June 4, 1968 M. F. IVANKO 3,386,400

BOBBIN THREAD REPLENISHMENT MECHANISM
FOR LOCKSTITCH SEWING MACHINES

Filed Oct. 16, 1967 3 Sheets-Sheet 1

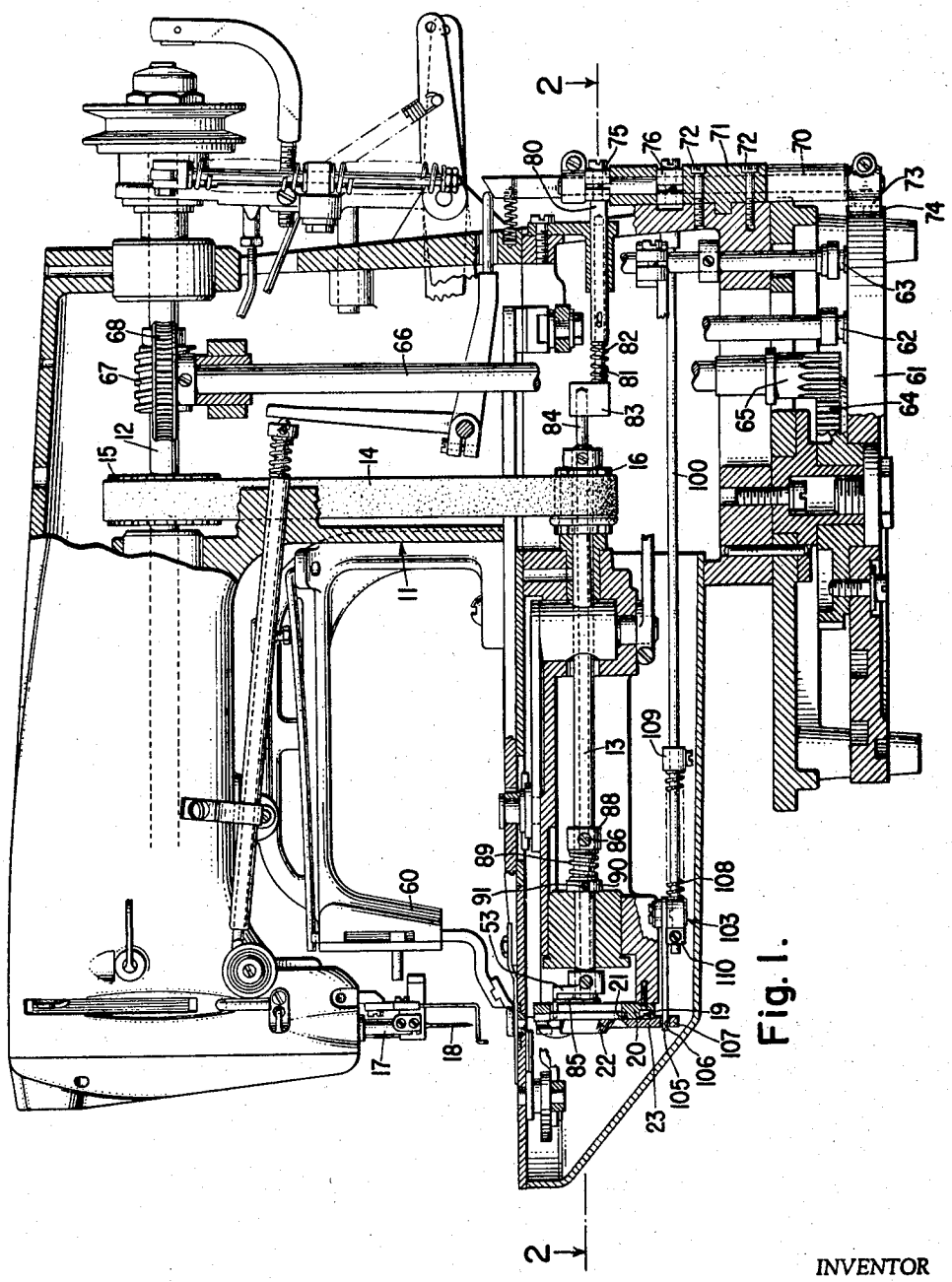


Fig. 1.

