STITCH-FORMING MECHANISMS FOR SEWING MACHINES

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This invention relates to improvements in lock-stitch sewing machines and more particularly to improvements in sewing machine loop-taker and thread-case combinations designed to cast loops of needle-thread about an interlocking thread housed within the thread-case.

In zigzag sewing machines of the lock-stitch variety in which the loop-taker is journaled rearwardly of the path of needle-reciprocation for clockwise rotation about an axis substantially parallel to the line of feed, the lead of the bobbin-thread is preferably such that, in the forward feed of the work, the stitches forming one side of the line of zigzag stitches are of the type commonly referred to in the trade as "perfect" lock-stitches and the stitches forming the other side of the line of zigzag stitches are of the type commonly referred to as "hitch" lock-stitches. These two types of lock-stitches are fully illustrated and described in the U. S. patent to H. Hemleb, No. 1,877,727, issued September 29, 1932.

When using the concerned stitch-forming devices in a cooperative relation such as shown in the accompanying drawing, the formation of a perfect lock-stitch tends to untwist the strands of the readily obtainable standard left-twist thread, while the formation of a hitch lock-stitch tends to twist or tighten the strands of the left-twist thread and to an extent in excess of the untwisting action on the thread caused by the production of the perfect lock-stitch. The formation of stitches in which the strands of the needle-thread are untwisted is undesirable for the reason that the needle-thread becomes frayed to the extent that it breaks or is not readily formed into a loop by the ascending needle for seizure by the loop-taker.

In view of the untwisting of the needle-thread during the formation of perfect lock-stitches, it is desirable in a zigzag lock-stitch machine of the type illustrated in the accompanying drawing to alternately and unerringly produce perfect lock-stitches and hitch lock-stitches. The result of this alternate formation of perfect and hitch stitches is a twisting of the needle-thread in a manner such as to be favorable to the standard left-twist thread.

It is the primary object of the present invention to provide, in a zigzag lock-stitch sewing machine, means whereby the stitch-forming mechanism will alternately and unerringly effect the production of perfect lock-stitches and hitch lock-stitches, the two types of stitches being formed on their respective sides of the line of zigzag stitches throughout the entire seam.

A further object of the invention is the provision of means whereby the lead of the bobbin-thread can be varied in accordance with a selected amplitude of vibration of the needle in order to insure the alternate production of perfect lock-stitches and hitch lock-stitches.

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

In the accompanying drawing,

Fig. 1 is a fragmentary view, partly in elevation, of a sewing machine equipped with a horizontal axis rotary loop-taker embodying the invention.

Fig. 2 is a vertical sectional view taken longitudinally of the sewing machine and substantially along the axis of rotation of the rotary loop-taker.

Fig. 3 is a view similar to Fig. 1, but showing the path of the bobbin-thread when the sewing machine is adjusted to sew a straightaway seam instead of a zigzag seam.

Fig. 4 is a perspective view of the thread-case.

Fig. 5 is a top-plan view of the work and a portion of the rotary loop-taker with the usual needle-aperture of the throat-plate shown in a dot-and-dash line, showing a plurality of stitches in the work and the lead of the bobbin-thread relative to the needle when the latter has penetrated the work at the hitch-stitch side of the zigzag seam.

Fig. 6 is a view similar to Fig. 5, but showing the lead of the bobbin-thread relative to the needle when the latter has penetrated the perfect stitch sides of the zigzag seam.

Fig. 7 is a view similar to Fig. 5, but showing the preferred lead of the bobbin-thread when the sewing machine is adjusted to produce a straightaway seam.

Fig. 8 is a diagrammatic view illustrating the so-called "perfect" lock-stitch.

Fig. 9 is a diagrammatic view illustrating the so-called "hitch" lock-stitch.

Referring to the drawing, the present improvement has been embodied in a sewing machine such as disclosed in the U. S. patent to C. F. Gray, No. 1,020,088, dated March 12, 1912. The sewing machine has a vertically reciprocatory and laterally vibratory needle 1, and the machine...
may be employed for making either zigzag or straightaway stitch seams. The work is supported by a throat-plate 2 provided with the usual feed slots 3 for a work-advancing feeding device 4. Said throat-plate also having a needle-appearing aperture 5 which in the present case, is elongated transversely of the line of feed to accommodate lateral vibrations of the needle.

Cooperating with the needle 1, in the formation of lock-stitches, is a rotary loop-taker 6 disposed below the throat-plate 2 and preferably of the rotary hook type. The loop-taker 6 is carried by a horizontally disposed loop-taker shaft 7 having its axis disposed substantially in a vertical plane containing the normal line of feed of the work, the loop-taker having a cup-shaped body provided at the outer edge of its periphery with a needle-thread loop-seizing beak 8 and a loop-discharging tail 9 adjacent and directed oppositely to the beak 8. Formed in the cup-shaped body of the loop-taker 6 is an internal raceway 10 of which the outer side wall is provided by a detachable rib 11 secured to the loop-taker body by screws 12.

