June 12, 1962 S. J. KETTERER ET AL 3,038,429

LOCK STITCH SEWING MACHINE

Filed March 4, 1960

6 Sheets-Sheet 1

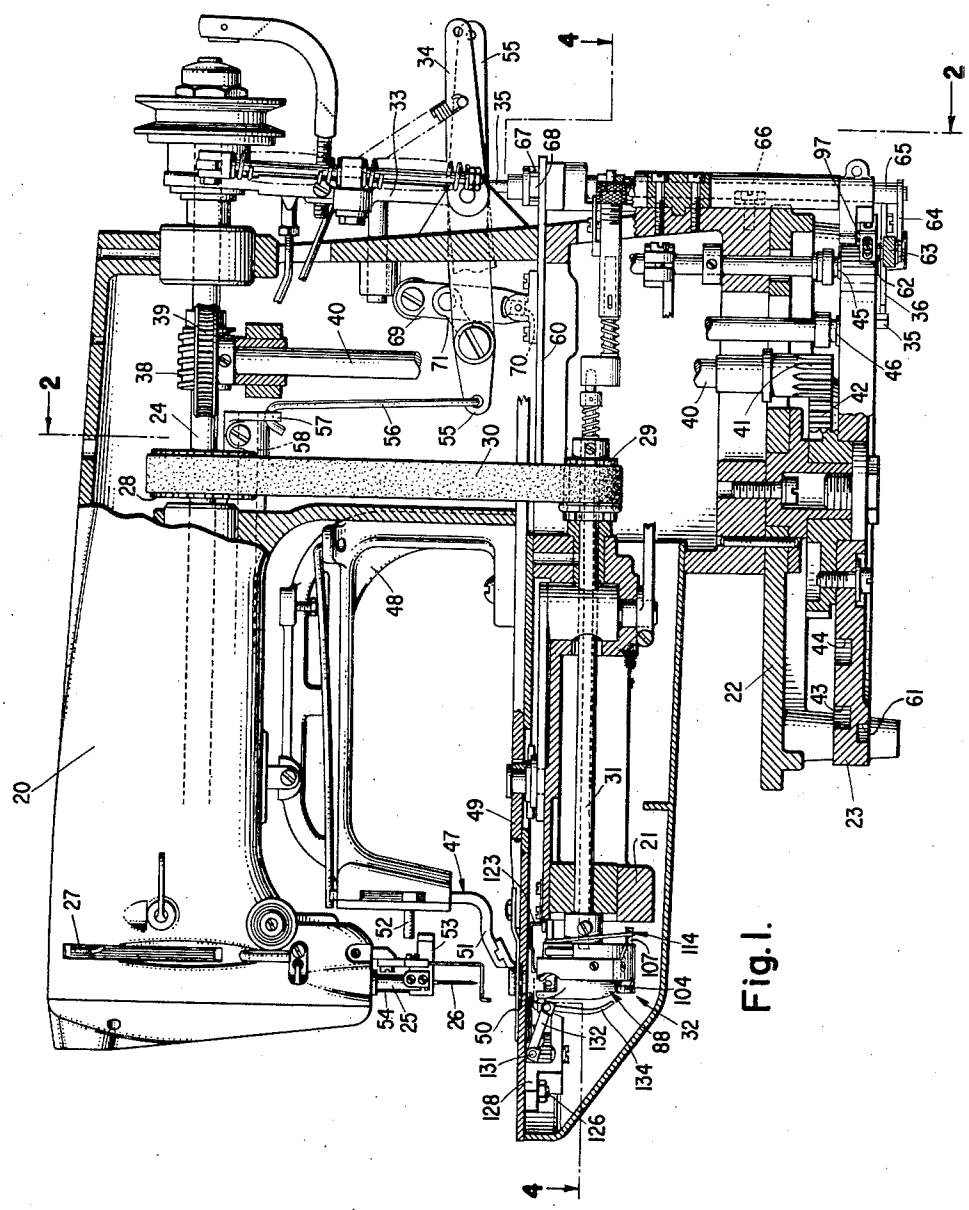

Fig. 1.

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June 12, 1962 S. J. KETTERER ET AL 3,038,429

LOCK STITCH SEWING MACHINE

Filed March 4, 1960 6 Sheets-Sheet 2

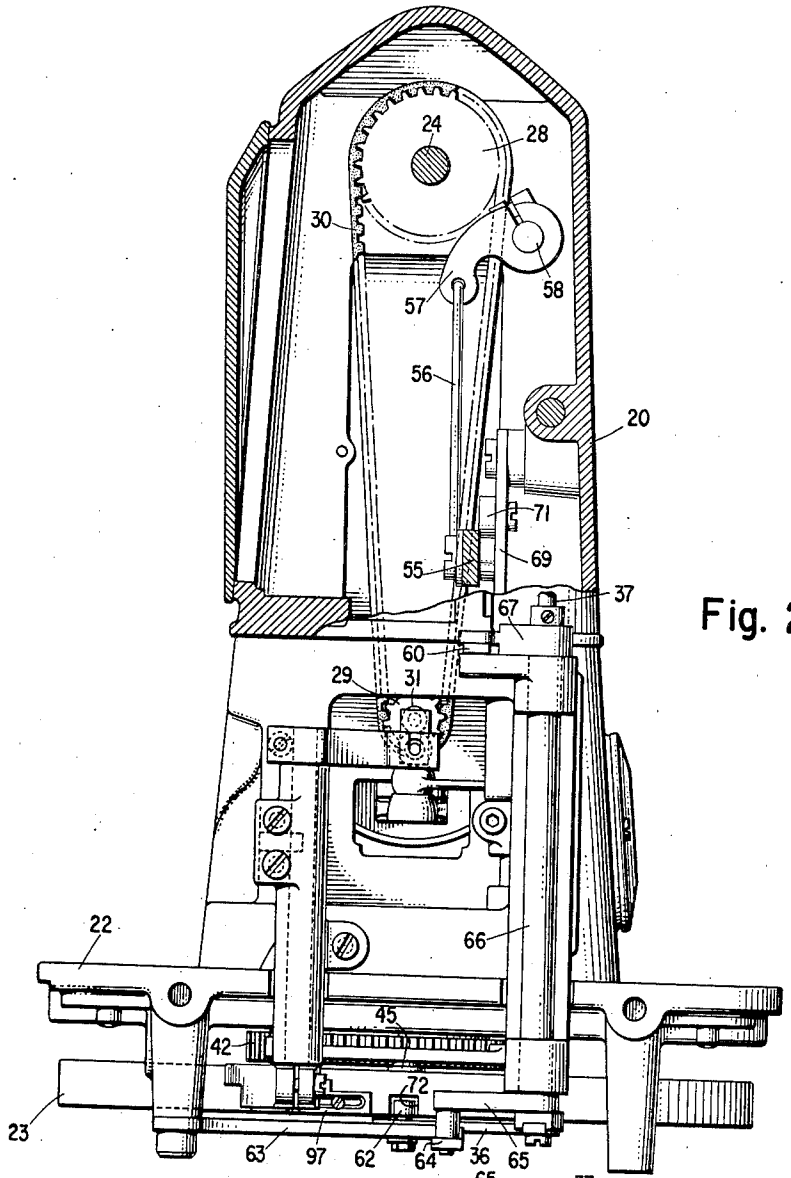

Fig. 2.

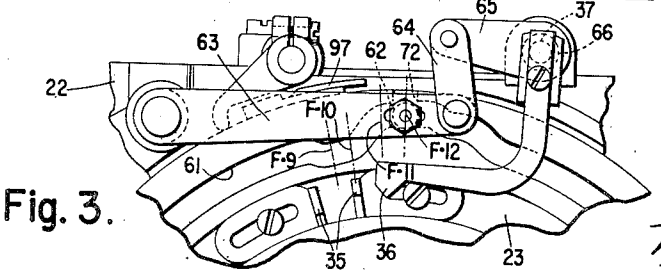

Fig. 3.

