Aug. 25, 1964 A. S. MELOY, JR 3,145,673

CONTROL DEVICE FOR LOCK STITCH SEWING MACHINE

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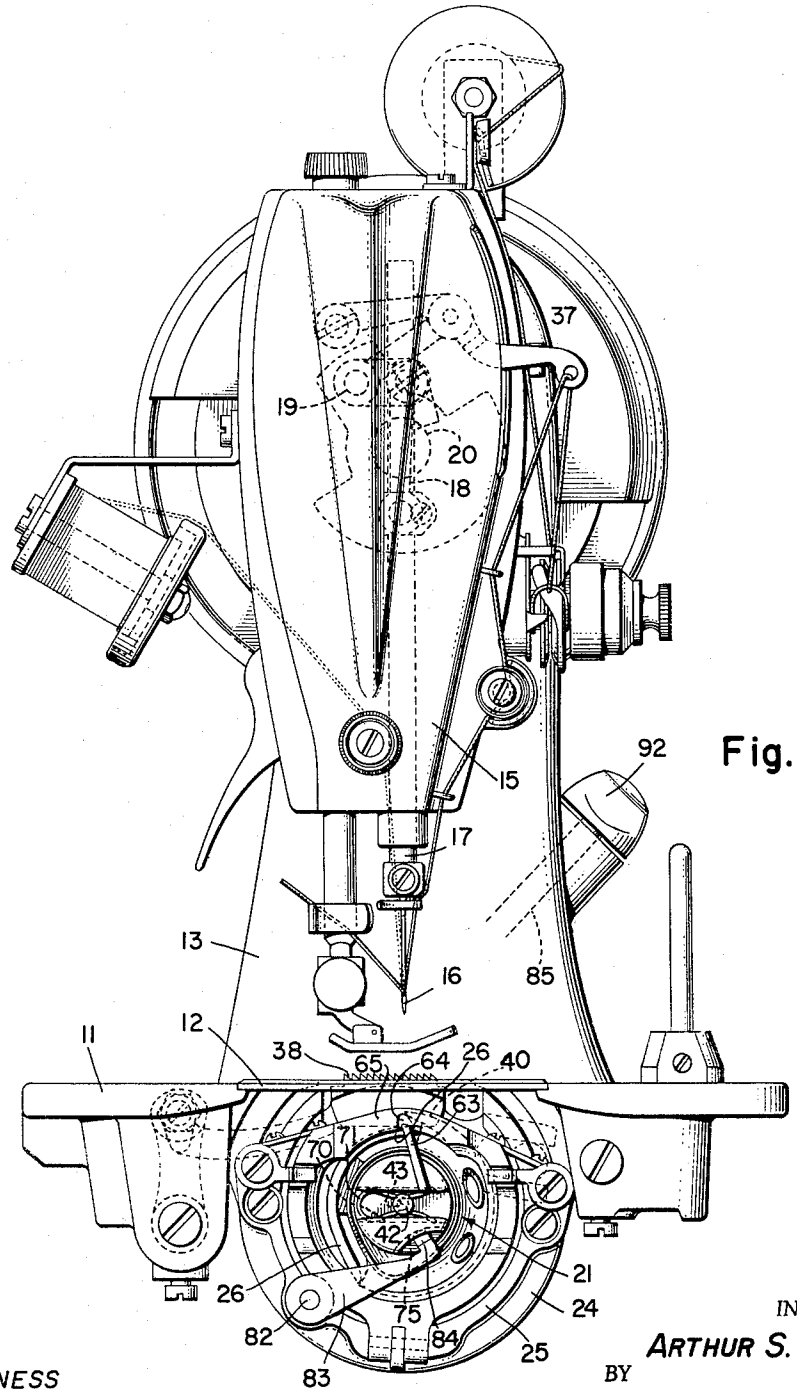


Fig. 1.

