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LOOP-TAKER MECHANISM FOR SEWING MACHINES

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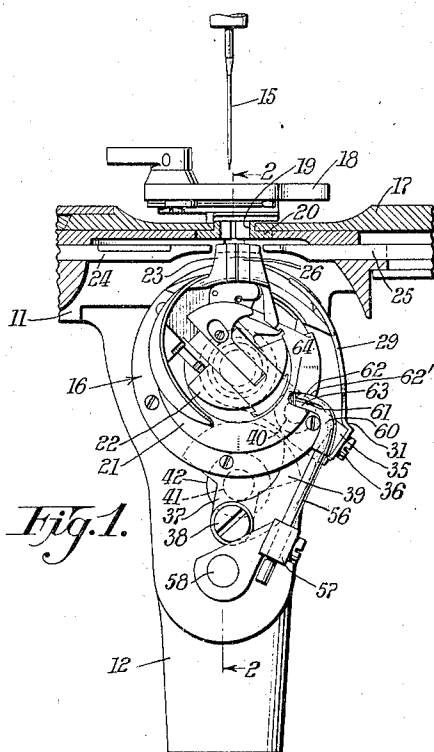


Fig. 1.

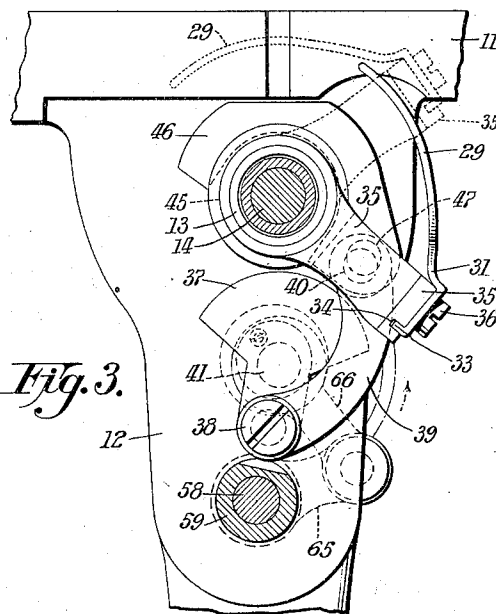


Fig. 3.

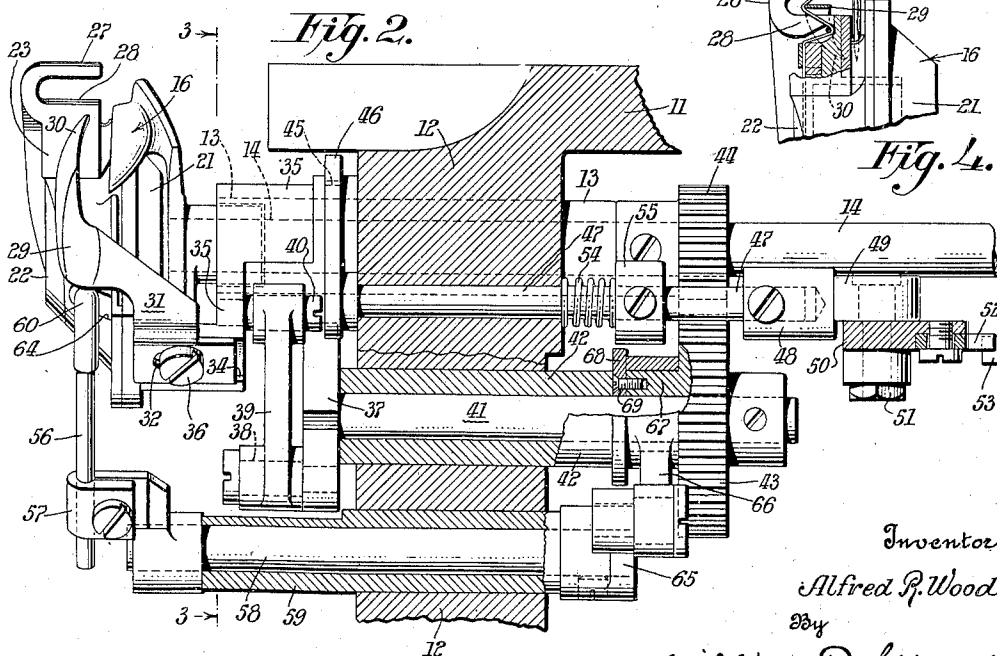


Fig. 2.