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LOCK STITCH SEWING MACHINE

Filed March 4, 1960 6 Sheets-Sheet 3

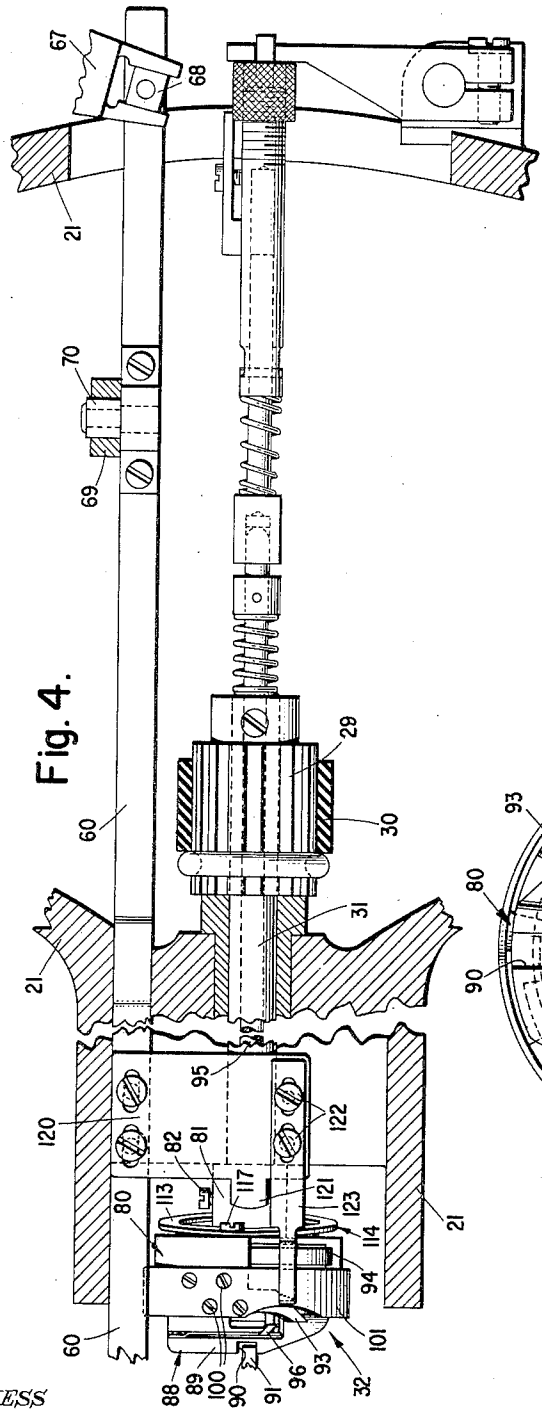

Fig. 4.

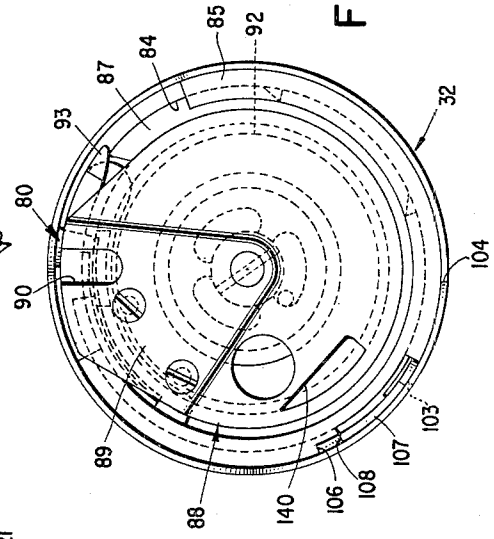

Fig. 5.

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LOCK STITCH SEWING MACHINE

Filed March 4, 1960 6 Sheets-Sheet 4

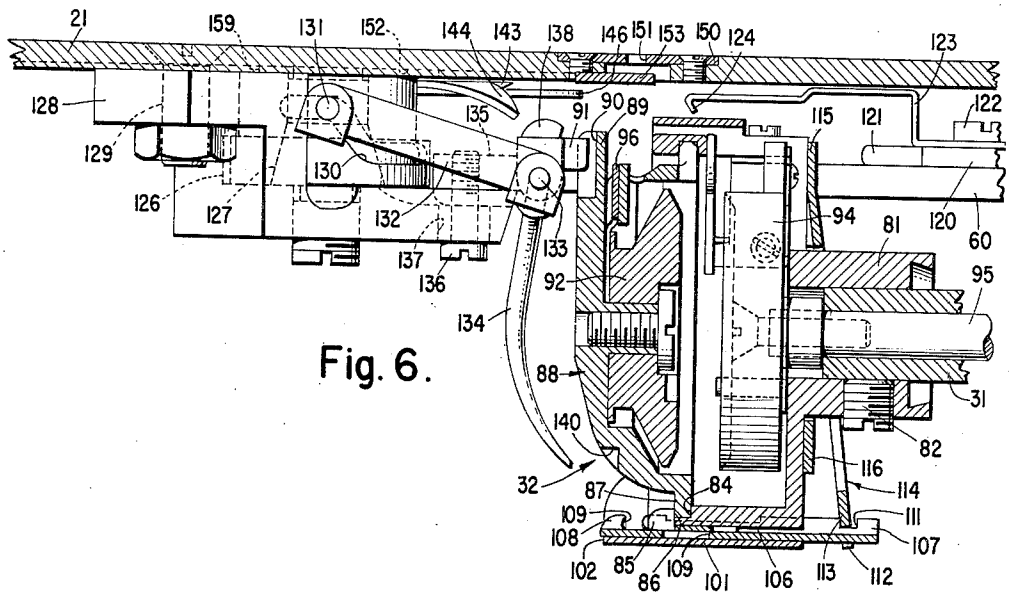

Fig. 6.

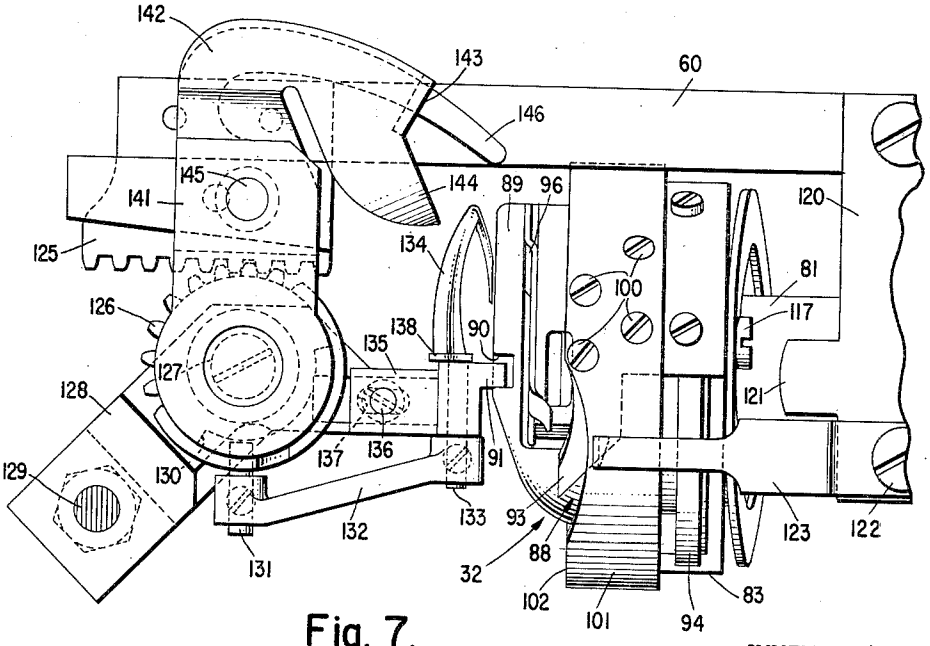

Fig. 7.

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LOCK STITCH SEWING MACHINE

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Fig. 8.