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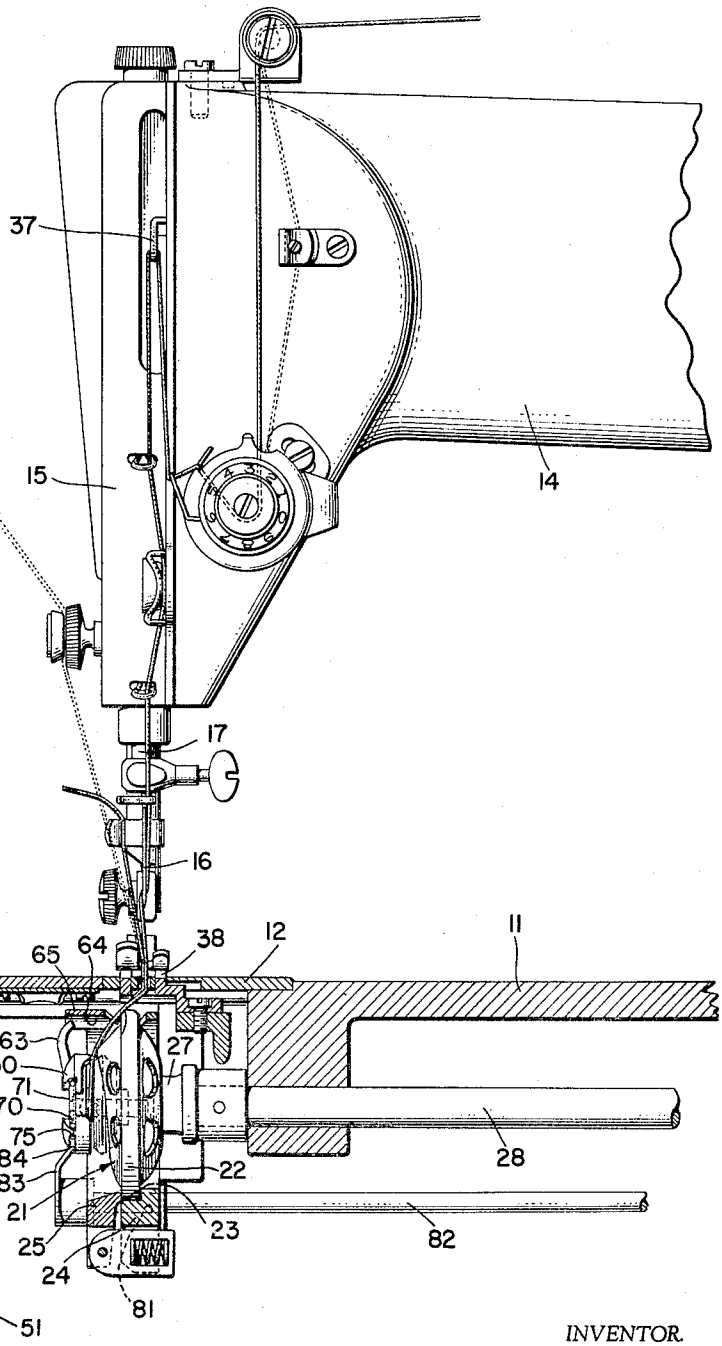
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CONTROL DEVICE FOR LOCK STITCH SEWING MACHINE

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Fig. 2.



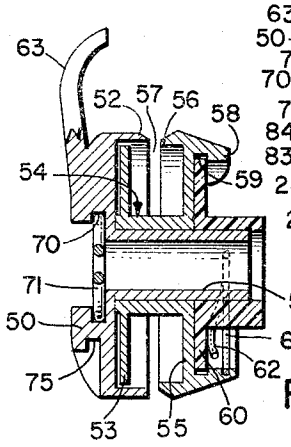


Fig. 8.

