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CHAIN STITCH DEVICES FOR LOCK STITCH SEWING MACHINES

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Fig. 6

Fig. 6a

Fig. 7

Fig. 7a

Fig. 8

Fig. 8a

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This invention relates to sewing machines, and more particularly, to devices for converting a lock stitch sewing machine into a chain stitch sewing machine.

It is an object of this invention to provide an improved device attachable to a lock stitch sewing machine for converting the machine to chain stitch formation.

A further object of this invention is to provide chain stitch conversion devices of the above character in which the manipulation of the thread is made more foolproof than has heretofore been possible.

Still another object of this invention is to provide chain stitch conversion devices comprising stationary elements fixedly secured relatively to the sewing machine frame and adapted to cooperate with the regular lock stitch forming instrumentality of the sewing machine including needle, loop taker, needle thread take-up and work feeding mechanism unaltered in structure or cooperative relation from that required for the formation of lock stitches.

The objects of the invention are accomplished by providing an upwardly projecting loop retaining member on the bobbin supporting case which is supported in the loop taker. The top of the loop retaining member extends into proximity to the point of needle penetration of a loop of thread entrapped on the loop retaining member on the side opposite from the direction of feed. A thread guide located on the work support between the loop retaining member and the point of needle penetration is formed with a bottom surface disposed lower than the highest point reached by the top of the loop retaining member. Reciprocation of the loop retaining member in timed relation with the reciprocation of the needle enables the loop retaining member to retain a loop until it is ensured that a second loop from the needle will be passed through it and seized by the loop taker. A loop is entrapped on the loop retaining member until the loop retaining member is depressed below the level of the bottom surface of the thread guide.

The proximity of the loop retaining member to the point of needle penetration minimizes the length of the thread loop formed on the loop retaining member so that when cast from the loop retaining member the small loop may be set quickly into the work. Moreover, the small size of the retained thread loop obviates interference with the loop by the loop taker. The nearness of the loop retaining member to the point of needle penetration and its transverse dimension provides for a retained thread loop in which the limits diverge from the point of needle penetration at a wide angle so that the needle carrying the needle thread will pass through it without mishap. Since the loop retaining member is on the bobbin supporting case and in one position its top is above the level of the bottom surface of the thread guide, a loop of thread carried away from the bobbin supporting case by the loop taker must be entrapped on the loop retaining member. The loop retaining member may be connected to an insert replacing a conventional bobbin in the bobbin supporting case and the thread guide may be connected to a throat plate incorporating the needle aperture so that an ordinary lock stitch sewing machine can be easily converted to sew chain stitches. Means on the feed dog acting in opposition to spring means on the loop retaining member may be used to reciprocate the loop retaining member, and means may be incorporated in the loop retaining member to limit its upward movement.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings in which:

FIG. 1 represents a head end elevational view of a lock stitch sewing machine with the bracket arm cover plate removed and portions of the bed in section to illustrate the stitch forming instrumentality having the chain stitch conversion device of this invention applied thereto.

FIG. 2 is a top plan view of the bobbin supporting case.

FIG. 3 is a top plan view of a bobbin insert to which is connected a finger carrying a loop retaining member.

FIG. 4 is a cross sectional view taken substantially along the line 4-4 of FIG. 3.

FIG. 5 is a bottom plan view of a throat plate with a thread guide.

FIG. 6 represents a perspective view of fragments of the stitch forming instrumentality incorporating the chain stitch conversion device of this invention with the loop taker having carried a loop of needle thread partially around the loop taker.

FIG. 6a is a vertical cross sectional view taken substantially along the line 6a—6a of FIG. 6.

FIG. 7 represents a perspective view of fragments of the stitch forming instrumentality similar to that of FIG. 6 with the loop of needle thread entrapped on the loop retaining member.

FIG. 7a is a vertical cross sectional view taken substantially along the line 7a-7a of FIG. 7.

FIG. 7b is a detail bottom plan view of the area surrounding the needle aperture in the throat plate with the loop of needle thread entrapped on the loop retaining member.