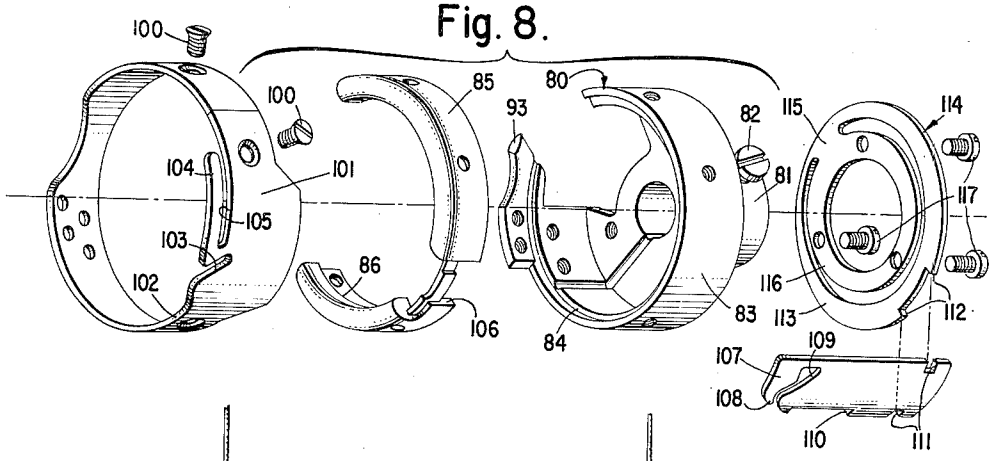
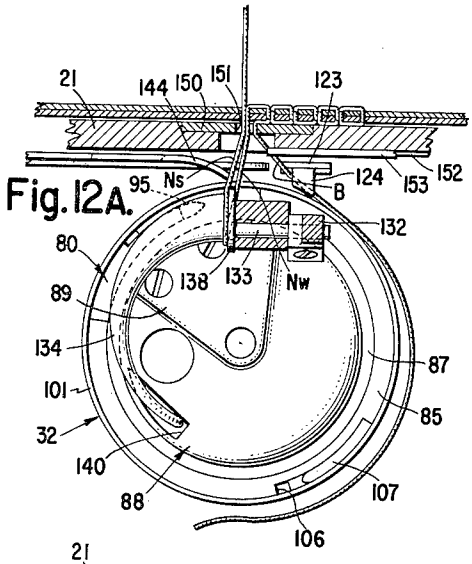


Fig. 12A.



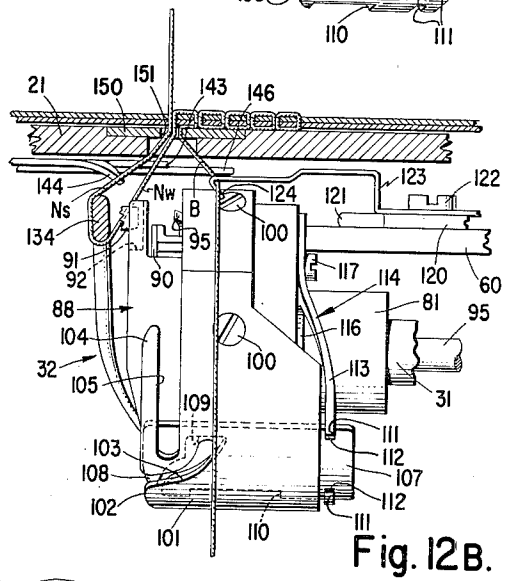


Fig. 12B.

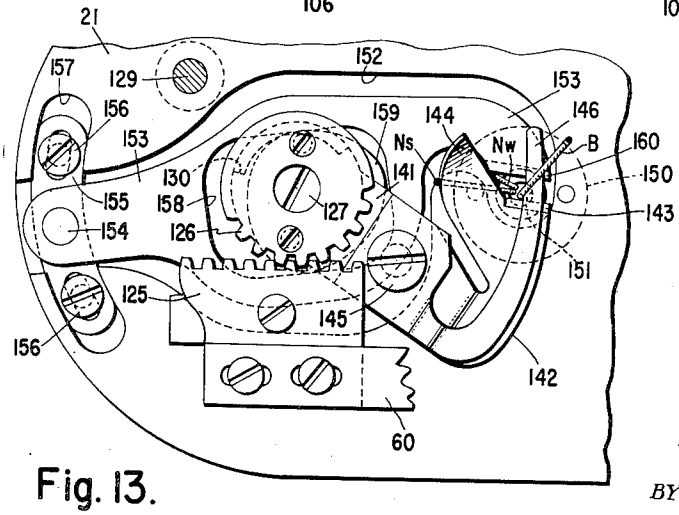


Fig. 13.

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June 12, 1962 S. J. KETTERER ET AL 3,038,429

LOCK STITCH SEWING MACHINE

Filed March 4, 1960 6 Sheets-Sheet 6

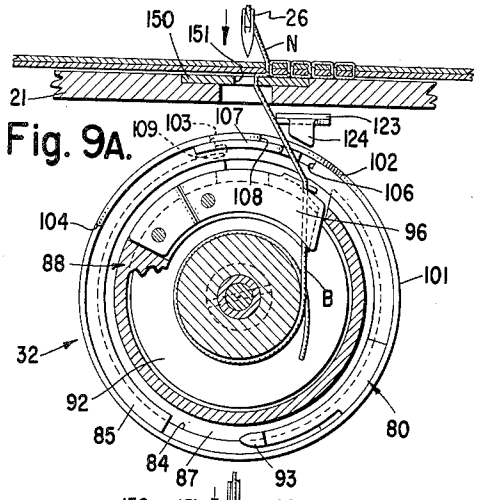

Fig. 9A.

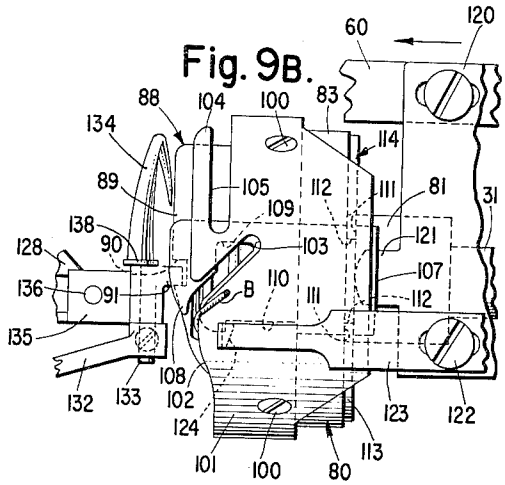

Fig. 9B.

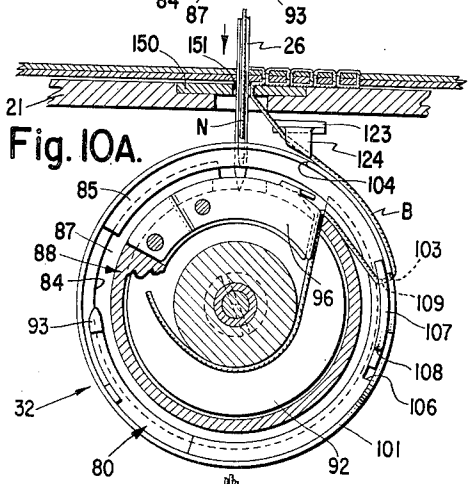

Fig. 10A.

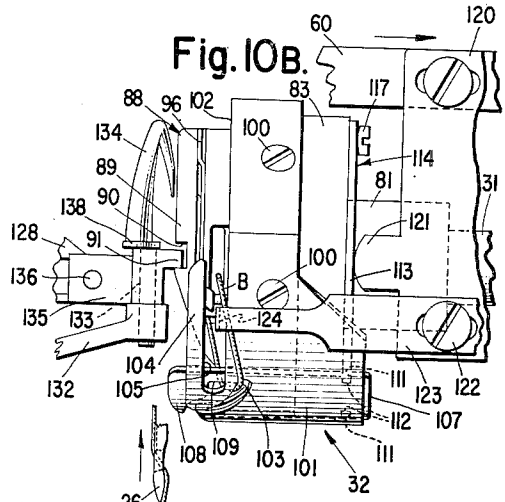

Fig. 10B.