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CONTROL DEVICE FOR LOCK STITCH SEWING MACHINE

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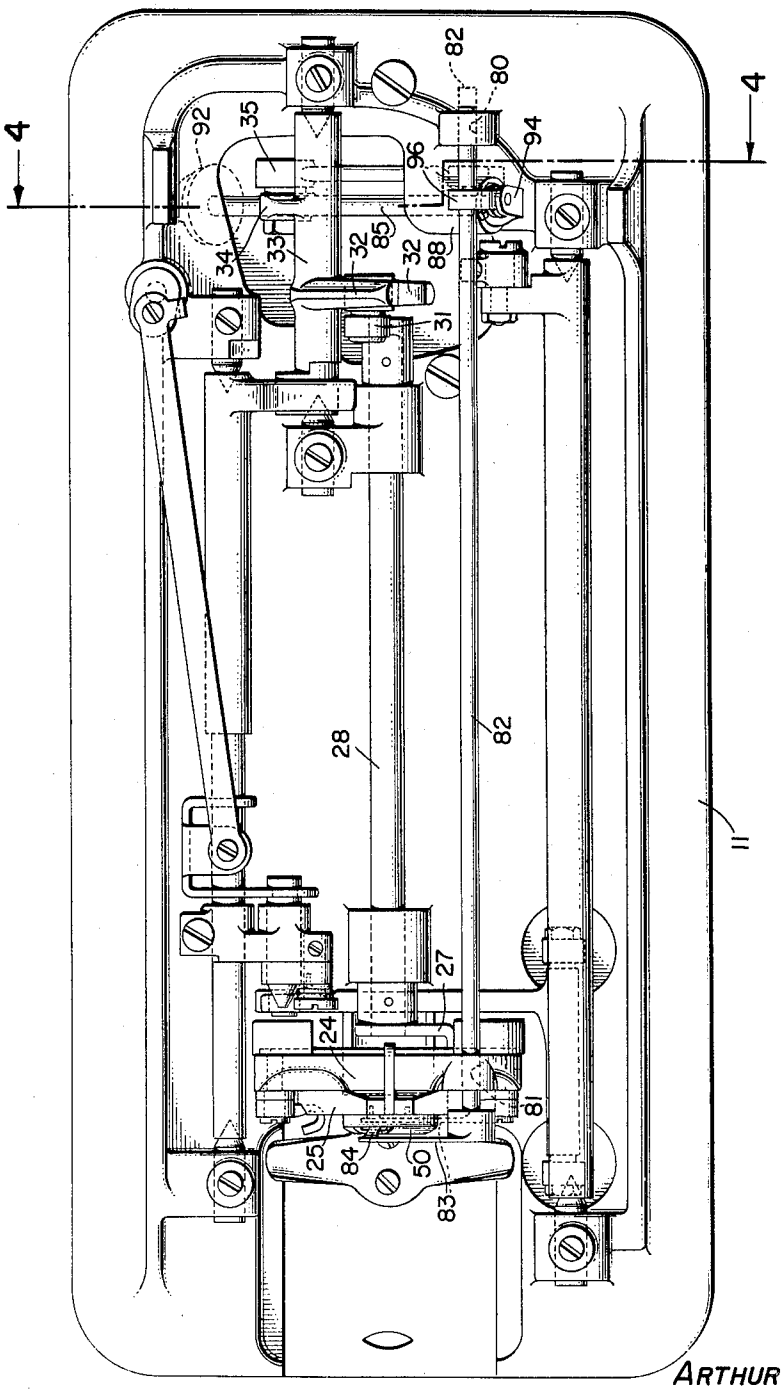


Fig. 3.