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Filed Oct. 16, 1967 3 Sheets-Sheet 2

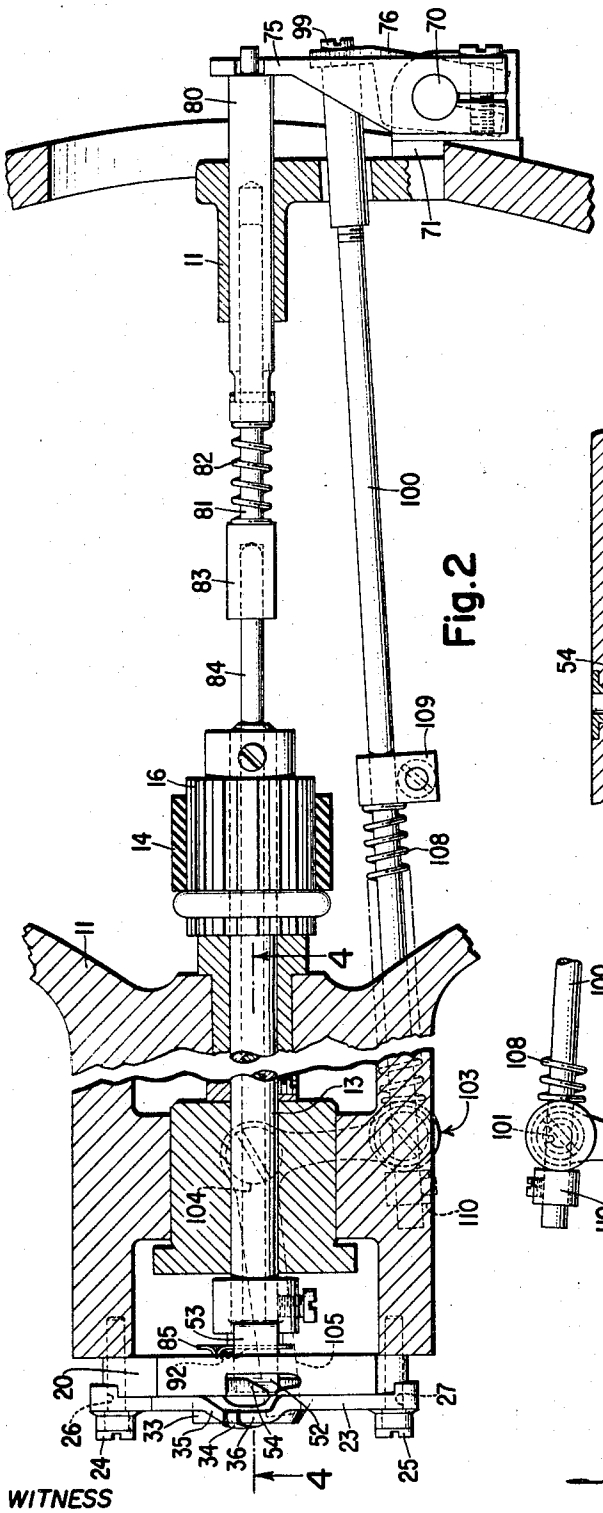


Fig.2

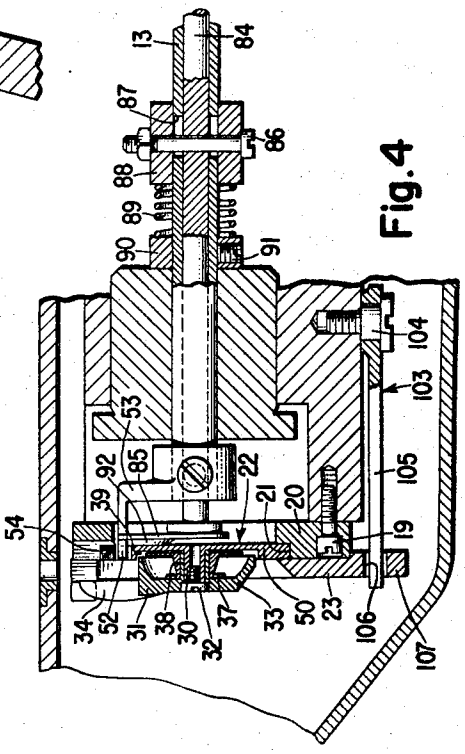


Fig.4

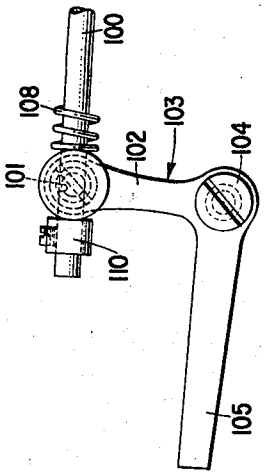