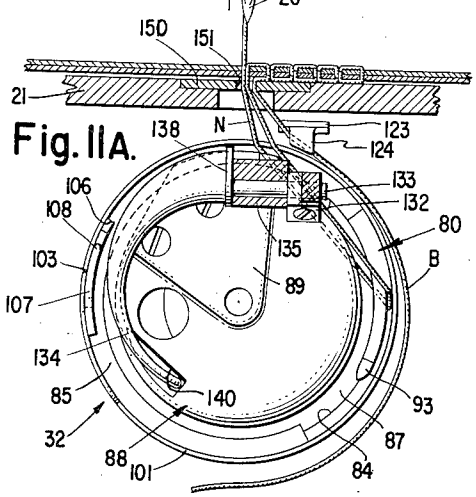

Fig. 11A.

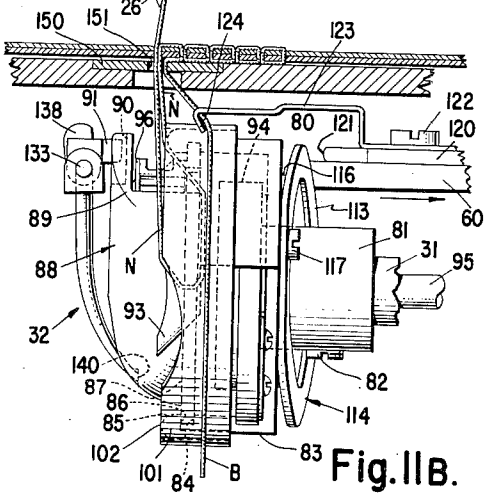

Fig. 11B.

United States Patent Office

3,038,429

Patented June 12, 1962

3,038,429

LOCK STITCH SEWING MACHINE

Stanley J. Ketterer, Stratford, William J. Edwards, Nichols, and Michael F. Ivanko, Stratford, Conn., assignors to The Singer Manufacturing Company, Elizabeth, N.J., a corporation of New Jersey

Filed Mar. 4, 1960, Ser. No. 12,828
16 Claims. (Cl. 112—181)

This invention relates to lock stitch sewing machines having automatic bobbin thread replenishing means and, more particularly, to automatically operable mechanism in a sewing machine of the above character for finishing each sewing operation preparatory to the next replenishment of the bobbin thread including thread cutting means for severing the needle and bobbin threads, and means for removing all unused thread previously wound on the bobbin.

It is an object of this invention to provide a thread cutting mechanism adapted to cooperate with a lock stitch forming rotary loop-taker to sever both the needle and bobbin threads closely adjacent to the work.

Another object of this invention is to provide a mechanism for automatically extracting unused thread from the bobbin of a lock stitch sewing machine.

It is an object of this invention to provide a common actuating means for said bobbin thread extracting means and said thread cutting mechanism.

With the above and other objects and advantages in view as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 represents a side elevational view, partly in vertical cross section, of a sewing machine having the present invention applied thereto,

FIG. 2 represents an enlarged rear elevational view of the sewing machine of FIG. 1 illustrated partly in cross section taken substantially along line 2—2 of FIG. 1,

FIG. 3 represents a fragmentary bottom plan view of the sewing machine illustrating particularly the cam means on the underside of the pattern cam,

FIG. 4 is an enlarged cross sectional view, taken substantially along line 4—4 of FIG. 1, showing the loop-taker drive and thread trimmer control connections,

FIG. 5 represents a front elevational view of the loop-taker,

FIG. 6 represents a side elevational view of the thread trimming and bobbin thread removing mechanisms with the loop-taker illustrated in vertical cross section,

FIG. 7 represents a top plan view of the thread trimming and bobbin thread removing mechanisms together with the loop-taker,

FIG. 8 is an exploded perspective view of the loop-taker body member and the parts which are secured for rotation therewith.

FIGS. 9–13 are views illustrating the sequence of operation of the thread trimming and bobbin thread removing mechanisms. In these sequence views, all figures having common numerical designations illustrate the parts in like position,

FIGS. 9A and 9B represent, respectively, a front view of the loop-taker partly in vertical cross section and a top view of the loop-taker as the needle begins the final downstroke in a cycle of sewing machine operation,

FIGS. 10A and 10B represent, respectively, a front view of the loop-taker partly in vertical cross section and a top view of the loop-taker after the last needle penetration in a cycle of sewing machine operation, illustrating the manner in which the bobbin thread is drawn from the bobbin,

FIGS. 11A and 11B represent a front view and a side elevational view, respectively, of the loop-taker including the needle loop pick up finger shortly after needle loop seizure by the hook beak on the last needle reciprocation of a cycle of sewing machine operation,

FIGS. 12A and 12B represent a front and a side elevational view of the loop-taker including the thread cutting knife beneath the throat plate in the position which the parts will occupy when the sewing machine is stopped by the stop motion device at the conclusion of each cycle of operation, and

FIG. 13 represents a bottom plan view of the thread cutting mechanism beneath the stitching point with the parts illustrated in the thread severing position.

Referring particularly to FIGS. 1 and 2 of the drawings, this invention is illustrated as applied to a cyclically operated group stitch sewing machine referred to as a Singer Class 269W machine as illustrated and described in detail in the copending United States patent application Serial No. 660,779, filed May 22, 1957, now Patent No. 2,938,477, granted May 31, 1960, to which reference may be had for a complete understanding of its operation.

The sewing machine comprises a frame including a bracket arm **20** and a work supporting bed **21**. Secured beneath the bed is a sub-base **22** in which is journaled a pattern cam **23** providing means for controlling the operation of the sewing machine.

A main shaft **24** journaled in the bracket arm is operatively connected to reciprocate a needle bar **25** which carries a needle **26**. The main shaft is also connected to oscillate a needle thread take up member **27**. Drivingly connected with the main shaft for rotation at twice the speed thereof by means of sprocket wheels **28** and **29** and a clip or lug type timing belt **30**, is a hollow bed shaft **31** to which a loop-taker, indicated generally as **32**, is secured.

The main shaft **24** carries a stop motion mechanism controlled by a swinging frame **33**. Depression of a starting lever **34** serves by way of the swinging frame to shift the stop motion mechanism into running position. The swinging frame is latched in the running position and the machine is stopped when the latch is released. As illustrated in FIG. 3, the latch is released by cam lugs **35** secured beneath the pattern cam **23** which engage and shift a follower arm **36** fast on a rod **37** carried vertically at the rear of the machine.

The pattern cam **23** is driven from the main shaft by a worm **38** on the main shaft, a worm wheel **39** on a vertical cam drive shaft **40**, and a pinion **41** on the cam drive shaft meshing with a gear **42** fast on the pattern cam.

In addition to controlling the stop motion mechanism, the pattern cam **23** is formed in the upper face with a pair of cam grooves **43** and **44** tracked by followers **45**, **46** operatively connected to control the sidewise and longitudinal movements, respectively, of a work clamp **47**. The work clamp comprises a gooseneck **48** carried on a slidably pivoted plate **49** to which is fastened the lower jaw **50** of the work clamp. An upper jaw **51** of the work clamp is slidable vertically in the gooseneck **48**. A lifting finger **52** on the upper jaw **51** is engageable by a lug **53** on a presser bar **54** in the bracket arm and thus operably connected to raise the upper jaw of the work clamp upon depression of a clamp opening lever **55** located at the rear of the sewing machine. For this purpose, the clamp opening lever **55** is connected by means of a link **56** to a rock arm **57** of a clamp opening rock shaft **58** journaled lengthwise in the bracket arm.

A further function of the pattern cam **23** is to impart certain preliminary motions to the thread cutter actuating slide bar **60**. For this purpose a cam groove **61** is formed

in the underside of the pattern cam and tracked by a roller follower 62 carried on a lever 63 fulcrumed on the subbase 22. As best illustrated in FIGS. 2 and 3, a pivoted link 64 connects the follower lever 63 to a rock arm 65 fast on a rock shaft 66 journaled vertically at the rear of the sewing machine. A rock arm 67 fast on the upper extremity of the rock shaft 66 is bifurcated and embraces a slide block 68 pivoted on the cutter actuating slide bar 60.