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CONTROL DEVICE FOR LOCK STITCH SEWING MACHINE

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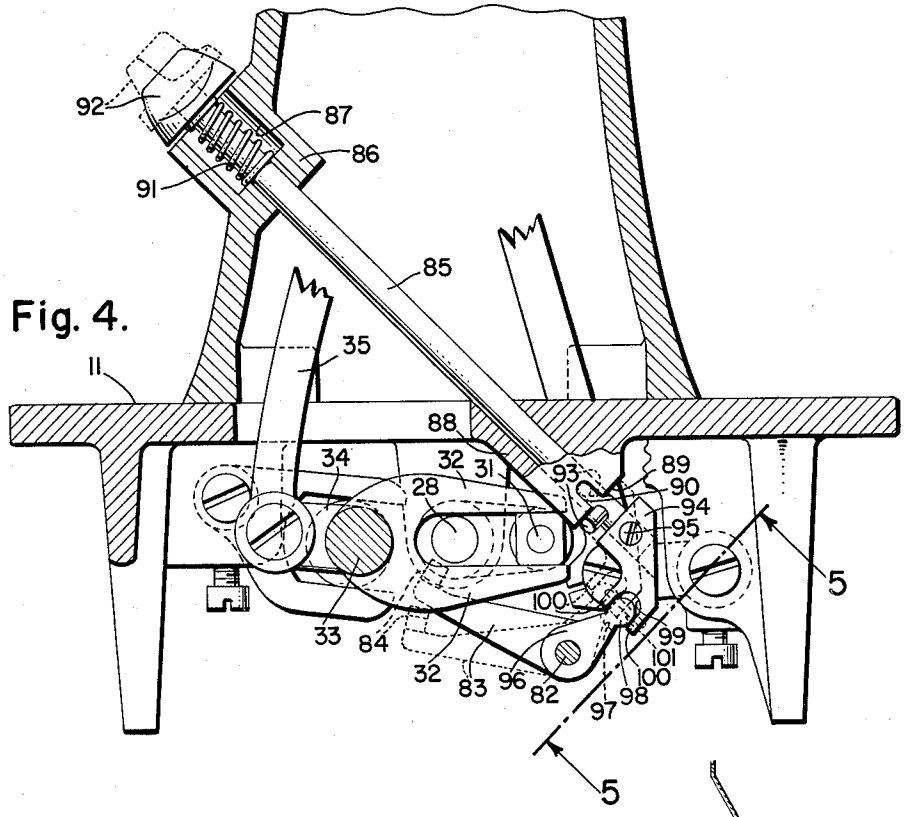


Fig. 4.

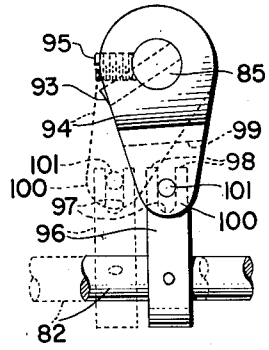


Fig. 5

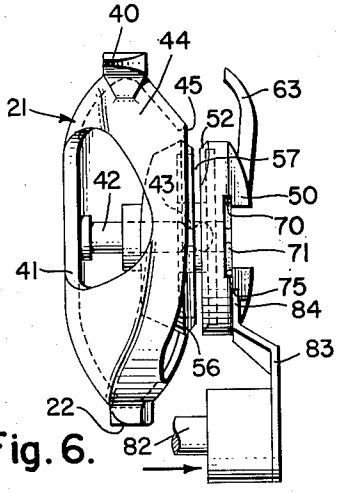


Fig. 6.

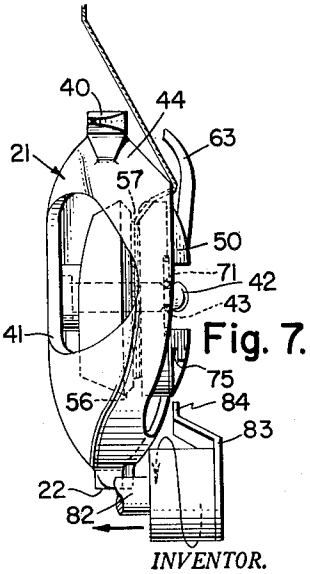


Fig. 7.

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United States Patent Office 3,145,673 Patented Aug. 25, 1964

3,145,673

CONTROL DEVICE FOR LOCK STITCH SEWING MACHINE

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Filed Oct. 2, 1962, Ser. No. 227,771
5 Claims. (Cl. 112—181)

This invention relates to lock stitch sewing machines, of the type in which the thread supply may be replenished on a bobbin in the loop-taker during motion of the needle and loop taker as is required for the formation of lock stitches.

This invention is useful as applied to a bobbin replenishing mechanism as disclosed in the co-pending United States Patent application of R. E. Johnson Serial No. 96,579, filed March 17, 1961, now Patent No. 3,096,736 and more particularly, relates to a novel means whereby the sewing machine operator may at will influence the position of sewing machine parts for either bobbin replenishment or sewing.

It is an object of this invention to provide a control means for positioning the bobbin relatively to the loop taker of a lock stitch sewing machine for selective adapting the machine either to replenish the bobbin thread or to sew.