Fig.3

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BOBBIN THREAD REPLENISHMENT MECHANISM FOR LOCKSTITCH SEWING MACHINES

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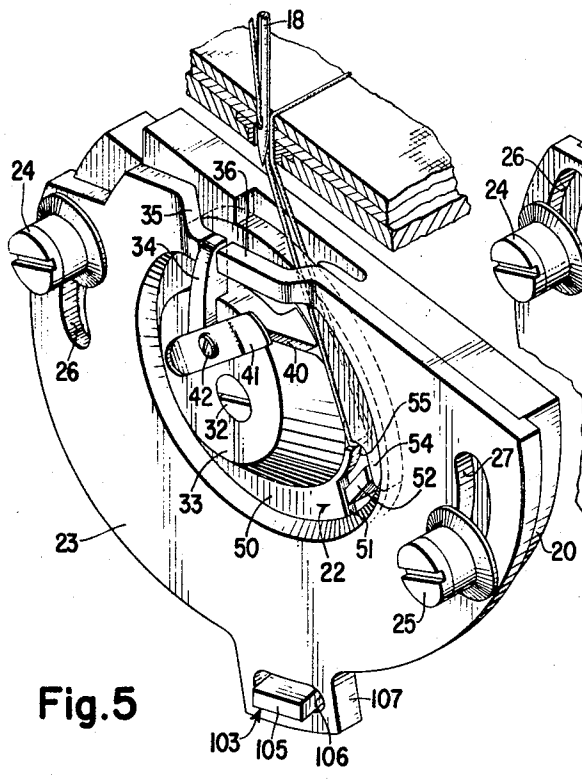