Disposed within the cup-shaped hook-body 1 is a two-part thread-case (Fig. 2) comprising a base-section 13 and a telescopically arranged cap-section 14. The base-section 13 is cup-shaped and is formed externally adjacent its rim with the usual peripheral bearing rib 15 which is journaled in the raceway 10 provided in the hook-body. At the outer edge of the rim of the base-section 13 there is provided a flange 16 having in its outer or front face a rotation-restraining notch 17 adapted to be entered by the tongue of the usual rotation-restraining bar (not shown) common to rotary lock-stitch sewing machines. Adjacent the rotation-restraining notch 17 the flange 16 is formed with a bobbin-thread guiding slot 18 which is separate and distinct from the rotation-restraining notch 17. Extending axially from the bottom wall of the base-section 13 is a cylindrical bobbin-supporting post 19 recessed at 20 to provide a head 21. Slightly mounted on the bobbin-supporting post 19 is a tubular member 22 extending inwardly from the cap-section 14, which tubular member freely receives the regular thread-carrying bobbin-member 23 (Fig. 2). The cap-section 14 is secured in proper position upon the bobbin-supporting post 19 by a latching device 24, the constructive features of which are fully disclosed in the U.S. Patent No. 1,995,278, issued to C. A. Kessler on March 19, 1935.

As clearly shown in Fig. 4, the cap-section 14 includes a thin vertical circular face-portion 25 terminating at its periphery in a horizontal cylindrical skirt-portion 26 notched, as at 27, and grooved, as at 28, to receive and guide the bobbin-thread 29 which leads from the bobbin-member 23 across the outer surface of the face-portion 25 of the thread-case. To apply the necessary tension on the bobbin-thread 29 there is secured on the face-portion 25 a tension-spring 30 having at its free end the inturbed lip notched at 31 to receive and guide the bobbin-thread 29. The tension applied on the bobbin-thread by the spring 33 can be regulated by the screw 32 which is threaded into the face-portion 25 of the cap-section 14.

Cooperating with the notched tension-spring 30 in properly leading the bobbin-thread 29 relative to the needle 1 is a thread-guide in the form of a thread-delivery slot 33 having a closed end and an open end; said thread-delivery slot being provided in a flat plate 34 secured by means of a screw 35 upon the face-portion 25 of the cap-section 14. To provide means permitting the position of the thread-guide to be varied transversely of the seam-line, the screw 35 passes through an elongated aperture 36 provided in the flat plate 34. By loosening the screw 35 the thread-guide can be shifted to the desired location. To assist in maintaining the thread-guide in its proper position the bottom edge of the flat plate 34 rests upon a shoulder 37 formed on the upper edge of that guide defining one side of the usual guideway in which slides the regular latch device. The thread-guide adjustably mounted is that the lead of the bobbin-thread can be regulated in accordance with selected amplitudes of vibration of the needle in order to insure that the needle in its successive work-penetrations will pass on the opposite sides of the bobbin-thread, thereby to effect the desired alternate production of perfect lock-stitches and hitlock-stitches. It will be understood that as the amplitude of the needle-vibration is reduced the lead of the bobbin-thread, such that perfect lock-stitches and hitlock-stitches are alternately formed, becomes more critical. By mounting the thread-guide so that the thread-slot 33 can be shifted transversely of the seam line the required degree of accuracy in the lead of the bobbin-thread can be readily obtained. When I have shown the thread-slot 33 as having an open end to facilitate threading, it will be appreciated that the thread-slot may be formed as an aperture without in any way affecting its action.

In operation, when the bobbin-thread 29 passes from the notch 31 in the adventitious slot 30 to the thread-slot 33, thence through the rotation-restraining notch 17 to the work, the lead of the bobbin-thread is such that when the needle 1 is descending through the work at the left-hand side of the zigzag seam (i.e., along the line a, Fig. 6), the needle passes the bobbin-thread 29 on the left-hand side of the latter, as shown in Fig. 6. The result of this relation of bobbin-thread lead to the needle, when concatenating the needle-thread and the bobbin-thread to produce a lock-stitch, is the formation of a perfect lock-stitch, shown diagrammatically in Fig. 8. When the needle 1 descends through the work at the right-hand side of the zigzag seam (i.e., along the line b, Fig. 5), the needle passes the bobbin-thread 29 on the right-hand side of the latter, as shown in Fig. 5. The result of this relation of bobbin-thread lead to the needle, when concatenating the needle-thread and the bobbin-thread to produce a lock-stitch, is the formation of a hitch lock-stitch, such as shown in Fig. 9. When the needle and loop-taker cooperate in the manner shown in the drawing, the spiralling of the needle-thread around the bobbin-thread continuously in the same direction results in the formation of perfect lock-stitches, see Fig. 8. The spiralling of the needle-thread to effect the formation of the perfect lock-stitch tends to untwist the conventional left-twist thread, thus causing the needle-thread to fray and break or to bow out and form the usual thread-loop for seizure by the advancing beak of the loop-taker. When the needle and loop-taker cooperate to form lock-stitches in which the needle-thread makes a series of knots on half-latches around the bobbin-thread, see Fig. 9.
the concatenation of the two threads is such as to tighten the twist of the conventional left-twist thread. It is desirable that the inherent twist of the thread with which the sewing is done be conserved so that the normal characteristics of the thread will not be lost. With these facts in mind, it will be appreciated that, if in the type of machine illustrated, the formation of a perfect lock-stitch tends to untwist a conventional left-twist thread and the formation of a hitch lock-stitch tends to tighten a left-twist thread, it is necessary to alternately produce perfect lock-stitches and hitch lock-stitches in order not to affect the normal twist of the thread.