There is an operative connection between the clamp opening lever 55 and the thread cutter actuating slide bar 60 (FIG. 1) provided by a bifurcated lever 69 fulcrumed on the bracket arm 20 and embracing a slide block 70 pivoted on the slide bar 60, and a link 71 pivoted to the clamp opening lever 55 and to the bifurcated lever 69. Motion of the slide bar 60 to perform the actual cutting of the sewing threads is derived from manual depression of the clamp opening lever 55. The cam groove 61 and the associated follower mechanism serves, as will be described in detail hereinbelow, to move the cutter actuating slide bar into a retracted position during sewing operations, to bring the thread severing and associated instrumentalities into a ready position at the completion of sewing, and to provide a safety interlock by means of a radial clearance opening 72 in the cam groove 61 opposite which the follower 62 will repose in the stopped position of parts, thus releasing the clamp opening mechanism for manual operation.

This invention relates to mechanism for facilitating the finishing operations of severing the sewing threads and removing unused bobbin thread at the completion of a group of lock stitches. While certain principles and features of this invention could be applied to any lock stitch forming mechanism, this invention is preferably embodied in association with lock stitch forming mechanism such as that disclosed in the co-pending patent application of S. J. Ketterer and W. J. Edwards No. 15,955, filed March 18, 1960, in which the bobbin thread is replenished automatically from the needle thread supply.

With particular reference to FIGS. 6, 7, and 8, the loop-taker 32 of the sewing machine comprises a cup-shaped loop-taker body 80 having a hub 81 secured on the bed shaft 31 by a set screw 82. The loop-taker body 80 is formed with a flange 83 having a raceway shoulder 84 complemented by a gib 85 secured to the loop-taker body flange 83 and having a raceway shoulder 86 therein. Journaled in the raceway having side faces defined by the shoulders 84 and 86 is the bearing rib 87 of a bobbin case 88.

The bobbin case 88 has a radial projection 89 formed with a rotation restraining notch 90 which loosely accommodates a rotation restraining finger 91 associated with the thread severing mechanism to be described in detail hereinbelow and fixed relatively to the work supporting bed 21. By this means the bobbin case 88 is prevented from rotating with the loop-taker body 80. A bobbin 92 is journaled in the bobbin case and is free to turn relatively thereto.

A hook beak 93 secured to the loop-taker body serves, in normal sewing, to engage and carry loops of needle thread about the bobbin and the bobbin case, the loops being drawn into the work by the take-up 27 with each loop being concatenated with a thread leading from the bobbin. A bobbin winding member 94 is arranged within the cup shaped loop-taker body between the bobbin and the hub of the loop-taker body and is secured to a rod 95 slidable within the hollow bed shaft 31. When the bobbin winding member is shifted toward the bobbin it blocks the space normally provided between the bobbin and the loop-taker body for passage of needle thread loops about the bobbin, and a needle thread loop seized by the hook beak will be guided to and wound on the bobbin by the winding member 94 rather than being cast about the bobbin and bobbin case as in conventional sewing. A bobbin tensioning spring 96 is secured to the bobbin case 88 in position to nip and tension the thread which is directed to and wound on the bobbin.

The above referenced co-pending patent application Serial No. 15,955, may be referred to for a detailed description of the operation of the bobbin winding mechanism. It will be sufficient for an understanding of this invention to appreciate that at the beginning of each stitching cycle of the machine, in response to a pair of cam lugs 97—97 on the pattern cam 23, the bobbin winding member 94 is shifted into operative position against the bobbin and held there until sufficient thread is wound on the bobbin to prepare the desired seam or group of stitches. When the bobbin winding member is released, normal lock stitch formation begins and continues until the completion of the cycle of sewing machine operation.

Encompassing the flange 83 of the hook body and secured thereto by screws 100, is an annular thread camming member 101 having an outer thread camming edge 102. An inclined slot 103 is formed in the thread camming member leading from its thread camming edge 102 closely adjacent to an outwardly protruding thread camming finger 104 defined by a needle clearance slot 105 formed in the thread camming member. Thread wound on the bobbin and extending from the bobbin to the stitches in the work fabric will extend over the edge 102 of the thread camming member 101. In conventional lock stitch formation the purpose of the thread camming edge 102, which may be considered as continuing along the thread camming finger 104, is to urge the bobbin thread to one side during needle penetration so as to minimize the danger of entanglement of the bobbin thread with the hook beak on the succeeding seizure of the needle thread loop thereby.

The gib 85 is formed with a transverse slot 106 providing a guideway for an auxiliary hook member 107. The auxiliary hook member is formed with a beak 108 defined by an inclined slot 109. When the auxiliary hook is retracted, the beak 108 underlies and closes off the inclined slot 103 in the thread camming member so that any thread passing thereover will not enter the slot 103. When the auxiliary hook member 107 is shifted into extended position, the beak 108 will protrude beyond the thread camming edge 102 and the inclined slots 103 and 109 will overlap so as to admit the bobbin thread.

The auxiliary hook member 107 is formed on one side with a shallow notch 110 embracing the gib 85 to provide stops limiting movement of the auxiliary member into extended and retracted positions. Notches 111 formed in opposite sides of the auxiliary hook member 107 accommodate and interlock with shoulders 112 formed on an annular spring portion 113 of an auxiliary hook supporting member 114. The spring portion 113 is joined by a narrow neck 115 to an annular base portion 116 secured by screws 117 to the rear of the loop-taker body 80. As illustrated in FIG. 6, the spring portion 113 when relaxed extends rearwardly of the loop-taker body 80 at an acute angle and urges the auxiliary hook member 107 into retracted position.

Referring to FIGS. 6 and 7, the slide bar 60 carries an arm 120 which extends laterally to the rear of the loop-taker. The arm 120 is formed with a cam finger 121 disposed, as illustrated in FIG. 6, opposite to the annular spring portion 113 of the auxiliary hook supporting member 114. Secured to the arm 120 by the screws 122 is an arched thread gripping finger 123 terminating in a depending hook 124 disposed over the loop-taker 80.

Secured at the free extremity of the slide bar 60 is a rack member 125 meshing with a gear segment 126 journaled on a stud 127 carried in a bracket 128 secured by a bolt 129 beneath the work supporting bed 21. The periphery of the gear segment 126 diametrically opposite the gear teeth is formed with a cam groove 130 (FIG. 6) tracked by a cam follower pin 131 secured in a rock arm 132 fast on a shank 133 of a needle thread pickup finger 134. The shank 133 is journaled in a block 135 adjust-

ably secured to the bracket 128 by a screw 136 threaded into the block and passing through a slot 137 formed in the bracket. The needle thread pick-up finger 134 at the juncture with the shank 133 is formed with a flange 138 to detain thread loops on the finger 134 and to prevent the detained thread loops from becoming wedged between the block 135 and the shank 133. The previously mentioned bobbin case rotation restraining finger 91 is formed as an extension of the block 135.

The bobbin case 88 is formed in the exposed face with a notch 140 adapted to accommodate the free extremity of the needle thread pick-up finger 134 when the finger moves toward the loop-taker.

Secured with respect to the gear segment on an arm 141 is a thread severing knife blade 142 formed at the free extremity with a sharpened knife edge 143 extending substantially radially with respect to the axis of turning movement thereof as determined by the stud 127. Protruding from the knife blade, in advance of the knife edge 143 and radially inwardly thereof relatively to the stud 127, is a thread loop engaging lug 144 of which the free extremity is bent slightly downwardly. Secured to the gear segment arm 141 with the knife blade 142 by the screw 145 is an arcuate thread camming finger 146 which protrudes in advance of the knife edge 143.