Fig.5

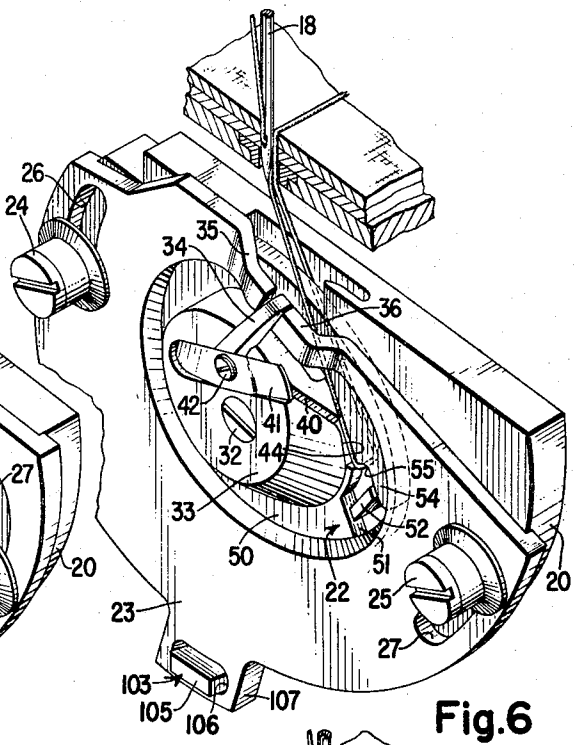


Fig.6

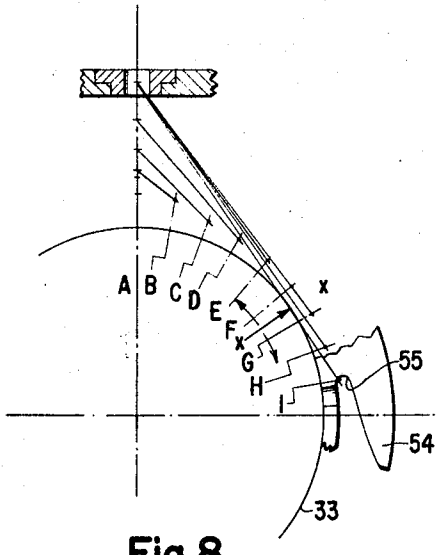


Fig.8

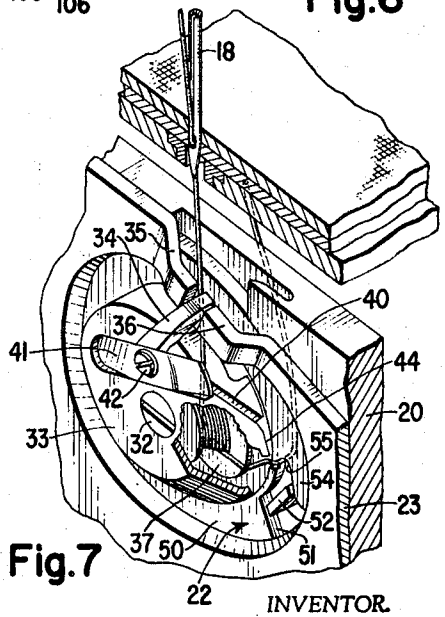


Fig.7

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BOBBIN THREAD REPLENISHMENT MECHANISM FOR LOCKSTITCH SEWING MACHINES

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Continuation-in-part of application Ser. No. 544,952, Apr. 25, 1966. This application Oct. 16, 1967, Ser. No. 675,498

8 Claims. (Cl. 112—181)

ABSTRACT OF THE DISCLOSURE

A lockstitch sewing machine is disclosed in which the rotation restraining means for the bobbin case in a circularly moving loop taker is associated with mechanism by which either one of two discrete angular positions of the bobbin case is attained. Needle thread manipulating means on the loop taker and on the bobbin case cooperate to influence the needle thread in one angular position of bobbin case to move about the bobbin case so as to form stitches, and in the other angular position of the bobbin case to move onto the bobbin for replenishment of bobbin thread.

Cross reference to related application

This application is a continuation-in-part of United States application Ser. No. 544,952, filed Apr. 25, 1966, now abandoned.

Background of the invention

This invention relates to lockstitch sewing machines in which the bobbin thread may be replenished while the bobbin remains in the loop taker of the sewing machine, and more particularly, to a new and improved loop taker construction and means for operating the loop taker for drawing in, winding, and tensioning a fresh supply of bobbin thread.

It is an object of this invention to provide novel and improved means associated with a loop taker of a lockstitch sewing machine for automatically winding a fresh supply of thread on the bobbin in the loop taker.

Another object of this invention is to provide means effective in the loop taker of a sewing machine for selectively influencing bobbin thread replenishment or sewing as the result of an angular shift of the restrained position of a bobbin case within the loop taker. With the novel arrangement provided by this invention, bobbin thread replenishment is effected without the necessity for the presence in the loop taker of any parts or instrumentalities which are not required for the manipulation of threads during sewing. As a result, the novel means of this invention may be applied readily to existing sewing machines or embodied conveniently in conventional sewing machine loop takers.

