Aug. 8, 1933. L. E. TOPHAM 1,921,897

SHOE SEWING MACHINE

Original Filed March 27, 1928 6 Sheets-Sheet 1

Fig. 1

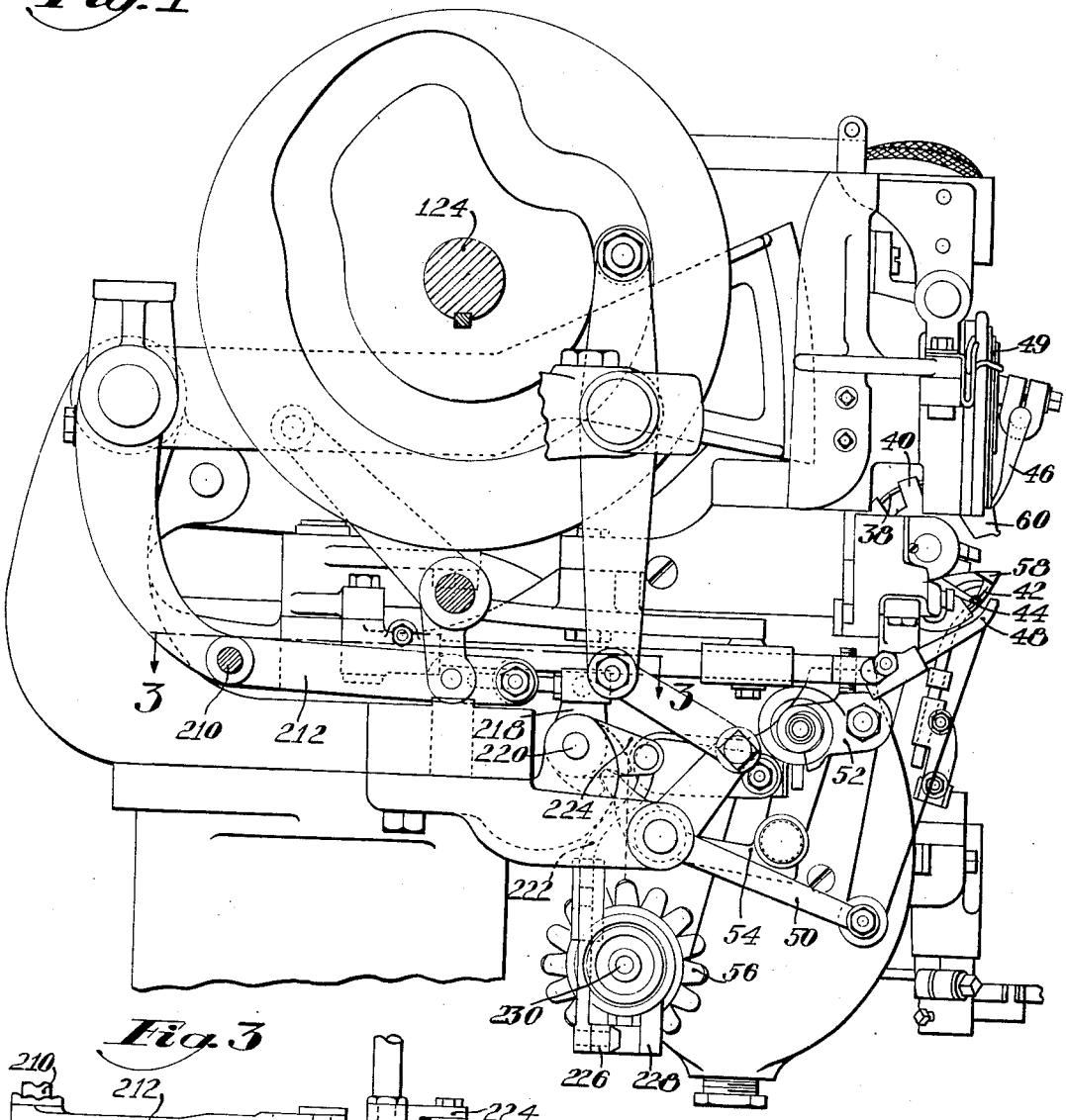


Fig. 3

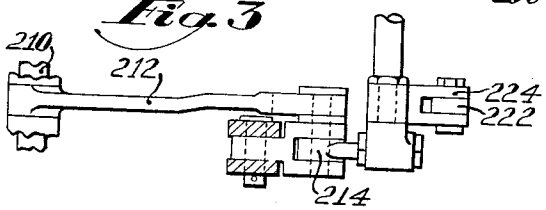
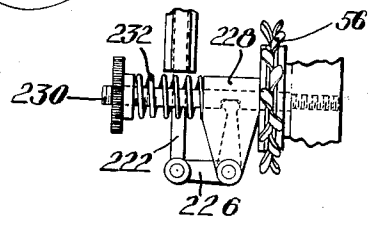