A further object of this invention is to provide a novel operator influenced control means for the effecting replenishment of thread on a bobbin in the loop taker during motion of the loop taker as is required for the formation of lock stitches.

With the above and additional 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 head end elevational view of a sewing machine having this invention applied thereto,

FIG. 2 represents a front elevational view of a portion of the sewing machine of FIG. 1 with the work supporting bed and portions of the mechanism carried therebeneath illustrated in vertical cross section taken substantially along the axis of the loop taker drive shaft,

FIG. 3 represents a bottom plan view of the sewing machine of FIGS. 1 and 2,

FIG. 4 is a cross sectional view taken substantially along line 4—4 of FIG. 3 and illustrating the operator influenced control shaft and the linkage connected therewith.

FIG. 5 is a cross sectional view taken substantially along line 5—5 of FIG. 4 and illustrating the linkage connected with the operator influenced control shaft.

FIG. 6 represents a left side elevational view of the loop taker of FIG. 1 with the bobbin thread case illustrated in winding position,

FIG. 7 represents a left side elevational view of the loop taker similar to that of FIG. 6 but showing the bobbin thread case disposed in sewing position, and

FIG. 8 is a vertical cross sectional view of the bobbin and bobbin thread case.

Referring particularly to FIGS. 1, 2 and 3, the sewing machine to which this invention is applied has a frame including a work supporting bed **11** with a throat plate **12** carried thereon. A standard **13** rising from the bed, joins with a cantilever arm **14** extending from the standard and sustaining a sewing head **15** over the throat plate.

The principal sewing instrumentalities include a thread carrying eye pointed needle **16** clamped to a needle bar **17** supported for vertical reciprocation in the head. The needle bar is operated by means of a drive link **18** pivotally connected to the needle bar and to a crank member **19** fast on an arm shaft **20** journaled in the cantilever

arm **14**. Cooperating with the needle **16** is a loop taker **21** which as illustrated in FIGS. 6 and 7 comprises a shuttle formed with an arcuate bearing rib **22** extending about slightly more than half the periphery of the shuttle. The shuttle bearing rib **22** is journaled in a raceway **23** formed in a shuttle supporting member **24** secured beneath the work supporting bed and is constrained in the raceway by a retainer member **25**. Spaced fingers **26—26** of a shuttle driving member **27** fast on an oscillating shuttle driving shaft **28** journaled beneath the bed operate against the extremities of the shuttle bearing rib **22** to impart oscillating motion to the shuttle. As illustrated in FIG. 3, the shuttle driving shaft **28** carries beneath the standard **13** a crank **31** embraced between the bifurcated arms **32** of a rocker **33**. An arm **34** on the rocker is pivotally connected to a pitman **35** operatively connected to a driving element (not shown) on the arm shaft **20**. Motion is thus imparted by the arm shaft **20** to the needle and to the shuttle in a timed relationship such as is required for the formation of lock stitches.

Also contributing to the formation of stitches is the needle thread take up mechanism **37** and the work feeding mechanism **38**. Since these devices do not form a direct part of this invention, reference is made to the co-pending United States patent application of R. E. Johnson Serial No. 96,579, filed April 17, 1961 for a detailed description of the manner in which these devices are operated in concert with the needle and loop taker.

Referring to FIGS. 6 and 7 the shuttle bearing rib **22** is formed with a loop seizing beak **40** which serves to engage and draw out loops of a thread carried by the needle. Extending diametrically across and offset rearwardly from the bearing rib **22** is a rear wall **41** of the shuttle from which along substantially the axis of curvature of the bearing rib extends a cylindrical post **42** formed near the free extremity with an annular groove **43**. Extending forwardly and upwardly from the bearing rib is a front skirt **44** terminating in an arcuate substantially planar free edge **45** substantially equidistant from the post **42**. Extending between the extremities of the rear wall **41** and the front skirt **44** is a bridge piece **47** completing an annular casing about the post **42**. The rear wall and front skirt portions of the shuttle provide thread loop manipulating surfaces which serve to expand and direct a thread loop engaged by the beak about an under thread mass in the formation of lock stitches.

