously and comprises a grooved cam-member into which the follower, when manually released, is projected by a spring; the follower being automatically ejected after one rotation of the cam and latched in ejected position. In cam mechanisms of this type, there is nothing to insure that the cam will be in position to receive the follower when the latter is manually released, and hence it frequently happens that the follower nicks the corners where the side walls of the cam join the cam-face by striking such corners before the cam is turned to a position where the cam-groove is in register with the follower. Constant repetition of this action prematurely destroys the cam.

The present invention has for an object to provide means for insuring that the cam-follower will be released only when the cam is turning through that portion of its cycle when its groove is in register with the cam-follower. A further object of the invention is to accomplish this result without blocking the operation of the manually operated mechanism, which should be free to be operated at any time regardless of the position of the cam.

To the attainment of the ends in view, the cam-follower is provided with a latch-mechanism for detaining it from entering the cam-groove, and the cam is provided with a normally idle latch-tripping means; the latch-mechanism being initially out of range of the latch-tripping means. A manually operated means is provided for shifting the latch-mechanism to a position within range of the latch-tripping means, whereby the timing of the release of the cam-follower is controlled and held constant regardless of the time of the operation of the manually operated means.

In the accompanying drawings, Fig. 1 is a side elevation of a buttonhole sewing machine embodying the invention. Fig. 2 is a transverse vertical section through the cam wheel shown in dotted lines in Fig. 1. Fig. 3 is a perspective view of the cam-follower plunger. Fig. 4 is a view of the cam-follower ejector. Fig. 5 is a perspective view of the manually operated lever and latch-mechanism carried thereby. Fig. 6 is a perspective view of an associated latch-lever. Fig. 7 is a detail view of a latch and latch-tripping mechanism for holding and releasing the manually operated lever, and Figs. 8 to 12, inclusive, are a series of views illustrating in successive stages the operation of the present improvement.

The invention is shown as applied to the clamp-closing mechanism of a buttonhole sewing machine constructed substantially in accordance with the disclosure of the patent to E. B. Allen No. 15,324; reissued April 4, 1922. The machine frame comprises the usual box-like bed 1 carrying the standard 2 of the overhanging bracket-arm 3 terminating in the head 4 carrying the usual upper thread or needle mechanism 5 which, together with the usual under thread or looper mechanism 6 on the rotary turret 7, constitute the stitch-forming mechanism of the machine.

The work-clamp, which is mounted to slide over the bed 1, comprises the usual side-by-side sections each of which includes a work-supporting plate 8 and upper clamping foot 9 carried by a clamp-arm 10 fulcrumed at 11 on a fulcrum-block 12 carried by the plate 8. The arm 10 is depressed to closed position by a cam 13 on a rock-shaft section 14 journaled in the block 12 and having fixed thereto a rearwardly extending arm 15 in position to be depressed by the roll 16 on the arm 17 of the usual 3-armed clamp-closing lever 17, 18, 19, fulcrumed at 20 on the standard 2.

The arm 18 of the 3-armed clamp-closing lever carries a slide-bolt or plunger 21 constituting a cam-follower the outer end of which has journaled thereon a follower-roll 22 adapted to enter the clamp-closing cam-groove 23 cut in the inner face 24 of the cam-wheel 25 which is mounted to rotate upon and relative to the usual buttonhole-cutter-shaft 26. The cam-wheel 25 has a belt-groove 27 in its peripheral portion by which it is connected to a source of power for continuous motion.

The plunger 21 has a reduced stem 28 surrounded by an expansion spring 29, Fig. 2,

housed in the plunger-receiving socket 30 in the lever-arm 18 and yieldingly urging the plunger 21 in a direction toward the cam-groove 23. A screw 31, passing through a slot 32 in the wall of the socket 30 and threaded into the plunger 21, limits the in-and-out motion of the latter relative to said socket. The plunger 21 is detained from entering the cam-groove 23 by a latch-arm 33 mounted to rock upon and relative to the stationary stud-screw 34 secured to the standard 2. A spring 35 yieldingly urges the latch 33 toward the plunger 21; said latch being adapted to enter the notch 36 in the plunger 21 to detain the latter.