Description of the drawings

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 vertical cross sectional view of the sewing machine to which the loop taker and bobbin thread replenishing mechanism of this invention is applied,

FIG. 2 is an enlarged cross sectional view taken substantially along line 2—2 of FIG. 1 and illustrating the loop taker and bobbin thread replenishing mechanism,

FIG. 3 represents a bottom plan view of a fragment

of the bobbin thread replenishing mechanism of FIG. 2,

FIG. 4 is a vertical cross sectional view through the loop taker taken substantially along line 4—4 of FIG. 2,

FIG. 5 is a perspective view of the loop taker including a representation of a needle thread loop seized by the loop taker beak and illustrating the position of the parts during normal sewing operation with the bobbin thread being omitted.

FIG. 6 is a perspective view of the loop taker including a representation of a needle thread loop seized by the loop taker beak and illustrating the position of the parts during bobbin thread replenishment,

FIG. 7 is a perspective view of the loop taker including a representation of the needle thread after bobbin thread replenishment has been effected, and

FIG. 8 represents a diagrammatic illustration of the relationship of a loop of needle thread seized by the loop taker beak relatively to the bobbin case.

Detailed description

Referring to FIG. 1, the sewing machine to which this invention is applied includes a frame **11** in which is journaled a main shaft **12**. A hollow loop taker drive shaft **13** is journaled in the frame parallel to the main shaft and is driven at twice the speed of the main shaft by means of a belt **14** and sprockets **15** and **16** on the main shaft and loop taker drive shaft, respectively. A needle bar **17** carrying a needle **18** is supported for endwise reciprocation in the sewing machine frame and adapted to be operated in a conventional manner from the main shaft **12**. Secured to the machine frame beneath the needle **18** as by screws **19** is a shuttle housing **20** formed with a raceway **21** in which a shuttle **22** is rotatable. Complemental to the shuttle raceway **21** is a shuttle retainer **23** which, as best illustrated in FIGS. 5 and 6, is sustained against the shuttle housing by a pair of screws **24** and **25** each threaded into the shuttle housing and passing through arcuate slots **26** and **27** in the shuttle retainer so that the shuttle retainer may partake of limited angular adjustment relatively to the shuttle housing.

Referring to FIG. 4, the shuttle **22** is formed with a central post **30** on which is journaled a bobbin case **31** which is constrained on the post by means of a headed fastening screw **32** threaded into the central post **30** of the shuttle. The bobbin case is formed with a substantially continuous outer cover portion **33** from which a rotation restraining finger **34** projects radially. The rotation restraining finger **34** engages between rotation restraining stop lugs **35** and **36** formed on the shuttle retainer **23**. The bobbin case accommodates a thread carrying bobbin **37** loosely journaled on a sleeve **38** of the bobbin case which embraces the central post **30** of the shuttle. The bobbin case cover portion **33** envelops the bobbin and projects slightly into a shallow cavity **39** in the shuttle **22**. The bobbin case cover portion **33** is formed with a thread receiving slot **40** which opens onto the bobbin within the bobbin case.

As shown in FIG. 6 of the drawings, the thread receiving slot **40** is inclined somewhat in the direction which the needle thread extends as the thread is directed toward the slot. Moreover, the mouth of the slot **40** at the outer periphery of the bobbin case cover portion **33** is preferably flared as indicated at **44** to provide a sufficiently wide opening in the bobbin case cover portion **33** for the thread to enter. It will be understood that in place of the flared mouth **44**, the entire slot could be made sufficiently wide as to accept the thread for enhance to the bobbin. A bobbin thread tensioning leaf spring **41** which is secured to the bobbin case by a screw **42** overlies a portion of the thread receiving slot **40**.

Referring to FIGS. 4 to 7, the shuttle **22** includes an annular bearing rib **50** which is constrained in the shuttle

raceway 21 and which is formed with a peripheral gap 51 which accommodates the free extremity 52 of a shuttle driver 53 fast on the loop taker drive shaft 13. The shuttle bearing rib is formed with a needle thread loop seizing beak 54 which projects into the gap 51 and which is formed with a throat 55 into which seized needle thread loops are carried.