FIG. 8 represents a perspective view of fragments of the stitch forming instrumentality similar to that of FIG. 7b with the loop of needle thread released from the loop retaining member and a second loop formed through the first loop, and

FIG. 8a is a vertical cross sectional view taken substantially along the line 8a—8a of FIG. 8.

This invention provides for the conversion to single thread chain stitch sewing of a conventional lock stitch sewing machine. FIG. 1 illustrates a head end elevational view of a conventional household lock stitch sewing machine to which this invention may be applied.

The sewing machine frame includes a bed 11 from which rises a standard 12 supporting a bracket arm 13 overhanging the bed. A main shaft 14 journaled lengthwise in the bracket arm drives all of the moving parts of the sewing machine and may be actuated by an electric motor (not shown), by foot treadle or the like.

A counterbalanced crank 15 on the main shaft 14 is operatively connected by means of a drive link 16 to a needle bar 17 endwise slidable in a bearing 18 in the bracket arm and carrying at its lower extremity an eye pointed needle 19. The crank 15 also actuates a needle thread take-up lever 20 of which the motion is constrained by an anchor link 21. The path of a needle thread passes from a supply (not shown) to a thread tensing device 22, through an eyelet 23 in the takeup lever 20, and then through appropriate guides, such as the thread guide 24 on the needle bar 17, and to the needle eye. This needle thread control arrangement is typical of that which is required for lock stitch formation. The use of the chain stitch conversion devices of this invention will operate successfully, however, with such lock stitch type needle thread controls.
taker indicated generally at 31. The loop taker illustrated in the drawings is a vertical axis rotary hook adapted to partake of two revolutions for each reciprocation of the needle. The loop taker is formed with a cup shaped body portion 32 formed with an inwardly extending loop seizing beak 33 adapted to engage and manipulate loops of thread from the needle 19 which as illustrated in FIG. 6 reciprocates in a path which passes inwardly of the cup shaped loop taker body portion.

A bobbin case 34 is journaled within the loop taker body portion 32 and constrained against rotation therewith by means of a rotation restraining assembly including a spring 36 carried on the bed 11 which spring engages an abutment 37 on the bobbin case 34. A bobbin accommodating cavity 38 is formed in the bobbin case within which a conventional thread carrying bobbin (not shown) may be placed with freedom to rotate.

The needle and loop taker thus far described are capable of producing lock stitches in a conventional manner. The loop seizing beak 33 of the loop taker will engage and carry loops of thread completely about the bobbin case and thus if a threaded bobbin is in place in the bobbin case the needle and bobbin threads will be concatenated into a true lock stitch (Federal type #301 needle) by needle penetration. The loop taker may be driven at two revolutions for each needle reciprocation by means of a shaft 40 in the standard 12 driven by bevel gears 41 from the main shaft and connected in turn by bevel gears 42 to a bed shaft 43 which drives the loop taker shaft 30 by a set of bevel gears 44.

Illustrated in FIG. 1 is a work feeding mechanism of the "drop feed" variety. A feed dog 49 formed with a transverse web 50 operates through slots 51 in a throat plate 52 and is secured by screws 53 to a feed bar 54 beneath the bed. Feed advance and return movements are driven by a feed bar gear of an oscillating feed advance rock shaft 55 connected to the feed bar by means of a rock arm 56. The feed advance rock shaft 55 is oscillated by means of conventional connections 57 in the standard from a feed cam 58 on the main shaft 14. The connections 57 may include conventional regulating means 59 for varying the stitch length. Rising and falling motion is imparted to the feed bar from an oscillating feed lift rock shaft 60 in the bed. The feed lift rock shaft 60 is provided with a rock arm 61 connected by means of a link 62 to the feed bar 54. The feed lift rock shaft is oscillated by means of conventional connections 63 in the standard from a feed lift eccentric 64 on the main shaft 14. It will be appreciated that as is conventional in the art the work feeding mechanism is timed relatively to the needle reciprocation so that the feed dog is lifted and advanced while the needle is raised out of any work on the throat plate, and the feed dog is lowered beneath the throat plate and returned while the needle descends.