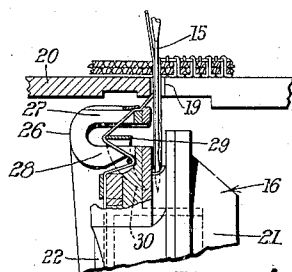


Fig. 4.

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LOOP-TAKER MECHANISM FOR SEWING MACHINES

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7 Claims. (Cl. 112—228)

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This invention relates to improvements in sewing machines, and more particularly to mechanical opener devices employed in connection with sewing machine loop-takers for providing an unobstructed passage around a thread-mass carrier for needle-thread loops cast thereabout by the loop-taker; the invention having for its primary object better to adapt devices of this character to operate at high speed with a minimum of noise.

The foregoing and other objects and advantages in view, together with means whereby the same may be carried into effect, will best be understood from the following description of a preferred embodiment thereof illustrated in the accompanying drawings, in which

Fig. 1 represents a front elevational view, partly in section, of a sewing machine equipped with my improved mechanical opener device.

Fig. 2 represents a vertical sectional view taken substantially along the line 2—2, Fig. 1, illustrating the operating mechanism for the mechanical opener.

Fig. 3 represents a vertical sectional view taken substantially along the line 3—3, Fig. 2.

Fig. 4 represents a right side elevational view, partly in section, of the stitch-forming instrumentalities, showing the bobbin-thread pull-off blade in its maximum thread pull-off position.

This application is a division of my co-pending application Serial No. 611,724, filed August 21, 1945, now Patent No. 2,438,833, March 30, 1948.

Referring more in detail to the drawings, the invention is shown as embodied in a buttonhole sewing machine constructed substantially in accordance with that forming the subject of my U. S. Patent No. 2,411,493, dated November 19, 1946. The machine has a frame including a bed 11 provided with a depending supporting lug 12. Journalled in a bushing 13 pressed into the supporting lug 12 is a rotary loop-taker shaft 14 geared to be operated by an arm-shaft (not shown) at a speed twice that of the arm-shaft. As clearly shown in my above mentioned patent, the arm-shaft is connected at the head-end of the machine to endwise reciprocate a thread-carrying needle 15 which is adapted to be vibrated in a direction crosswise of the bed 11. Cooperating with the needle 15 in the formation of lock-stitches is a loop-taker, indicated generally as 16, of the rotary hook lock-stitch type, which loop-taker is fast on the rotary shaft 14.

The work to be buttonholed is adapted to be held in a work-clamp comprising the usual lower workplate 17 and the upper clamp-foot 18, Fig. 1. The work-clamp is adapted to be moved in

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step-by-step fashion under the endwise reciprocatory and laterally vibratory needle 15, and relative to the usual needle-aperture 19 in the throat-plate 20, first away from the machine-standard and then towards the machine-standard to cause the first and second rows of side zig-zag stitches to be laid side by side in the work. The mechanism for imparting to the work-clamp its traveling movements is fully disclosed in my previously mentioned U. S. Patent No. 2,411,493, and therefore no further description will be made herein of said mechanism.

As previously indicated, the stitch-forming mechanism of the machine illustrated comprises the endwise reciprocatory and laterally vibratory thread-carrying needle 15 and the complementary rotary hook 16. The rotary hook is adapted to seize the thread-loop presented by the needle and expand such loop for passing it about the under thread-mass contained in the stationary thread-mass enclosing means of the rotary hook. The thread-mass enclosing means shown in the drawings forms the subject of my U. S. Patent No. 2,419,698, dated April 29, 1947, and therefore only sufficient reference will be made in this case to this means as will be required to give an understanding of the operation of the present invention. Suffice it to say that the thread-mass enclosing means comprises a cup-shaped carrier-member 21 and a telescopically disposed thread-case 22, defining between them a thread-mass cavity into which is inserted the usual bobbin or cop. To restrain the thread-mass enclosing means against rotation with the rotary loop-seizing beak of the loop-taker, the carrier-member 21 has extending upwardly from its periphery a substantially C-shaped projection 23, the upper portion of which is adapted to extend between the free ends of a pair of stop-plates 24 and 25 (Fig. 1), adjustably secured to the bed 11 of the machine-frame. The C-shaped projection 23 is vertically channeled to receive a correspondingly shaped upstanding projection 26 formed on the thread-case 22.