As illustrated in FIGS. 6 and 13, the work supporting bed 21 at the stitching point is fitted with a throat plate 150 formed with a needle aperture 151. Beneath the throat plate, the underside of the work supporting bed is formed with a shallow recess 152 in which is disposed a thin ledger blade 153 with which the knife edge 143 cooperates in severing the sewing threads. As illustrated in FIG. 13, the ledger blade 153 is pivotally secured to a pivot pin 154 carried on a block 155 adjustably secured by screws 166 in an arcuate slot 157 formed beneath the work supporting bed 21. The ledger blade 153 is formed with an opening 158 which embraces a cam disk 159 fast on the gear segment 126. The cam disk 159, when it turns with the gear segment 126, will swing the ledger blade 153 and shift the sharpened free extremity of a ledger blade finger 160 thereon into a position as illustrated in FIG. 13 adjacent to the needle hole 151 in the throat plate during the severing motion of the knife blade 142. Since both the knife and the ledger blade move to a cutting position beneath the needle hole, the threads will be severed extremely close to the work fabrics. During sewing, the cam disk 159 on the gear segment 126 will move the ledger blade 153 to a retracted position so as not to interfere with the thread manipulation during sewing.

Operation

The operation of the devices of this invention might best be understood with reference to FIGS. 9–12 which illustrate the sequence of positions occupied by the various parts during the last needle reciprocation of a cycle of stitching. Reference may also be made to FIG. 3 in which the cam groove 61 from which the movement of the thread severing and bobbin thread removing parts in FIGS. 9–12 is derived. In FIG. 3 the various stations of the cam follower 62 along the cam groove 61 corresponding to the positions of parts illustrated in FIGS. 9–12 are indicated by the phantom lines F–9, F–10, F–11, and F–12, respectively.

FIGS. 9A and 9B illustrate the loop-taker and associated parts in the position occupied as the needle begins its last downstroke during a cycle of stitching. The bobbin thread B is wrapped on the bobbin 92 and directed under the bobbin thread tensioning spring 96 across the thread caming edge 102 of the thread camming member 101 and thence up through the needle aperture 151 in the throat plate 150 to the stitched seam in the work fabrics. The needle thread N leads directly from the seam in the work fabrics to the needle. As illustrated in FIG. 3, the follower roller 62 in the position of parts of FIGS. 9A

and 9B will be disposed on the phantom line F–9 which occurs on a portion of the cam groove which slopes toward the center of the cam. By way of the linkage 64, 65, 66, and 67, the slide bar 60 will thus be shifted outwardly toward the free extremity of the work support. The cam finger 121 and the arched finger 123 move with the slide bar 60 toward the exposed face of the loop-taker. The cam finger 121 moves into engagement with the spring portion 113 of the support member for the auxiliary hook member 107 urging the auxiliary hook beak 108 outwardly beyond the thread camming surface 102 and shifting the inclined thread slots 103 and 109 into overlapping registering relation. In the position of parts illustrated in FIGS. 9A and 9B, the auxiliary hook member 107 is, therefore, shifted into a position to direct the bobbin thread B into the inclined slot 103 in the thread camming member.

FIGS. 10A and 10B illustrate the position of the loop-taker and associated parts after approximately 90 degrees of loop-taker rotation beyond that of FIGS. 9A and 9B. In FIGS. 10A and 10B the bobbin thread B is shown located in the inclined slot 103 of the thread camming member 101 by the continued rotation of which the bobbin thread, being anchored at one end in the work, will be drawn out of the bobbin tension spring 96 and from the bobbin 92. FIGS. 10A and 10B also illustrate the manner in which the bobbin thread B will be engaged by the hook 124 of the arched spring finger 123 when the arched finger is advanced toward the exposed face of the loop-taker. The hook 124 serves to hold the bobbin thread alongside the thread camming member 101 which, being the member of the largest diameter associated with the loop-taker, provides the largest possible drum with which to draw unused bobbin thread out of the bobbin. With reference to FIG. 3 it will be apparent that as indicated at F–10, the cam follower roller 62 in the position of parts illustrated in FIGS. 10A and 10B is in a portion of the cam groove 61 which slopes outwardly away from the center of the cam 23. In FIG. 10B, therefore, the hook 124 will be beginning a motion toward the right. The cam finger 121 will also begin moving toward a retracted position out of engagement with the spring portion 113 of the support member 114 for the auxiliary hook member 107. The auxiliary hook member will thus retract to close the mouth of the inclined slot 103 preventing seizure of any additional threads thereby.

Continued rotation of the loop-taker beyond the position illustrated in FIGS. 10A and 10B will, therefore, draw the bobbin thread from the bobbin and leave the bobbin thread hanging from the hook 124 downwardly over the thread camming member 101 at one side of the loop-taker. Although for economy of thread, it would be desirable to wind on the bobbin only sufficient thread to produce the seam required in addition to a length of bobbin thread from the work to the bobbin tension spring 96 remaining at the conclusion of sewing, the mechanism of this invention is capable of withdrawing from the bobbin a length of thread equal to more than twice the circumference of the thread camming member 101. As a result, the mechanism of this invention is advantageous in that the amount of thread wound on the bobbin is not critical and a wide variation is permissible without malfunction of the machine.

FIGS. 11A and 11B illustrate the loop-taker and associated parts after approximately one half revolution beyond the position illustrated in FIGS. 10A and 10B. The bobbin thread B is completely withdrawn from the bobbin and the hook beak 93 has seized a loop of needle thread from the needle 26.

Referring to FIG. 3, the line F–11 indicates the position of the cam follower roller 62 relatively to the cam groove 61 in the position of parts shown in FIGS. 11A and 11B. It will be noted that in this position of parts the cam follower roller 62 will have been shifted to an extreme outward position which, by way of the linkage

64, 65, 66, and 67, will shift the slide rod 60 inwardly away from the free extremity of the work supporting bed 21.

Referring to FIGS. 6 and 7, the motion of the slide bar 60 toward the right will cause the rack 125 on the slide bar to turn the gear segment 126 clockwise, as viewed in FIG. 7, from the position illustrated in FIGS. 6 and 7 to the position as illustrated in FIGS. 11A, 11B, 12A, and 12B. This turning movement of the gear segment accomplishes two distinct functions. First, turning of the gear segment shifts the cam groove 130 relatively to the follower pin 131 thus turning the rock arm 132, shank 133 and pick-up finger 134 until the free extremity of the pick-up finger 134 is disposed within the bobbin case notch 140. Upon continued rotation of the loop-taker from the position illustrated in FIGS. 11A and 11B to the position illustrated in FIGS. 12A and 12B, the loop of needle thread on the hook beak 93 will be carried onto the pick-up finger 134 and against the flange 138 thereon. The needle thread loop will not be concatenated with the bobbin thread since the bobbin thread will have been drawn out of the bobbin immediately preceding the final loop seizure by the hook beak.

Second, the knife blade 142 and the thread camming finger 146 are moved from a retracted position, as illustrated in FIG. 7, to a ready position illustrated in FIGS. 12A and 12B. In the ready position, the knife edge 143 is disposed near the edge of the needle aperture 151 opposite that of the ledger blade 153. The thread camming finger 146 will have passed behind and urged the bobbin thread B to a position between the knife edge 143 and the ledger blade, and the thread engaging lug 144 will be poised opposite the needle thread loop which is carried on the thread pick-up finger 134. In FIGS. 12A, 12B, and 13 that limb of needle thread which leads from the thread pick-up finger to the needle 26 and then to the supply is labeled N_S and that limb leading to the work is labeled N_W.

When the sewing machine stops at the conclusion of each stitching cycle, the thread engaging lug 144 will be positioned, as illustrated in FIGS. 12A and 12B, ready to enter the needle thread loop constrained on the thread pick-up finger 134. Referring to FIG. 13, which shows the parts in the positions occupied on the initial cutting motions of the knife and ledger blade, the thread engaging lug 144 will move into the needle thread loop constrained on the thread pick-up finger and urge the needle thread limb N_S away from the cutting edges and urge both the limb N_W of the needle thread and the bobbin thread B to a position between the knife edge 143 and the ledger blade cutting edge.