Mounted on the stud-screw 34, independently of the latch 33, is a manually operated bell-crank starting lever 37, 38, the arm 37 of which is connected by a vertically movable rod 39 to the usual starting treadle or finger lever (not shown) common to machines of this type. When the rod 39 is pulled downwardly to start the machine, it is locked in its down position, throughout the cycle of operations of the machine, by a latch 40 pivoted at 41 to the frame-bracket 42. The latch 40 has a laterally extended lower end 43 which engages over a collar 44 fixed to the rod 39 and detains the latter in running or dotted line position, Fig. 1. The collar 44 has an inclined under face 45 which, in the down-motion of the collar 44, engages the laterally extending lower end 43 of the latch 40 and swings the latter outwardly preparatory to the final inward movement of the latch 40 to detaining position, Fig. 7, over the collar 44. A recovery spring 45′ moves the rod 39 upwardly when the latter is released.

The arm 38 of the bell-crank starting lever 37, 38, Fig. 5, has fixed to it a boss 46 in which is journaled a rock-shaft 47 to the outer end of which is fixed a crank-arm 48 carrying a roll 49. Fixed to the inner end of the rock-shaft 47 is a latch-lever 50 having a tail 51 yieldingly held in engagement with a stop-pin 52 on the lever-arm 38 by a spring 53. The latch-lever 50 has a hook-shoulder 54 adapted to engage the lateral pin 55 carried by the latch 33, as shown in Fig. 8. The latch-lever 50 is also formed with a curved lower edge-portion 56 which engages the notch 57 in the plunger 21 and constitutes a second latch for detaining the plunger 21 from entering the cam-groove 23.

The latch 50, rock-shaft 47 and crank-arm 48, constitute latch-mechanism carried by the manually operated lever 38 and movable with the latter from initial position, Fig. 8, to running position, Fig. 9, during which movement the shoulder 54 of the latch-lever 50 is engaged with the lateral pin 55 on the latch 33 and withdraws the latch 33 from the notch 36 in the plunger 21.

Upon withdrawal of the latch 33, however, the plunger 21 is not released, as is the case in the operation of the mechanism disclosed in said Allen reissued patent, but is detained by the lower edge of the latch 50 which is curved concentrically with the stud-screw 34 and slides in the notch 57 in the plunger 21 without releasing the latter.

Mounted on the cam-wheel 25 is a tripping block 58 which is timed on the cam-wheel 25 to engage the follower-roll 49 on the crank-arm 48 and swing the latch 50 to the position shown in Fig. 10 and release the plunger 21 when the concentric portion 23′ of the cam-slot 23 is in exact register with the plunger. It will be understood that in the position of the parts shown in Fig. 8, the follower-roll 49 is out of range of the tripping block 58 and that the manually operated lever 38 shifts the latch-mechanism 50, 47, 48 from an out-of-range position to an into-range position without releasing the plunger 21; the timing of the release of the plunger 21 being controlled solely by the tripping block 58. The plunger 21, therefore, when released, invariably enters the cam-groove cleanly, i. e., without striking the face 24 of the cam-wheel or nicking the corners of the walls of the cam-groove 23.

Upon entry of the plunger 21 into the cam-groove 23, Fig. 10, the clamp-closing lever 17, 18, 19 is coupled to the cam-wheel 25 and will first be given a clamp-closing impulse in one direction, followed by a restoring impulse in the reverse direction. During the clamp-closing impulse, the parts are moved into the position shown in Fig. 11, wherein it will be observed that the plunger 21 has lifted the latch 50 sufficiently to carry the shoulder 54 out of engagement with the lateral pin 55, thereby releasing the latch 33 which is pulled over by its spring 35 into engagement with the stem of the plunger 21 at one side of the notch 36.

At the end of the reverse or restoring impulse given to the clamp-closing lever 17, 18, 19, by the cam-groove 23, the ejector-block 59 in the cam-groove 23 ejects the plunger 21 which is latched in ejected position by the latch 33, Fig. 12. It will be observed in Fig. 12 that the manually operated lever 37, 38 is still detained in running position and that the latch 50 is riding upon the lateral pin 55 thus holding the follower-roll 49 out of range of the tripping-block 58 which passes the roll 49 without striking the latter during the remainder of the cycle of operations of the machine.