The needle and loop taker arrangement described above are operated in timed relation by the shafts 12 and 13 interconnected by the belt 14 so as to impart two revolutions to the shuttle for each reciprocation of the needle so as to cooperate in a conventional fashion to produce lockstitches comprising a needle thread and a thread carried by the bobbin 37. The sewing machine illustrated in FIG. 1 is of a cyclically operated variety particularly suited for sewing predetermined groups of stitches and includes a work holding clamp 60 and a pattern cam 61 tracked by cam followers 62 and 63 operatively connected to impart motion in mutually perpendicular directions to the work clamp as is conventional in group stitch sewing machines. The pattern cam 61 carries a gear 64 meshing with a pinion 65 on a cam shaft 66 which is driven by means of a worm 67 and worm wheel 68 from the main shaft 12. The pattern cam 61 is also utilized to effect manipulation of the loop taker in a manner such that thread may be replenished on the bobbin during select intervals of the operation of the needle and loop taker. To this end a cam follower shaft 70 is secured in a bushing bracket 71 fastened by screws 72 to the machine frame and carries a rock arm 73 which tracks the periphery of the pattern cam 61 so as to be operated by a cam lug 74 attached to the pattern cam periphery. Clamped on the cam follower shaft 70 are two spaced operating arms 75 and 76 which, as will be described hereinbelow, serve to influence selectively either a thread replenishing or a sewing condition of the loop taker.

Referring to FIGS. 1 and 2, the operating arm 75 embraces one part 80 of a pair of telescopically arranged rods 80, 81, which together are slidable endwise in the sewing machine frame 11. A coil spring 82 biases the telescoping rods 80 and 81 apart. By means of a connection block 83 the telescoping rods 80 and 81 engage a rod 84 which is carried coaxially within the hollow loop taker shaft 13. Between the shuttle and the shuttle driver 53 a thread clamping member 85 is secured to the rod 84. The thread clamping member is locked for rotation with the loop taker drive shaft by a transverse pin 86 accommodated in a lengthwise elongate slog 87 in the loop taker drive shaft but passing snugly through the rod 84. The pin 86 is secured in a collar 88 slidable on the loop taker drive shaft 13 and biased in a direction away from the shuttle by a coil spring 89 which acts between the collar 88 and a collar 90 secured as by a set screw 91 to the loop taker drive shaft 13. The thread clamping member 85 is formed with a radial extending projection 92 disposed adjacent to the throat 55 behind the thread engaging beak 54 of the shuttle in such a position that when the thread clamping member 85 is shifted into engagement with the shuttle by means of the cam 74 a needle thread loop seized by the shuttle beak will be clamped securely in the throat 55 by the projection 92.

The second operating arm 76 on the cam follower shaft 70 is loosely secured by a headed screw 99 to one extremity of a push rod 100 which passes loosely through an aperture 101 formed in one arm 102 of a bell crank lever 103 fulcrum at 104 beneath the sewing machine frame. The other arm 105 of the bell crank lever 103 extends into a clearance aperture 106 formed in a projection 107 of the shuttle retainer 23. A compression spring 108 is carried on the rod 100 between the bell crank arm 102 and a collar 109 secured to the rod 100 so that the movement of the rod 100 can exceed that to which the bell crank lever 103 is moved, with the compression spring 108 absorbing the difference. A collar 110 secured on the rod 100 at the opposite side of the bell crank lever 102 from the compression spring 108 serves to return the bell crank lever when the push rod 100 is retracted. The retraction is effected by the action of the springs 82 and 89 and by way of the operating arms 75 and 76.