As illustrated in FIGS. 2 and 3, the clearance opening 72 in the cam groove 61 is disposed opposite the cam follower 62 in the stopped position of the parts so that the work clamp opening lever 55 may be turned manually to open the work clamp and in so doing impart additional movement to the slide bar 60 by way of the link 71, the lever 69, and the slide block 70. The cutting of the threads will be accomplished, therefore, by movement of the work clamp opening lever 55 with the clearance opening 72 of the cam groove 61 permitting such movement. Such movement of the slide bar 60, through the rack 125 and gear segment 126 will turn the knife edge toward and beyond the edge of the ledger blade severing bobbin thread and the work limb of the needle thread loop N_W closely adjacent to the underside of the work.

Having thus set forth the nature of this invention what we claim herein is:

1. In a sewing machine for forming lock stitches in a work fabric and having an endwise reciprocating thread carrying needle and a loop-taker having a bobbin journaled therein on which a thread is adapted to be wound, means for actuating said loop-taker in cooperation with said needle to engage and carry needle thread loops about said bobbin to form lock stitches, the combination of means on said loop-taker for engaging and withdrawing from said bobbin a thread remaining wound thereon during operation of said means for operating said loop-taker in cooperation with said needle, and means for severing said withdrawn bobbin thread closely adjacent to the work fabrics.

2. In a lock stitch sewing machine having an endwise reciprocating thread carrying needle and a loop-taker having a bobbin journaled therein on which thread is adapted to be wound, said loop-taker cooperating with said needle to engage and carry needle thread loops about said bobbin to form lock stitches, means associated with said loop-taker for winding thread from said thread carrying needle on said bobbin, means for operating said needle and loop-taker to form lock stitches of thread carried by said needle concatenated with said thread wound on said bobbin from said thread carrying needle, and means on said loop-taker and effective during the operation of said means for operating said needle and loop-taker for engaging and withdrawing from said bobbin a thread remaining wound thereon.

3. In a lock stitch sewing machine having an endwise reciprocatory thread carrying needle, a loop-taker having a bobbin journaled therein on which thread is adapted to be wound, means operatively connecting said needle and said loop-taker for cooperating stitch forming motions to concatenate needle thread loops about a thread wound on said bobbin to form lock stitches, means for imparting a predetermined series of said stitch forming motions to said needle and said loop-taker, means associated with said loop-taker for winding thread from said thread carrying needle on said bobbin during the start of each series of stitch forming motions, and means on said loop-taker effective at the completion of said series of stitch forming motions for engaging and withdrawing from said bobbin a thread remaining wound thereon.

4. In a sewing machine for forming lock stitches in a work fabric and having an endwise reciprocating thread carrying needle and a loop-taker having a bobbin journaled therein on which a thread is adapted to be wound, said loop-taker cooperating with said needle to engage and carry needle thread loops about said bobbin to form lock stitches, the combination of a thread cutting member for severing the sewing threads between the work fabric and said loop-taker, operator influenced means for actuating said thread cutting member, interlocks means for preventing operation of said thread cutting member, means on said loop-taker for engaging and withdrawing from said bobbin a thread remaining wound thereon, and control means operated by said sewing machine for effecting in seriatim the operation of said bobbin thread withdrawing means and the release of said interlock means.

5. In a sewing machine for forming lock stitches in a work fabric and having a work support, a work penetrating thread carrying needle carried above said work support, and a loop-taker arranged beneath said work support, said loop-taker having a thread carrying bobbin journaled therein and means associated with said loop-taker for engaging and carrying needle thread loops about said bobbin to form lockstitches, the combination of a means on said loop-taker for engaging and withdrawing from said bobbin a thread remaining wound thereon, a means for detaining beneath said work support a loop of needle thread being carried about said bobbin by said loop-taker, and a thread cutting means carried beneath said work support for severing simultaneously said bobbin thread and one limb of said detained loop of needle thread.

6. In a sewing machine for forming lock stitches in a work fabric and having a work support, a work penetrating thread carrying needle carried above said work support, and a loop-taker arranged beneath said work support, said loop-taker having a thread carrying bobbin journaled therein and means associated with said loop-

taker for engaging and carrying needle thread loops about said bobbin to form lock stitches, the combination of means on said loop-taker for engaging and withdrawing from said bobbin a thread remaining wound thereon, a thread cutting member carried beneath said work support for severing sewing threads between said work support and said loop-taker, means for actuating said thread cutting member, interlock means for preventing operation of said thread cutting member, a needle thread pick-up finger shiftably supported beneath said work support for movement toward said loop-taker into the path of a needle thread loop being carried by said loop-taker, and control means operated by said sewing machine for effecting in seriatim, the operation of said bobbin thread withdrawing means, the shifting of said needle thread pick-up finger toward said loop-taker, and the release of said interlock means.

7. In a lock stitch sewing machine having an endwise reciprocating thread carrying needle, a loop-taker, a bobbin journaled in said loop-taker, and actuating means permanently interconnecting said needle and said loop-taker for timed cooperating movements in which said loop-taker seizes and carries loops of a thread from said needle about said bobbin to form lock stitches, means for imparting a predetermined series of stitch forming movements to said needle and said loop-taker, a winding means associated with said loop-taker and operated by said actuating means for winding a thread from said needle on said bobbin during the start of each series of stitch forming movements, an unwinding means associated with said loop-taker and operated by said actuating means at the completion of each series of stitch forming movements for engaging and withdrawing from said bobbin a thread remaining wound thereon, and a thread cutter for severing said withdrawn bobbin thread adjacent to said lock stitches.

8. In a lock stitch sewing machine having a work support, an endwise reciprocating thread carrying needle carried at one side of said work support, a rotary loop-taker carried at the opposite side of said work support, a hook beak carried on said loop-taker for engaging loops of thread presented by said needle, a bobbin journaled in said loop-taker, and actuating means permanently interconnecting said needle and said loop-taker for timed cooperating movements as are required for said loop-taker beak to seize and carry loops of thread from said needle about said bobbin in the formation of lock stitches, means for winding thread from said needle on said bobbin comprising clamp means associated with said loop-taker for clamping a loop of needle thread on said beak, means effective simultaneously with said clamp means for blocking passage of said loop of needle thread about said bobbin and for guiding said clamped needle thread to said bobbin, a thread camming member carried by said loop-taker for determining the path of a thread from said bobbin to the stitches in a work fabric on said work support, and means for removing thread from said bobbin during said cooperating motions of said needle and loop-taker as are required for the formation of lock stitches comprising an auxiliary hook carried on said loop-taker, means supporting said auxiliary hook for movement into and out of an operative position in said path of thread from said bobbin to the stitches in a work fabric, and means for shifting said auxiliary hook into operative position to draw thread from said bobbin during rotation of said loop-taker.

9. In a lock stitch sewing machine having a work support, an endwise reciprocating thread carrying needle carried at one side of said work support, a rotary loop-taker carried at the opposite side of said work support, a hook beak carried on said loop-taker for engaging loops of thread from said needle, a bobbin journaled in said loop-taker, and actuating means permanently interconnecting said needle and said loop-taker for timed cooperating movements as are required for said loop-taker

beak to seize and carry loops of thread from said needle about said bobbin in the formation of lock stitches, means for winding thread from said needle on said bobbin comprising clamp means associated with said loop-taker for clamping a loop of needle thread on said beak, means effective simultaneously with said clamp means for blocking passage of said loop of needle thread about said bobbin and for guiding said clamped needle thread to said bobbin, an annular thread camming member carried on the periphery of said loop-taker and having a free edge projecting axially from said rotary loop-taker about which edge extends said thread from the bobbin to the stitches in a work fabric on said work support, and means for removing thread from said bobbin during said cooperating motions of said needle and said loop-taker as are required for the formation of lock stitches comprising, an auxiliary hook carried between said loop-taker and said thread camming member, means supporting said auxiliary hook for sliding movement axially of said loop-taker into and out of an exposed position beyond said thread camming member and into the path of said thread from said bobbin extending about the edge of said thread camming member, and means for shifting said auxiliary hook into said exposed position to draw thread from said bobbin during rotation of said loop-taker.