Ejection of the plunger 21 by the ejector-block 59 causes its inner end to engage the lower end of the stationary stop-arm 60 which, together with the abutment screw 61, Fig. 1, engaging the arm 17, locks the clamp-closing lever against displacement from its initial or starting position.

Machines of the type under consideration commonly have a feed-wheel 62 which makes

one complete rotation per buttonhole-producing cycle and is formed with cam-grooves (not shown) for controlling the relative movement between the stitch-forming mechanism and work-clamp. The feed-wheel 62 is geared in one-to-one relation with a cam-wheel 63 on the cross-shaft 64 which is rapidly driven both prior and subsequent to the sewing operation by the constantly running rapid-feed shaft 65 through the usual clutch-connection (not shown). The first rapid movement of the feed-wheel 62 derived from the shaft 65 is utilized to rapidly shift the work-clamp from initial or buttonhole cutting position, Fig. 1, to sewing position under the needle 5, whereupon the stitch-forming mechanism is started and the feed-wheel 62, is more slowly driven by the usual stitch-feed driving mechanism disclosed in said Allen reissued patent, to place the stitches around the buttonhole. When the sewing operation is completed, the cross-shaft 64 is again coupled to the rapid-feed shaft 65 for the rapid return of the work-clamp to initial or buttonhole cutting position, Fig. 1.

During this second rapid movement of the cam-wheel 63, the tripping point 66 thereon engages the arm 67 fulcrumed at 68 on the frame bracket 42 and swings the latch 40 outwardly, thereby releasing the rod 39 which rises to its initial position shown in full lines, Fig. 1. In the return or recovery of the rod 39 and lever 37, 38, Fig. 12, the shoulder 54 of the latch 50 drops over the lateral pin 55 and the cam-edge 56 centers the notch 57 in the plunger 21; the parts being then restored to their respective initial or starting positions shown in Fig. 1 ready for a repetition of the cycle of operations.

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

1. A cam having a cam-groove, a cam-follower, means for projecting said cam-follower into said cam-groove, a latch-mechanism for detaining said cam-follower from entering said cam-groove, latch-tripping means on said cam, said latch-mechanism being initially out of range of said tripping means, and manually operated means for shifting said latch-mechanism to a position within range of said tripping means, without releasing said cam-follower.

2. A cam having a cam-groove, a cam-follower, means for projecting said cam-follower into said cam-groove, a manually operated lever, a latch mounted on said manually operated lever, latch-tripping means on said cam, said latch being movable by means of the manually operated lever from a position out of range of said tripping means to a position within range of said tripping means without by such movement releasing said cam-follower, said tripping means being timed to release said cam-follower at a point in the revolution of said cam such that said cam-follower will cleanly enter said cam-groove.

3. A cam having a cam-groove, a cam-follower, a cam-follower carrier lever having an inactive starting position, means for projecting said cam-follower into said cam-groove, a cam-follower ejector, a latch for detaining said cam-follower in ejected position, and means coacting with said cam-follower in the ejected position of the latter for locking said carrier lever in starting position.

4. A cam, a cam-follower, means for moving said cam-follower into operative engagement with said cam, a latch for detaining said cam-follower out of engagement with said cam, a manually operated member and connections for moving said latch to release said cam-follower, a second latch carried by said manually operated member and adapted to detain said cam-follower from engagement with said cam after said cam-follower is released by said first-mentioned latch, and means running with said cam for tripping said second latch to release said cam-follower.

5. A cam having a cam-groove, a cam-follower, means in said cam-groove for ejecting said cam-follower, means for projecting said cam-follower into said cam-groove, a manually operated latch for detaining said cam-follower in ejected position, a second latch engaging both said manually operated latch and said cam-follower and operating to detain said cam-follower in ejected position after it is released by said manually operated latch, and means on said cam for tripping said second latch, said follower acting in its operative movement imparted by said cam to move said second latch to release said first latch for engagement with said cam-follower when the latter is ejected from said cam groove.

In testimony whereof, I have signed my name to this specification.

EDWARD P. SPAINE.