Referring to FIGS. 2-5, the conversion device for rendering the above described lock stitch sewing machine suitable for sewing chain stitches includes a cylindrical bobbin insert 70 which seats in the cavity 38 formed in the bobbin case 34 in place of the conventional thread carrying bobbin. The bobbin insert 70 carries a finger 71 which has an upturned loop retaining member 72 at its free end. The finger 71 is pivoted in a slot 73 in the top of the bobbin insert 70 by means of a roll pin 74 or other suitable connection. A compression spring 75 is secured in a recess 76 in the bottom of the slot 73 serves to bias the loop retaining finger 71 upward. A bevel 77 on the extremity of the finger 71 opposite from the loop retaining member 72 may serve by engagement with the bottom of the slot 73 to limit the upward movement of the loop retaining member 72. The bobbin insert 70 is equipped with an annular channel 78 around its circumference and a vertical hole 79 to facilitate insertion and removal from the bobbin case 24. The bobbin insert 70 may be composed of aluminum to simulate the lightweight characteristics of a bobbin.

Cooperating with the loop retaining member 72 on the bobbin insert 70 is a thread guide or depending step 80 formed in the bottom of the throat plate 52 in close proximity to a needle aperture 81 in the throat plate 52. The depending step 80 may be easily formed by a machine cut in the metal from which the throat plate 52 is formed.

Referring to FIGS. 6, 7 and 8 and the companion FIGURES 5a, 5b, 5c and 5d, the operation of a sewing machine fitted with the chain stitch conversion devices of this invention may be described.

FIGS. 6 and 6a illustrate the position of the parts of the sewing instrumentality of the sewing machine during the formation of chain stitches when the loop seizing beak 33 of the loop taker has carried a loop 90 of thread partially around the bobbin case 34. The top of the loop retaining member 72 is blased up against the bottom of the throat plate 52 by the compression spring 75. There is a clearance gap 91 between the loop retaining member 72 and the depending step 80 to clear the arc described by the top of the loop retaining member 72 as it pivots about the roll pin 74. The gap 91 may be larger than is necessary for arc clearance to permit looser manufacturing tolerances.

FIGS. 7, 7a and 7b illustrate the position of the parts after the loop 90 has become entrapped on the loop retaining member 72. As long as the loop of the loop retaining member 72 is above the level of the bottom surface of the depending step 80, there is no place for the loop 90 to go except around the loop retaining member 72. From the foregoing, it is obvious that the top of the loop retaining member 72 does not have to actually touch the bottom of the throat plate 52 as long as it is above the level of the bottom surface of the depending step 80. It will be appreciated that the bevel 77 on the extremity of the finger 71 may be dimensioned so as to engage the bottom of the slot 73 in the bobbin insert 70 to limit the upward position of the top of the loop retaining member 72. The bottom surface of the depending step 80 holds the loop 90 in a horizontal plane on the loop retaining member 72 against the tightening of the loop 90 by the take-up lever 20 as long as the top of the loop retaining member 72 is above the level of the bottom surface of the depending step 80. The loop 90 is too short to be interfered with by the loop seizing beak 33 of the loop taker even if the loop 90 should intentionally slip off the loop retaining member 72.

As shown in FIG. 7b, the loop retaining member 72 is broad enough to spread the limbs of the loop 90 far enough apart so that the needle can easily penetrate the loop 90 without mishap.

FIGS. 8 and 8a illustrate the position of the parts after the loop 90 has been released from the loop retaining member 72 as the web 50 of the feed dog 49 bearing against the finger 71 has lowered the top of the loop retaining member 72 below the level of the bottom surface of the depending step 80 and the take-up lever 20 has started to pull the loop 90 upwardly through the needle aperture 81 to form a chain stitch. The web 50 of the feed dog 49 is equipped with a clearance cut 92 for the loop retaining member 72. The parts are so timed that the loop 90 is not released from the loop retaining member 72 until it is ensured that the need 99 will have penetrated the loop 90 to carry a second loop 93 through the loop 90 for seizure by the loop seizing beak 33 of the loop taker to repeat the cycle.