10. In a sewing machine for forming lock stitches in a work fabric and having a work support, an endwise reciprocating thread carrying needle carried at one side of said work support, a rotary loop-taker carried at the opposite side of said work support, a thread carrying bobbin journaled in said loop-taker, and a hook beak carried on said loop-taker, means for rotating said loop-taker in timed relation with reciprocation of said needle as is required for the formation of lock stitches, means for removing thread from said bobbin during said rotation of said loop-taker as is required for the formation of lock stitches comprising means on said loop-taker for determining the path of a thread from said thread carrying bobbin to the stitches in a work fabric on said work support, an auxiliary hook carried on said loop-taker, means supporting said auxiliary hook for movement into and out of an operative position in said path of the thread from said bobbin to the stitches in a work fabric, and means effective during rotation of said loop-taker as is required for the formation of lock stitches for shifting said auxiliary hook into operative position to draw the thread from said bobbin.

11. In a sewing machine for forming lock stitches in a work fabric and having a work support, an endwise reciprocating thread carrying needle carried at one side of said work support, a rotary loop-taker carried at the other side of said work support, a thread carrying bobbin journaled on said loop-taker, and a hook beak caried on said loop-taker, means for rotating said loop-taker in timed relation with reciprocation of said needle for engaging and carrying loops of thread from said needle about said bobbin as is required for the formation of lock stitches, an annular thread camming member carried on the periphery of said loop-taker and having a free edge projecting axially from said rotary loop-taker about which edge extends said thread from the bobbin to the stitches in said work fabric, means for removing thread from said bobbin during said rotation of said loop-taker as is required for the formation of lock stitches comprising an annular leaf spring secured along a portion of the periphery thereof to said rotary loop-taker and disposed coaxially of said rotary loop-taker with a free extremity disposed at an angle to a plane perpendicular to the axis of said loop-taker when said leaf spring is relaxed, an auxiliary hook slidably confined for movement axially of said loop-taker between said loop-taker and said annular thread camming member thereon, means interconnecting said auxiliary hook with free extremity of said leaf spring to bias said auxiliary hook into a retracted position beneath said thread camming member in the relaxed position of said leaf spring, a cam finger carried on said sewing machine and disposed

between the axis of said rotary loop-taker and said work support, means for shifting said cam finger into engagement with said annular leaf spring to bias said auxiliary hook into exposed position outwardly of said thread camming member as said auxiliary hook passes between the axis of said loop-taker and said work support.

12. In a sewing machine for forming lock stitches in a work fabric and having a work support, an endwise reciprocating thread carrying needle carried at one side of said work support, a rotary loop-taker carried at the other side of said work support, a thread carrying bobbin journaled on said loop-taker, and a hook beak carried on said loop-taker, means for rotating said loop-taker in timed relation with reciprocation of said needle for engaging and carrying loops of thread from said needle about said bobbin as is required for the formation of lock stitches, an annular thread camming member carried on the periphery of said loop-taker and having a free edge projecting axially from said rotary loop-taker about which edge extends said thread from the bobbin to the stitches in said work fabric, means for removing thread from said bobbin during said rotation of said loop-taker as is required for the formation of lock stitches comprising an annular leaf spring secured along a portion of the periphery thereof to said rotary loop-taker and disposed coaxially of said rotary loop-taker with a free extremity disposed at an angle to a plane perpendicular to the axis of said loop-taker when said leaf spring is relaxed, an auxiliary hook slidably confined for movement axially of said loop-taker between said loop-taker and said annular thread camming member thereon, means interconnecting said auxiliary hook with free extremity of said leaf spring to bias said auxiliary hook into a retracted position beneath said thread camming member in the relaxed position of said leaf spring, a cam finger carried on said sewing machine and disposed between the axis of said rotary loop-taker and said work support, and means for shifting said cam finger into engagement with said annular leaf spring to bias said auxiliary hook into exposed position outwardly of said thread camming member as said auxiliary hook passes between the axis of said loop-taker and said work support.

13. In a device as set forth in claim 12, a thread guiding member having a thread engaging free extremity, said thread engaging member carried by said cam finger and disposed spanning said annular thread camming member on said rotary loop-taker, and means effective after said auxiliary hook has engaged the thread extending from said bobbin to the fabric on said work support for shifting the thread engaging free extremity of said thread guiding member into a position opposite said annular thread camming member to guide said bobbin thread thereon to be unwound from said bobbin.

14. In a lock stitch sewing machine having a work support, an endwise reciprocatory thread carrying needle carried above said work support, a rotary loop-taker carried beneath said work support, a bobbin case journaled in said loop-taker, a bobbin freely journaled in said bobbin vase and interengaging means on said work support and on said bobbin case for restraining rotation of said bobbin case, actuating means for reciprocating said needle and rotating said loop-taker in one direction in timed relation with said needle reciprocation in the formation of lock stitches, stop motion means for suspending operation of said actuation means, thread severing means carried beneath said work support, and means for presenting the thread from said thread carrying needle to said thread severing means comprising a thread engaging finger carried by said bobbin case rotation restraining means on said work support, said thread engaging finger having a free extremity disposed adjacent to the periphery of said rotary loop-taker and facing in a direction opposite that of the direction of rotation of said loop-taker, said bobbin case being formed with an exposed notch, means effective during the needle reciprocation next succeeding suspension of operation of said actuating means by said stop motion means for shifting the free extremity of said thread engaging finger into said bobbin case notch, and means for shifting said thread severing means into a severing position between said thread engaging finger and said work support.

15. In a lock stitch sewing machine having an endwise reciprocating thread carrying needle, and a rotary loop-taker cooperating with said needle in the formation of lock stitches in a work fabric by engaging and carrying loops of needle thread about a thread carrying bobbin carried in a non-rotating bobbin case journaled in said loop-taker, means for severing both the needle and bobbin threads closely adjacent to the work fabric including a thread cutting blade formed with a cutting edge, a cutting blade carrier, means shiftably supporting said cutting blade carrier for movement relatively to said needle and bobbin threads, a thread pick-up finger having a free extremity, means shiftably supporting said thread pick-up finger for movement of said free extremity toward and away from said bobbin case, interengaging cam and cam follower means associated with said cutting blade carrier and said thread pick-up finger effective to shift the free extremity of said thread pick-up finger against said bobbin case upon movement of said thread cutting blade toward said needle and bobbin threads, means for shifting said thread cutting blade toward said threads, and a thread separating lug projecting from said thread cutting blade at one side of said cutting edge in position to enter a loop of needle thread on said thread pick-up finger and to direct only one limb of said needle thread loop to said cutting edge.

16. In a lock stitch sewing machine having a work support, stitch forming instrumentalities including an endwise reciprocatory work penetrating needle arranged above the work support and a rotary loop-taker arranged beneath the work support and having a thread carrying bobbin journaled therein and a hook beak formed thereon for engaging the carrying loops of thread from the needle about said bobbin in the formation of lock stitches, a stop motion mechanism, and means for initiating operation of said sewing machine for a predetermined number of stitch forming cycles preceding automatic operation of said stop motion mechanism, the improvement which comprises in combination, an auxiliary hook, means shiftably supporting said auxiliary hook on said loop-taker for movement into and out of an operative thread engaging position in angularly spaced relation to said hook beak, a thread pick-up finger arranged beneath said work support in spaced relation in front of said loop-taker and having a free extremity shiftable toward and away from said rotary loop-taker, a thread cutting means shiftably supported beneath said work support, interlock means for preventing operation of said thread cutting means during operation of said stitch forming instrumentalities, means for in seriatim shifting said auxiliary hook into operative position to engage the bobbin thread prior to the final work penetration of said needle for drawing the unused thread from said bobbin, for shifting the free extremity of the thread pick-up finger into the path of the last needle thread loop being carried about the bobbin by the hook beak, and for releasing said interlock means.

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