With reference to FIGS. 5 and 6, it will be appreciated that by means of the bell crank lever 103 and its action upon the shuttle retainer 23 the angular position of restraint of the bobbin case may be selectively changed. FIG. 5 illustrates the sewing position of the parts in which the bobbin case has been turned in a counterclockwise direction and FIG. 6 illustrates the position of the parts bobbin thread replenishing will take place in which the bobbin case has been turned in a clockwise direction. The manner in which such angular shift of the bobbin case can influence thread replenishment or sewing might best be understood with reference to FIG. 8 which illustrates diagrammatically a number of different angular positions of the loop seizing beak 54 of the shuttle from a position indicated at A in which the beak 54 begins needle thread loop seizure and in a sequence A . . . I, is the seized needle thread loop is carried onto the bobbin case cover portion 33. As illustrated in FIG. 8, the seized needle thread loop will first assume a position of tangency to the bobbin case cover portion 33 when the loop seizing beak occupies a position as illustrated in FIG. 8 and indicated at I with the point of tangency being indicated by the arrow x—x. If the mouth 44 of the thread entrance slot 40 in the bobbin case is disposed in a counterclockwise direction from the station x—x, the thread will bypass the thread entrance slot and be carried about the bobbin case so that sewing will take place. FIG. 5 illustrates this arrangement of parts and the thread which occupies a position of tangency with the periphery of the bobbin case cover portion. FIG. 5 thus illustrates the means in which the seized needle thread loops will bypass the thread entrance slot 40 in the bobbin case during sewing.

When the bobbin case is shifted angularly into a position in which the mouth 44 of the thread entrance slot 40 is disposed in a clockwise position beyond the position x—x as illustrated in FIG. 8 the seized thread when it is carried by the loop seizing beak into tangency with the bobbin case cover portion 33 will draw the thread into the thread entrance slot 40 and thus onto the bobbin. FIG. 6 illustrates this position of parts and indicates the manner in which the thread will be drawn into the slot 40 when the bobbin case is turned clockwise to position the mouth of the thread entrance slot 40 clockwise beyond the position x—x indicated in FIG. 8.

Since the angular shift of the bobbin case 31 by the cam 74 is effected simultaneously with the movement of the thread clamping member 85 into thread clamping position against the rear of the shuttle, the needle thread loop which is directed into the thread entrance slot 40 of the bobbin case will remain clamped to the shuttle beak throughout the bobbin thread replenishing operation. Further rotation of the main shaft 12 and loop taker shaft 13 will effect winding of coils of the needle thread onto the bobbin until the cam 74 terminates the bobbin thread replenishing operation by acting upon the cam follower shaft 70 to return the rods 84 and 100. The bobbin case 31 will then be shifted counterclockwise as viewed in FIG. 5 into the sewing position and on subsequent penetrations of the needle, lock stitches will be formed utilizing the needle thread and the thread which had been wound upon the bobbin.

Although this invention is illustrated in the drawings as embodied in a cyclic sewing machine in which the controls for alternatively replenishing bobbin thread or sewing emanate from a cam 74, it will be appreciated that any other means for influencing the angular position of the bobbin case so as to effect selectively sewing and admittance of thread into the bobbin case for bobbin re-

plenishment would come within the preview of this invention.

It is also pointed out that this invention is not limited to usage with a shuttle, but will find utility with any circularly moving loop taker such as a rotary hook in which the loop seizing beak manipulates needle thread loops relatively to a bobbin case which is restrained from circular movement with the loop taker.

Having thus set forth the nature of this invention, what is claimed herein is:

1. Lockstitch forming instrumentalities for a sewing machine including a loop taker comprising a bearing portion formed with a loop seizing beak, means supporting said loop taker bearing portion for circular movement in said sewing machine, a bobbin case journaled relatively to said loop taker bearing portion, a thread carrying bobbin journaled in said bobbin case, and means for restraining said bobbin case from circular movement with said loop taker bearing portion, means for replenishing thread on said bobbin in place in said bobbin case including means for rotatably shifting the angular position in which said bobbin case is maintained by said restraining means, and means rendered effective by said shifting of said bobbin case into a predetermined angular position for replenishing thread on said bobbin in place in said loop taker.