FIG. 8 best illustrates the manner in which the bobbin and bobbin case are assembled. Indicated at **50** is the substantially circular head portion of a bobbin case formed with a central sleeve **51** adapted snugly to embrace the shuttle post **42** and with a peripheral lip **52** adapted to overlie and shield one flange **53** of a bobbin **54** journaled on the sleeve **51**. The bobbin is formed with a second flange **55** having a peripheral lip **56** extending toward the bobbin case lip **52** but providing a thread entrance slot **57** therebetween. The bobbin flange **55** is also formed with a peripheral lip **58** e xtending at the side opposite the lip **56** and provided with an undercut **59** into which is snapped a frictioning washer **60** of flexible resilient material such as nylon, hard rubber or the like. Both the undercut **59** and a leaf spring **61** anchored in the lip **58** of the bobbin and having an inturned free extremity **62** bearing against the frictioning washer **60** serve to urge the washer against the bobbin flange **55** so as to frictionally resist turning movement of the bobbin relatively to the bobbin case and thus to apply a tension to the under or bobbin thread. The bobbin case is formed with a rotation restraining finger **63** which as illustrated FIGS. 1 and 2 is constrained in a rotation restraining notch **64** in a plate **65** spanning the shuttle retainer **25**. As illustrated in FIG. 2, the plate **65** and the notch **64** therein are of considerable width so as to prevent rota-

tion of the bobbin case not only when the bobbin case is positioned completely on the post 42 as illustrated in FIG. 7 but also when the bobbin case occupies a position outwardly along the post 42 as illustrated in FIG. 6.

An undercut slot 70 formed diametrically across the head portion of the bobbin case constrains a spring clip 71 which accommodates the post 42 of the shuttle and snaps into the annular groove 43 of the post to constrain the bobbin case on the post in the position as illustrated in FIG. 7. The position of the bobbin case as illustrated in FIG. 7 constitutes the sewing position of the parts in which a thread loop engaged by the shuttle beak and manipulated by the front skirt 44 of the shuttle will be directed completely about the bobbin case so as to form, with a thread on the bobbin, an interlocked thread concatenation known in the art as a lock stitch.

The head of the bobbin case is also formed with a radially open peripheral slot 75 perferably at the opposite side of the bobbin case from the rotation restraining finger 63. The peripheral slot 75 provides for interengagement of the bobbin case with a means which will now be described for shifting the bobbin case and with it the bobbin from the sewing position into a position for replenishment of thread on the bobbin and back into sewing position.

Journaled for turning and endwise sliding movement in a bearing 80 in the bed beneath the standard and in a bearing 81 in the shuttle supporting member is a rod 82 disposed substantially parallel to the shuttle drive shaft. Secured to the rod 82 beyond the bearing 81 is a bobbin case positioning member 83 formed at the free extremity with an offset finger 84 adapted to enter the peripheral slot 75 in the bobbin case when the rod 82 is turned and adapted to carry the bobbin case axially of the shuttle when the rod 82 is shifted endwise while the finger 84 is engaged in the bobbin case slot.

For turning and shifting the rod 82 an operating shaft 85 is journaled obliquely in the standard on an axis disposed in a plane perpendicular to that of the rod 82 and spaced from the axis of the rod 82. The operating shaft is journaled in an upper bearing 86 in the standard wall, which bearing is formed exteriorly with a counterbore 87 and in a lower bearing 88 in the bed, the under surface 89 of which is machined perpendicularly to the operating shaft and formed with a narrow slot 90 substantially parallel to the operating shaft and extending to the machined under surface 89 of the bearing. A compression spring 91 on the operating shaft in the counterbore 87 bears against a knob 92 fixed to the operating shaft exteriorly of the standard and biases the operating shaft upwardly. A pin 93 set into the operating shaft beneath the bearing 88, however, permits axial movement of the operating shaft in only one predetermined angular position of the shaft i.e. in which the pin 93 is aligned with the slot 90.