Since the throat plate 52 with the depending step 80 is compatible with lock stitch formation, all that has to be done to convert the machine to chain stitch sewing is to replace the bobbin with the bobbin insert 70. In lock stitch formation, a round needle aperture in the throat plate is conventional. In chain stitch formation, an elongate needle aperture 81 as illustrated in the draw-
ings is preferable to provide clearance for manipulation of the thread loops.  Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention.  

What is claimed is:  

1. A sewing machine having lock stitch forming instrumentalities including a frame having a work support formed with a needle aperture, a thread-carrying eye-pointed needle supported above the work support for endwise reciprocation through said needle aperture, a circularly moving loop taker disposed below said work support, means for driving said needle and loop taker in timed relation for the seizure of a loop of thread from the eye of the needle by said loop taker during each stroke of the needle downwardly through said needle aperture and the release of said seized loop by the loop taker during each succeeding upward stroke of the needle, a bobbin supporting case journaled in said loop taker and constrained from circular movement with said loop taker by stop means sustained on said frame, and a linear work feeding mechanism effective to advance work fabric on said work support in one direction from said needle aperture between each needle penetration thereof, means for sewing chain stitches using thread carried by said needle comprising an upwardly projecting loop retaining member positioned in proximity to the point of needle penetration of a loop of thread entrapped on the loop retaining member on the side of said point of needle penetration opposite from the direction of feed of said work support beneath said work support, means connected to said loop retaining member for urging said loop retaining member upwardly toward said work support, a thread guide on said work support having a bottom surface between said point of needle penetration and said loop retaining member lower than the highest point reached by the top of said loop retaining member, a needle thread take-up mechanism mounted on said frame effective alternately to draw tight and slacken said needle thread in timed relation with the endwise reciprocation of said needle, and means connected between said means for driving said needle and loop taker and said loop retaining member for lowering the top of said loop retaining member below the level of the bottom surface of said thread guide in timed relation with the endwise reciprocation of said needle to retain a first loop of thread entrapped on said loop retaining member until a second loop of thread is passed through said first loop by said needle.  

2. A device as set forth in claim 1 in which the loop retaining member is positioned in such proximity to the throat plate needle aperture that the length of a thread loop extending through the needle aperture and entrapped on said loop retaining member is less than the smallest length of thread loop extending through the needle aperture which can be seized by said loop taker and in which the loop retaining member is formed with sufficient lateral dimension to spread the limbs of a thread loop entrapped thereon at least as far apart as the transverse dimension of the shank of said needle.  

3. In a sewing machine having lock stitch forming instrumentalities including a frame having a work support formed with a needle aperture, a thread-carrying eye-pointed needle supported above the work support for endwise reciprocation through said needle aperture, a circularly moving loop taker disposed below said work support, means for driving said needle and loop taker in timed relation for the seizure of a loop of thread from the eye of the needle by said loop taker during each stroke of the needle downwardly through said needle aperture and the release of said seized loop by the loop taker during each succeeding upward stroke of the needle, a bobbin supporting case journaled in said loop taker and adapted to accommodate a conventional bobbin, means sustained on said frame constraining said bobbin case from circular movement with said loop taker, and a linear work feeding mechanism effective to advance work fabric on said work support in one direction from said needle aperture between each needle penetration thereof, means for sewing chain stitches using thread carried by said needle comprising a removable insert replacing a conventional bobbin in said bobbin supporting case, an upwardly projecting loop retaining member connected to said insert with its top positioned in proximity to the point of needle penetration of a loop of thread entrapped on the loop retaining member on the side of said point of needle penetration opposite from the direction of feed beneath said work support, means connected to said loop retaining member for urging said loop retaining member upwardly toward said work support, a thread guide on said work support having a bottom surface between said point of needle penetration and said loop retaining member lower than the highest point reached by the top of said loop retaining member, a needle thread take-up mechanism mounted on said frame effective alternately to draw tight and slacken said needle thread in timed relation with the endwise reciprocation of said needle, and means connected between said means for driving said needle and loop taker and said loop retaining member for lowering the top of said loop retaining member below the level of the bottom surface of said thread guide in timed relation with the endwise reciprocation of said needle to retain a first loop of thread entrapped on said loop retaining member until a second loop of thread is passed through said first loop by said needle.  