Disposed to operate between the spaced bobbin-thread-directing guides defined by the upper and lower limbs 27 and 28 of the C-shaped projection 26 (Fig. 4) is a curved thread pull-off blade 29 formed adjacent its free end with a thread-cam edge 30. At its other end, the pull-off blade 29 merges into an offset shank 31 (Fig. 2) provided with an elongated hole 32 and an inturned positioning lip 33; the lip being adapted to enter a slot 34 formed in the outer end of a carrier-lever 35 which embraces and is freely journaled at its

inner end on the exposed end of the hook-shaft bushing 13. A clamp screw 36 passing through the elongated hole 32 and threaded into the carrier-lever 35 adjustably secures the blade 29 to said lever 35. The lip 33, when disposed in the slot 34, prevents the pull-off blade 29 from turning about the clamping screw 36. As the carrier-lever 35 is actuated to fulcrum on the periphery of the hook-shaft bushing 13, the pull-off blade 29 moves into and out of thread-engaging position between the limbs 27 and 28 of the C-shaped projection 23. When the pull-off blade 29 is advanced from its retracted position, shown in full-lines in Fig. 3, to its advanced position, shown in dotted lines in the same figure, the thread-cam edge 30 is adapted to contact and deflect laterally the portion of the bobbin-thread leading from the lower to the upper limb of the C-shaped projection 26 and form a bight in the thread between the limbs of the projection, in the manner shown in Fig. 4. The blade 29, in forming the bight in the bobbin-thread, draws from the supply within the thread-case 22 a length of thread sufficient to form a bobbin-thread loop of a size such that it may be pulled through to the upper side of the work so that in the finished seam the needle-thread will lie in substantially a straight line adjacent the buttonhole slit. It will be noted that the limbs 27 and 28 of the C-shaped projection 23 are rather closely spaced apart. This is advantageous for the reason that the bobbin-thread extending between the limbs 27 and 28 is relatively short. It is, in fact, so short that, when the thread-cam edge 30 of the pull-off blade engages the thread, any inherent elasticity in the thread does not militate against the drawing of a uniform length of thread from the supply during each stroke of the pull-off blade.

The mechanism for actuating the bobbin-thread pull-off blade 29 preferably comprises a counter-balanced crank 37 (Fig. 3) having a crank-pin 38 connected by a link 39 to a pin 40 threaded into the carrier-lever 35. The counter-balanced crank 37 is carried on the outer end of a horizontally disposed rotary actuating shaft 41 journaled in a bearing bushing 42 pressed into the supporting lug 12. Secured on the other end of the actuating shaft 41 is a gear 43 in mesh with a half-size gear 44 fast on the hook-shaft 14. Through the mechanism just described, rotation of the hook-shaft 14 imparts to the actuating shaft 41, through the gearing 43 and 44, rotary movements at one half the speed of the hook-shaft. In other words, the pull-off blade 29 is given one complete to-and-fro actuation for each stitch-forming cycle. As the actuating shaft is rotated, the counterbalanced crank 37 imparts to the carrier-lever 35, through the link 39 and pin 40, a motion causing the carrier-lever to oscillate about the bushing 13. The pull-off blade 29, which is secured to the carrier-lever, is thereby swung about the axis of the rotary hook 16 and is timed to begin its advance as the needle is starting down and to complete its advance at about the time the needle reaches the limit of its down-stroke. The pull-off blade 29 dwells in its advanced position (dotted lines in Fig. 3) while the needle is throwing out a loop of upper thread for seizure by the rotary hook 16. The pull-off then retracts so that slack bobbin-thread is available to be absorbed into the next stitch when the needle-loop is pulled up by the usual needle-thread take-up mechanism. At the time of initial engagement of the pull-off blade 29 with the bobbin-thread, said blade is moving at a speed

considerably less than that of the rotary hook 16. This fact, coupled with the gradual incline of the thread-cam edge 30, results in the pull-off blade engaging the bobbin-thread with a smooth action, thus avoiding a jerking of the bobbin-thread and minimizing any tendency toward over-running or spilling of thread by the bobbin or cop.