A rock arm 94 fixed on the operating shaft by a set screw 95 and rock arm 96 fast on the rod 82 interengage and serve to transmit movements of the operating shaft to the rod 82. When the operating shaft is depressed against the action of the compression spring 91 into the position illustrated in FIG. 4, the rock arms 94 and 96 are preferably disposed in substantially mutually perpendicular relation as illustrated in solid lines in FIG. 5. The rock arms 94 and 96 are each bifurcated to define radial slots, the slots in each case being arranged transversely of the rod or shaft to which the rock arm is secured. The rock arm 96 fast on the rod 82 is formed with a radial slot 97 cut perpendicular to the axis of the rod 82 and providing bifurcated free extremities 98—98 of the rock arm 96 which free extremities are preferably formed each with a rounded protuberance. The rock arm 94 fast on the operating shaft 85 is formed with a radial slot 99 cut perpendicular to the axis of the operating shaft 85 and providing bifurcated free extremities 100—100 embracing snugly the free extremities 98—98 of the rock arm 96. A pin 101 secured spanning the bifurcated free extremities 100 of the rock arm 94 is constrained in the slot 97 in the rock arm 96.

By means of the connection afforded between the rock arms 94 and 96, axial movement of the operating shaft 85 will cause turning movement of the rod 82 and of the bobbin case positioning member 83. Similarly, turning movement of the operating shaft 85 will cause axial sliding movement of the rod 82 as illustrated in dashed lines in FIG. 5.

The right circular free extremity 89 and the slot 90 in the bearing 88 provide a cam surface for controlling the motion which might possibly be imparted to the operating shaft 85. The pin 93 set into the shaft 85 cooperates with the surfaces 89 and 90 after the fashion of a cam follower permitting axial movement of the operating shaft 85 only while the pin 83 is aligned with or in the slot 90, and permitting turning movement of the operating shaft 85 only when the shaft has been shifted axially to carry the pin 93 out of the slot 90. The knob 92 is fixed on the shaft 85 so as to prevent axial motion of the shaft beyond the point at which the pin 93 is clear of the slot 90.

In terms of the rod 82, the pin 93 and cam surfaces 89 and 90 provide for turning the bobbin case positioning member 83 into or out of engagement with the bobbin case only in the sewing position of the bobbin case and likewise provide for shifting the rod 82 axially only while the bobbin case is engaged by the bobbin case positioning member. It will be apparent that an interlock in the nature of the pin 93 and cam surfaces 89 and 90 might also be arranged between the rod 82 and one of the bushings 80 or 81.

As illustrated in FIGS. 1, 2 and 7, the bobbin case when held in the sewing position by engagement of the spring 71 with the annular groove 43 of the post 72 in the shuttle positions the thread entrance slot 57 into the bobbin within the planar free edge 45 of the front skirt of the shuttle so that thread loops being manipulated by the shuttle will pass complete about the bobbin and bobbin case and lock stitches can be produced. Also in the position of the bobbin case illustrated in FIGS. 1, 2 and 7 the bobbin case positioning member 83 may be turned so as to carry the finger 84 thereon into and out of engagement with the slot 75 in the bobbin case.

When it is desired to replenish thread on the bobbin, the knob 92 is depressed, turning the finger 84 into the slot and freeing the pin 93 on the shaft 85 out of the slot 90 in the bushing 88. Turning of the knob 92 will then shift the rod 82 and member 83 thereon axially so as to overcome the spring 71 and shift the bobbin case outwardly along the post 42 until the thread entrance slot 57 is diposed outwardly of the planar free edge 45 of the shuttle shirt. Thread loops manipulated by the shuttle in this position of parts, as illustrated on FIG. 6, will be directed onto the bobbin and wound thereon for subsequent use as under or locking thread in the formation of lock stitches.

When sufficient under thread has been wound on the bobbin, sewing may be commenced by simply turning the knob 92 so as to shift the bobbin case back into sewing position within the shuttle. The spring 71 will be reengaged in the annular groove 73 of the shuttle post to constrain the bobbin case in the shuttle and the pin 93 upon being returned into alignment with the slot 90 in the bushing 88 will free the spring 91 to shift the knob 92 and shaft 85 outwardly thus turning the bobbin case positioning member 83 out of engagement with the bobbin case.