4. A device as set forth in claim 3 in which the sewing machine frame is fitted with a removable throat plate formed with said needle aperture and in which the thread guide is on the bottom of said throat plate.  

5. In a sewing machine having lock stitch forming instrumentalities including a frame having a work support formed with a needle aperture, a thread-carrying eye-pointed needle supported above the work support for endwise reciprocation through said needle aperture, a circularly moving loop taker disposed below said work support, means for driving said needle and loop taker in timed relation for the seizure of a loop of thread from the eye of the needle by said loop taker during each stroke of the needle downwardly through said needle aperture and the release of said seized loop by the loop taker during each succeeding upward stroke of the needle, a bobbin supporting case journaled in said loop taker and constrained from circular movement with said loop taker by stop means sustained on said frame, and a linear work feeding mechanism effective to advance work fabric on said work support in one direction from said needle aperture between each needle penetration thereof, means for sewing chain stitches using thread carried by said needle comprising a removable insert displacing a removable bobbin in said bobbin supporting case, a finger having an upwardly projecting loop retaining member connected to said insert with its top positioned in proximity to the point of needle penetration of a loop of thread entrapped on the loop retaining member on the side of said point of needle penetration opposite from the direction of feed beneath said work support, a thread guide on said work support having a bottom surface between said point of needle penetration and said loop retaining member lower than the highest point reached by the top of said loop retaining member, a needle thread take-up mechanism mounted on said frame effective alternately to draw tight and slacken said needle thread in timed relation with the endwise reciprocation of said needle, and means connected between said means for driving said needle and loop taker and said loop retaining member for lowering the top of said loop retaining member below the level of the bottom surface of said thread guide in timed relation with the endwise reciprocation of said needle to retain a first loop of thread entrapped on said loop retaining member until a second loop of thread is passed through said first loop by said needle.
a needle thread take-up mechanism mounted on said frame effective alternately to draw tight and slacken said needle thread in timed relation with the endwise reciprocation of said needle, and means on said work feeding mechanism bearing against said finger for lowering the top of said loop retaining member below the level of the bottom surface of said thread guide in timed relation with the endwise reciprocation of said needle to permit a first loop of thread entrapped on said loop retaining member to be pulled off of said loop retaining member by said needle thread take-up mechanism when it is ensured that a second loop of thread will be passed through said first loop and be seized by said loop taker.

6. A device as set forth in claim 5 in which the finger is pivotally mounted at an intermediate portion on the insert and has means at its end opposite from the loop retaining member for limiting the upward movement of the loop retaining member.

7. A chain stitch conversion device for a lockstitch sewing machine having a thread manipulating loop taker formed with a bobbin accommodating cavity, said chain stitch conversion device comprising a body member adapted to replace a bobbin in said loop taker cavity, a loop retaining member shiftably supported on said body member, and spring means biasing said loop retaining member relatively to said body member into a position effective to engage thread manipulated by said loop taker.

8. A chain stitch conversion device for a lock stitch sewing machine having a frame including a work support, a circularly moving thread manipulating loop taker carried on a vertical axis beneath said work support and

formed with a cylindrical bobbin accommodating cavity, and a work feed mechanism including an element reciprocable vertically beneath said work support, said chain stitch conversion device comprising a cylindrical body member adapted to replace a bobbin in said loop taker bobbin accommodating cavity, a thread engaging finger including a free extremity extending radially outward from said body member, means pivotally supporting said thread engaging finger on said body member on a substantially horizontal axis when said body member occupies a position within said bobbin accommodating loop taker cavity, and spring means interposed between said body member and said thread engaging finger urging said free extremity of the thread engaging finger upwardly toward the work support and vertically reciprocable work feed element when said body member occupies a position within said bobbin accommodating loop taker cavity.

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