2. A lockstitch sewig machine comprising a frame, a thread carrying needle endwise reciprocable in said frame, a loop taker journaled for circular movement in said frame, a needle thread engaging beak on said loop taker, actuating mechanism operating said needle and loop taker in cooperative timed relation required for the formation of lockstitches, a bobbin case journaled relatively to said loop taker, a thread carrying bobbin journaled in said bobbin case, means for restraining said bobbin case from circular movement with said loop taker, means for shifting said restraining means to vary the stationary angular position of said bobbin case, thread manipulating means on said loop taker and on said bobbin case effective in one stationary angular position of said bobbin case for manipulating needle thread loops engaged by said beak completely about said bobbin case in the formation of lockstitches, and effective in another stationary angular position of said bobbin case for manipulating at least one limb of a needle thread loop engaged by said beak onto said bobbin in said bobbin case for replenishing thread on said bobbin.

3. A lockstitch sewing machine as set forth in claim 2 in which said thread manipulating means includes means formed on said bobbin case defining a passageway for the introduction of thread from said loop seizing beak onto said bobbin, and in which said means for shifting said bobbin case restraining means positions said thread introduction passageway alternatively into or out of coincidence with at least one position of a needle thread loop being manipulated by said loop-seizing beak.

4. A lockstitch sewing machine as set forth in claim 2 which includes cam means driven by said actuating mechanism for said needle and loop taker, and cam follower means responsive to said cam means and operatively connected to control said means for alternatively shifting said bobbin case restraining means.

5. A lockstitch sewing machine as set forth in claim 2 which includes a thread clamping member cooperating with said hook beak to secure a seized loop of needle thread thereon, cam means driven by said actuating mechanism for said needle and loop taker, first cam follower means responsive to said cam means and operatively connected to control said thread clamping member, and second cam follower means responsive to said cam means and operatively connected to control said means for alternatively shifting said bobbin case restraining means.

6. A shuttle mechanism for a lockstitch sewing machine comprising a shuttle housing fixed in said sewing machine, a shuttle retainer contiguous to said shuttle housing, said shuttle housing and shuttle retainer formed with cooperating annular surfaces defining a shuttle race, a shuttle journaled for circular movement in said shuttle race and formed with a loop seizing beak, a bobbin case journaled relatively to said shuttle and a bobbin freely journaled in said bobbin case, means constraining said shuttle retainer for limited angular movement relative to said shuttle housing coaxially of said shuttle race, a rotation restraining finger formed on said bobbin case, rotation restraining lugs formed on said shuttle retainer straddling said rotation restraining finger so as to move said finger with said shuttle retainer, a mechanism for replenishing thread on said bobbin carried on said sewing machine and operatively connected to said shuttle retainer for varying the nagular position of said shuttle retainer relatively to said shuttle housing one angular position of said shuttle retainer being for sewing and another angular position being for replenishing said bobbin.

7. A shuttle mechanism as set forth in claim 6 in which said bobbin case is formed with a substantially radial thread accommodating groove opening onto said bobbin, said thread accommodating groove being located on said bobbin case so as to be positionable into coincidence with the path of a thread seized and being manipulated by said shuttle beak in response to operation of said means for varying the angular position of said shuttle retainer relatively to said shuttle housing.

8. A shuttle mechanism as set forth in claim 7 which includes a bobbin thread tensioning spring carried by said bobbin case and overlying said thread accommodating slot.

References Cited

UNITED STATES PATENTS

1,077,056	10/1913	Dorsey	112—186
2,016,364	10/1935	Dixon.	
2,822,773	2/1958	Ivanko.	
3,012,530	12/1961	Ketterer et al.	112—181
3,063,392	11/1962	Ketterer et al.	112—181
3,096,736	7/1963	Johnson	112—181
3,145,673	8/1964	Meloy	112—181
3,308,776	3/1967	Ivanko et al.	112—181

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