Provision is made for rendering the pull-off blade 29 ineffective during the sewing of the barring stitches at each end of the buttonhole so that the locking points of these stitches will not be pulled through the work as are the side stitches of the buttonhole. To this end, the working position of the carrier-lever 35 is shifted longitudinally of the bushing 13 so that the free end of the pull-off blade will, in its advance, miss the bobbin-thread, as shown in my co-pending application Serial No. 611,724, of which this is a division. To effect this shifting of the pull-off blade 29, the hub of the carrier-lever 35 is formed with a circumferential groove 45 which is entered by the half-round recessed portion of an arm 46 (Fig. 3) on a slide-shaft 47 journaled in the supporting lug 12. At its rearward end, the slide-shaft 47 has adjustably fastened on it a head 48 adapted to be contacted by a roller 49 journaled on the free end of a horizontally disposed swing-lever 50 pivoted on a stud 51 threaded into the bed 11. The lever 50, at its free end, adjustably carries a cam-follower 52 disposed to be engaged by a cam-section 53 secured on the usual feed-cam (not shown). In the operation of the machine, the feed-cam is rotated once during each complete buttonholing cycle. When the cam-section 53 on the feed-cam engages the cam-follower 52, the swing-lever 50 is moved in a direction away from the feed-cam, causing the roller 49 to move into engagement with the head 48 of the slide-shaft 47 and shift the same outwardly against the action of a coil-spring 54 acting between a collar 55 on the slide-shaft and the supporting lug 12. When the slide-shaft 47 is shifted, the carrier-lever 35, through the medium of the arm 46, is moved outwardly on the bearing bushing 13 and to the extent that the point of the pull-off blade 37 entirely misses the bobbin-thread and no bobbin-thread is pulled off during the formation of the barring stitches. After the completion of the last barring stitch and the cam-section 53 has moved beyond the cam-follower 52, the coil-spring 54 acts to return the pull-off blade 29 to its effective position, which position is determined by the hub of the arm 46 striking the supporting lug 12. It will be understood that the pin 40 slides relative to the upper end of the link 39 during the shifting of the pull-off blade and, consequently, the driving relationship of the pull-off blade actuating mechanism is not interrupted. It will be understood that the timing of the shift of the pull-off blade from effective to ineffective position can be regulated by virtue of the adjustment of the cam-follower 52 on the swing-lever 50. Moreover, the ineffective position of the pull-off blade can be accurately determined by adjusting the head 48 lengthwise of the slide-shaft 47.

As mentioned above, the bobbin supply is adapted to be housed in a thread-mass enclosing means including a thread-case 22 and a carrier 21 therefor; the thread-case and carrier being restrained against rotation with the rotary loop-taker 16 by means of the loosely interengaging projection 23 and stop-plates 24 and 25. As a result of the frictional drag between the bearing rib on the thread-case carrier and the raceway in the loop-taker,

the thread-case and its carrier have a normal tendency to rotate with the loop-taker, thereby causing the rotation-restraining projection 23 to bear against the stop-plate 25. In order to obtain a free passage on each side of the projection 23 for the unobstructed free travel of the needle-thread loop about the thread-case and its carrier during stitch-formation, the thread-case and its carrier are intermittently oscillated, to a limited extent, in a direction opposite to the direction of rotation of the loop-taker. This oscillation is effected by means of a mechanical opener comprising an opener-arm 56 (Figs. 1 and 2) which is adjustably clamped at its lower end in a split socket-member 57 fast on the outer end of a rock-shaft 58 journaled in a horizontal bushing 59 pressed into the supporting lug 12. At its upper end, the opener-arm 56 is bent or offset, as at 60, to provide a hook-shaped end extending toward the thread-case 21; the hook-shaped end being notched, as at 61, Fig. 1, to form spaced resilient fingers 62 and 63 adapted to enter an opener-finger receiving pocket 64 formed in the thread-case carrier 21 on the cast-on side thereof. The fingers 62 and 63, as shown in Fig. 1, have rounded free ends and the upper finger 62 is preferably lengthwise convexly curved as at 62' to provide a cam-face so that there is a smooth cam-like initial engagement of the upper finger 62 with one side of the thread-case carrier pocket 64 to initiate an oscillation of the thread-case carrier in a direction reverse to the direction of rotation of the hook-body, and that following this engagement the lower finger 63 resiliently engages the other side of the pocket 64, whereby the rotation-restraining projection 23 is maintained stationary substantially midway between the stop-plates 24 and 25. The spaced resilient fingers 62 and 63 serve to provide a relatively noiseless mechanical opener, as well as one which maintains the rotation-restraining projection on the thread-mass enclosing means stationary and in position such that an open thread passage exists on both sides of the projection for the free unobstructed travel of the needle-thread loop.