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

1. In a lock stitch sewing machine having a thread carrying needle, a circularly movable loop-taker, a loop seizing beak and a thread loop manipulating surface formed on said loop taker, actuating means operatively connecting said needle and loop taker for cooperating movement as is required for the formation of lock stitches, a bobbin case journaled in said loop taker, a rotatable bobbin constrained against axial movement relatively to said bobbin

case, spring detent means effective between said bobbin case and said loop taker to constrain said bobbin case with said bobbin in a sewing position disposed completely within the path of a thread loop being manipulated by said thread loop manipulating surface of said loop taker, means for shifting said bobbin axially relatively to said loop taker from said sewing position into a winding position spanning the path of a thread loop being manipulated by said thread loop manipulating surface of said loop taker comprising, a bobbin case positioning member, means supporting said member for movement in substantially perpendicular paths one path parallel to the axis of circular movement of said loop taker and the perpendicular path into and out of positive engagement with said bobbin case, an operator influenced means for imparting movements in said substantially perpendicular paths to said bobbin case positioning member, and interlock means between said bobbin case positioning member and said sewing machine permitting movement of said member parallel to the axis of circular movement of said loop taker only when in positive engagement with said bobbin case and permitting movement of said member into and out of positive engagement with said bobbin case only when in a position corresponding to said sewing position of said bobbin.

2. In a lock stitch sewing machine having a thread carrying needle, a circularly moving shuttle, a loop seizing beak, a thread manipulating surface and an axial post formed on said shuttle, actuating means operatively connecting said needle and said shuttle for cooperating movement as is required for the formation of lock stitches, a bobbin case journaled on said circular post in said shuttle, a rotatable bobbin constrained against axial movement relatively to said bobbin case, a detent formed in said circular post on said shuttle, spring means on said bobbin case cooperating with said detent to constrain said bobbin case with said bobbin in a sewing position disposed completely wthin the path of a thread loop being manipulated by said thread loop manipulating surface of said shuttle, means for shifting said bobbin axially relatively to said shuttle from said sewing position to a winding position spanning the path of a thread loop being manipulated by said thread loop manipulating surface of said shuttle comprising, a radially open peripheral slot formed in said bobbin case, a bobbin case positioning member, a bobbin case slot engaging finger formed on said member, a rock shaft journaled in said sewing machine on an axis substantially parallel to the axis of circular motion of said shuttle, means securing said bobbin case positioning member to said rock shaft, operator influenced means for turning said rock shaft to swing said finger into said bobbin case slot, and operator influenced means for shifting said rock shaft axially to shift said bobbin from said sewing position to said winding position.

3. A device as set forth in claim 2, a cam follower finger associated with said rock shaft for turning and translatory movements in response to axial sliding movement and turning movements respectively of said rock shaft, and means carried by said sewing machine and formed with a cam track embracing said cam follower finger permitting turning movement of said rock shaft only when said bobbin case slot engaging finger is disposed opposite said winding position of said bobbin case, and permitting axial sliding movement of said rock shaft only when said bobbin case slot engaging finger is turned into said bobbin case slot.

4. A device as set forth in claim 2 in which said operator influenced means for turning and axially shifting said rock shaft comprises an operating shaft journaled in said sewing machine on an axis disposed in a plane perpendicular to the axis of said rock shaft, said operating shaft and said rock shaft each having secured thereto a rock arm terminating in bifurcated arms defining therebetween a slot extending transversely of the shaft to which each rock arm is secured, said rock arms being disposed in substantially mutually perpendicular relation with the bifurcated arms of a first of said rock arms being formed with protruding rounded free extremities embraced between the bifurcated arms of the second of said rock arms, and a pin fixed between the bifurcated arms of the second of said rock arms and extending between the bifurcated arms of the first of said rock arms.

5. In a device as set forth in claim 4, a bushing for said operating shaft carried by said sewing machine, said bushing having cam surfaces comprising a right circular free extremity and a radial slot extending axially of said bushing from said right circular free extremity, a cam follower finger carried by said operating shaft and extending radially outward therefrom, said finger being freely slidable in said bushing slot so as to permit turning of said operating shaft when said shaft has been shifted axially to carry said pin out of said bushing slot and so as to permit axial movement of said operating shaft when said finger is turned into alignment with said bushing slot.

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