It will be understood from the foregoing that I have provided simple means for insuring the alternate production of perfect lock-stitches and hitch lock-stitches. Furthermore, provision has been made so that, as the amplitude of vibration of the needle is adjusted, the lead of the bobbin-thread can be accurately controlled in accordance with the selected amplitudes of vibration, whereby the alternate formation of perfect lock-stitches and hitch lock-stitches is insured.

It is desirable in zigzag sewing machines that provision be made whereby the amplitude of needle-vibration can be reduced to zero to enable the machine to produce straightaway seams. To provide for this contingency the thread-case 18 is formed with the usual bobbin-thread guiding slot 15 into which the bobbin-thread 29 is placed (Fig. 3) when the sewing machine is adjusted to produce a straightaway seam. When the bobbin-thread is directed to the work by the thread-guiding slot 15, the lead of the bobbin-thread is such that the needle passes the bobbin-thread on the right-hand side of the latter. By so doing hitch lock-stitches are continuously formed. Inasmuch as hitch lock-stitches favorably twist the conventional left-twist thread, when the stitches are formed by a machine in which the concerned stitching instrumentalities are arranged as illustrated in the accompanying drawing, the sewing machine operates satisfactorily.

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

1. In a zigzag sewing machine, an endwise reciprocatory thread-carrying needle having laterally vibratory movements of variable amplitude, a circularly moving loop-taker cooperating with said needle in the formation of lock-stitches, a thread-case for an interlocking bobbin-thread disposed within said loop-taker and restrained against movement with said loop-taker, said thread-case having a face-portion, a thread-guide secured to said face-portion for directing the interlocking bobbin-thread in a predetermined relation with respect to said needle, and means providing for variation of the position of said thread-guide in accordance with selected amplitudes of vibration of said needle.

2. In a zigzag sewing machine, an endwise reciprocatory thread-carrying needle having laterally vibratory movements of variable amplitude, a circularly moving loop-taker cooperating with said needle in the formation of lock-stitches, a thread-case for an interlocking bobbin-thread disposed within said loop-taker and restrained against movement with said loop-taker, said thread-case having a face-portion, a thread-guide for directing the interlocking bobbin-thread in a predetermined relation with respect to said needle, and having a thread-directing opening therein, and means securing said plate to said face-portion with capacity for varying the position of the thread-directing opening in accordance with selected amplitudes of vibration of said needle.

3. In a zigzag sewing machine, an endwise reciprocatory thread-carrying needle having laterally vibratory movements of variable amplitude, a feeding mechanism, a circularly moving loop-taker movable in a plane transversely of the normal line of feed, and cooperating with said needle in the formation of lock-stitches, a thread-case for an interlocking bobbin-thread disposed within said loop-taker and restrained against movement with said loop-taker, a thread-guide for directing the interlocking bobbin-thread in a predetermined relation with respect to said needle, and means providing for variation of the position of said thread-guide transversely of the normal line of feed in accordance with selected amplitudes of vibration of said needle.

4. In a zigzag sewing machine, an endwise reciprocatory thread-carrying needle having laterally vibratory movements of variable amplitude, a circularly moving loop-taker cooperating with said needle in the formation of lock-stitches, a thread-case for an interlocking bobbin-thread disposed within said loop-taker and restrained against movement with said loop-taker, said thread-case having a face-portion, a thread-guide for directing the interlocking bobbin-thread in a predetermined relation with respect to said needle, said thread-guide comprising a plate secured flat against the face-portion of said thread-case and having a thread-directing opening therein, and means securing said plate to said face-portion with capacity for varying the position of the thread-directing opening in accordance with selected amplitudes of vibration of said needle.

5. In a zigzag sewing machine, an endwise reciprocatory thread-carrying needle having laterally vibratory movements of variable amplitude, a circularly moving loop-taker cooperating with said needle in the formation of lock-stitches, a thread-case for an interlocking bobbin-thread disposed within said loop-taker and restrained against movement with said loop-taker, said thread-case having a face-portion, a thread-guide for directing the interlocking bobbin-thread in a predetermined relation with respect to said needle, said thread-guide comprising a plate secured flat against the face-portion of said thread-case and having formed therein a thread-directing opening and an elongated aperture, and a screw extending through said elongated aperture and threaded into the face-portion of said thread-case.

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