The opener-arm rock-shaft 58 is actuated by means of a rock-lever 65 which is connected to one end of a short pitman 66 embracing at its other end an eccentric 67 preferably integral with the gear 43. Separating the pitman 66 from the end of the bushing 42 is a disk 68 secured to the eccentric 67 by a screw 69, (Fig. 2).

From the above description taken in connection with the accompanying drawings, it will be understood that I have devised a mechanical opener mechanism in which the thread-case carrier engaging means includes spaced resilient fingers adapted to engage spaced shoulders on the thread-case carrier with a smooth cam-like action, reducing to a minimum the noise of impact between the fingers and the thread-case carrier. Also, after the fingers have moved into engagement with the shoulders on the thread-case carrier, the rotation-restraining projection on the thread-case carrier is firmly held spaced from the oppositely disposed stop-plates 24 and 25, whereby a free thread-passageway is provided for the needle-thread loop.

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

1. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker, a thread-mass carrier journaled in said rotary loop-taker and having a pocket formed therein, means for restraining rotation of said thread-

mass carrier with said loop-taker, and a mechanical opener for providing a thread passage past said rotation-restraining means, said mechanical opener including an opener-member having a pair of resilient fingers adapted to engage the opposite sides of said pocket.

2. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker cooperating with said needle in the formation of stitches, a thread-mass carrier journaled in said loop-taker and having a pocket providing spaced shoulders, means for restraining rotation of said thread-mass carrier with said loop-taker, and means for opening a thread passage past said rotation-restraining means including an opener-member having a pair of fingers, one of said fingers being adapted to engage one of said shoulders to initiate oscillation of the thread-mass carrier in a direction reverse to the direction of rotation of said loop-taker and the other of said fingers adapted to engage the second shoulder to arrest the oscillation of said thread-mass carrier.

3. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker cooperating with said needle in the formation of stitches, a thread-mass carrier journaled in said loop-taker, means for restraining rotation of said thread-mass carrier with said loop-taker, and means for opening a thread passage past said rotation-restraining means including an opener-member engageable with said thread-mass carrier to initiate oscillation of the thread-mass carrier in a direction reverse to the direction of rotation of said loop-taker and again to engage said thread-mass carrier to arrest the oscillation of said thread-mass carrier so that an open thread passage exists on opposite sides of the rotation-restraining means.

4. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker cooperating with said needle in the formation of stitches, a shaft carrying said loop-taker, a thread-mass carrier journaled in said loop-taker, means for restraining rotation of said thread-mass carrier with said loop-taker, and means for opening a thread passage past said rotation-restraining means including an opener-arm, a rock-shaft supporting said opener-arm and arranged substantially parallel with said loop-taker shaft, a rock-lever fast on said rock-shaft, an eccentric geared to said loop-taker shaft to rotate at one half speed of the loop-taker shaft, and a pitman connecting said eccentric with said rock-lever.

5. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker, a thread-mass carrier journaled in said loop-taker and having opposed shoulders formed thereon, means for restraining rotation of said thread-mass carrier with said loop-taker, and a mechanical opener for providing a thread passage past said rotation-restraining means, said mechanical opener including an opener-arm having an offset free end longitudinally notched to provide a pair of resilient fingers adapted to engage the opposed shoulders on said thread-mass carrier.

6. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker cooperating with said needle in the formation of stitches, a shaft carrying said loop-taker, a thread-mass carrier journaled in said loop-taker and having opposed shoulders formed thereon, means for restraining rotation of said thread-

mass carrier with said loop-taker, and opener-means for providing a thread passage past said rotation-restraining means, said opener-means including a rock-shaft spaced from and arranged parallel to said loop-taker carrying shaft, an opener-arm adjustably secured at one end to said rock-shaft and at its other end bent into hook-shape to extend toward said thread-mass carrier, said hook-shaped end being formed with spaced fingers each adapted to engage one of the opposed shoulders on said thread-mass carrier.

7. In a lock-stitch sewing machine, a reciprocatory thread-carrying needle, a rotary loop-taker, a thread-mass carrier journaled in said loop-taker and having opposed shoulders formed thereon means for restraining rotation of said thread-mass carrier with said loop-taker, and a me-

chanical opener for providing a thread passage past said rotation-restraining means, said mechanical opener including an opener-arm provided at its thread-mass carrier engaging portion with spaced resilient fingers each having a rounded free end and one throughout its length being lengthwise convexly curved.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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