Fig. 2



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Fig. 5

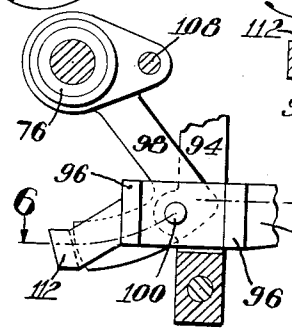


Fig. 6

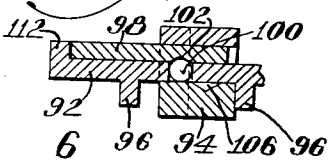


Fig. 7

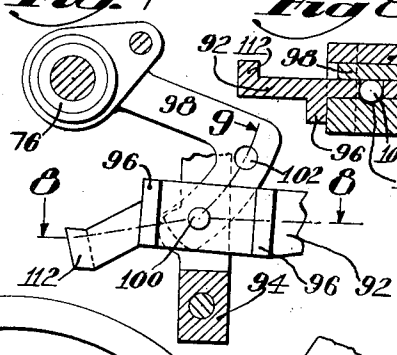


Fig 8

Fig. 4

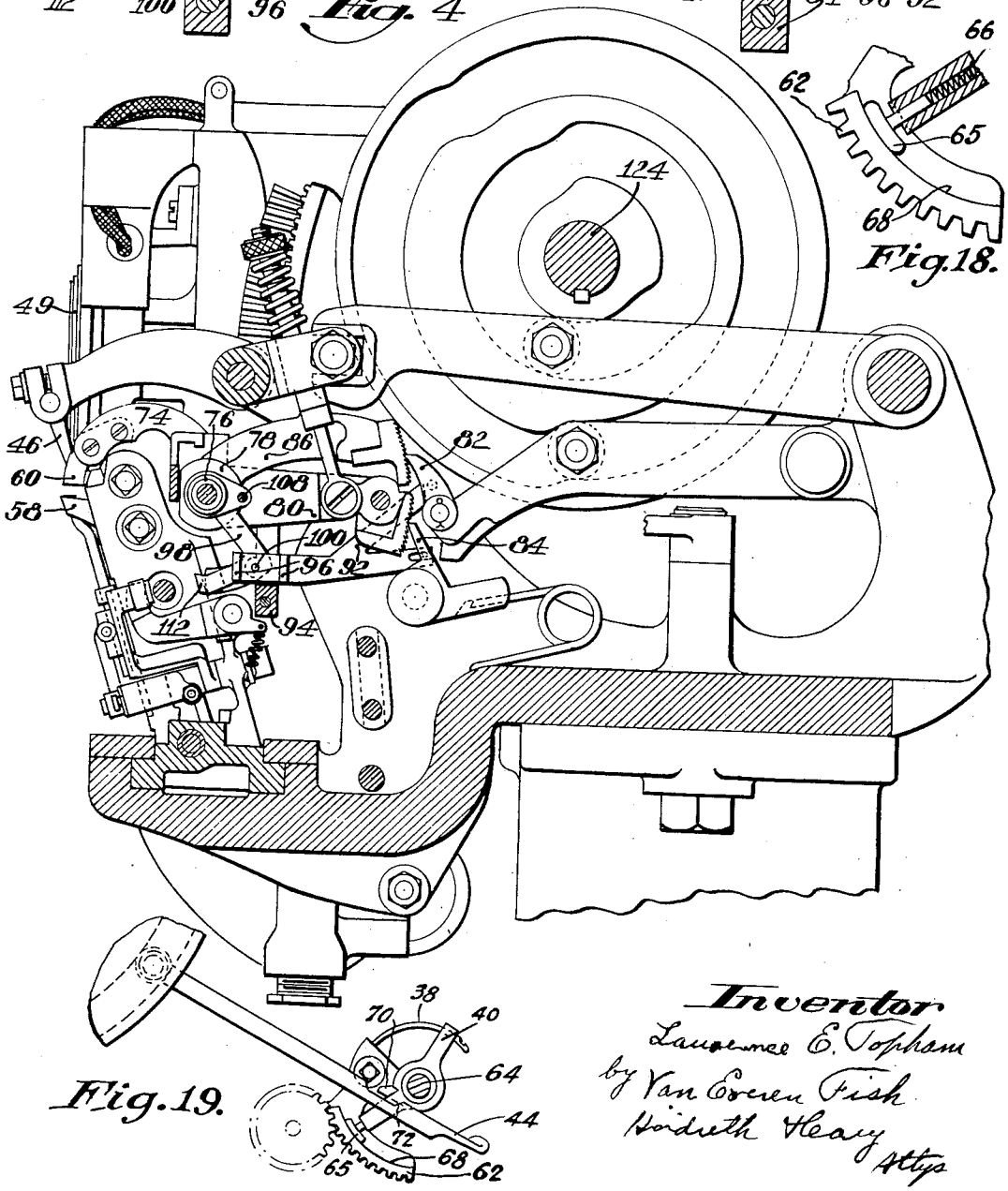


Fig.18.

Fig.19.

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Fig. 9

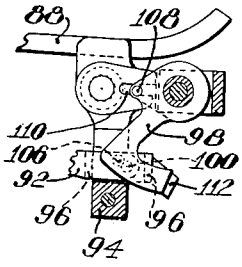


Fig. 10

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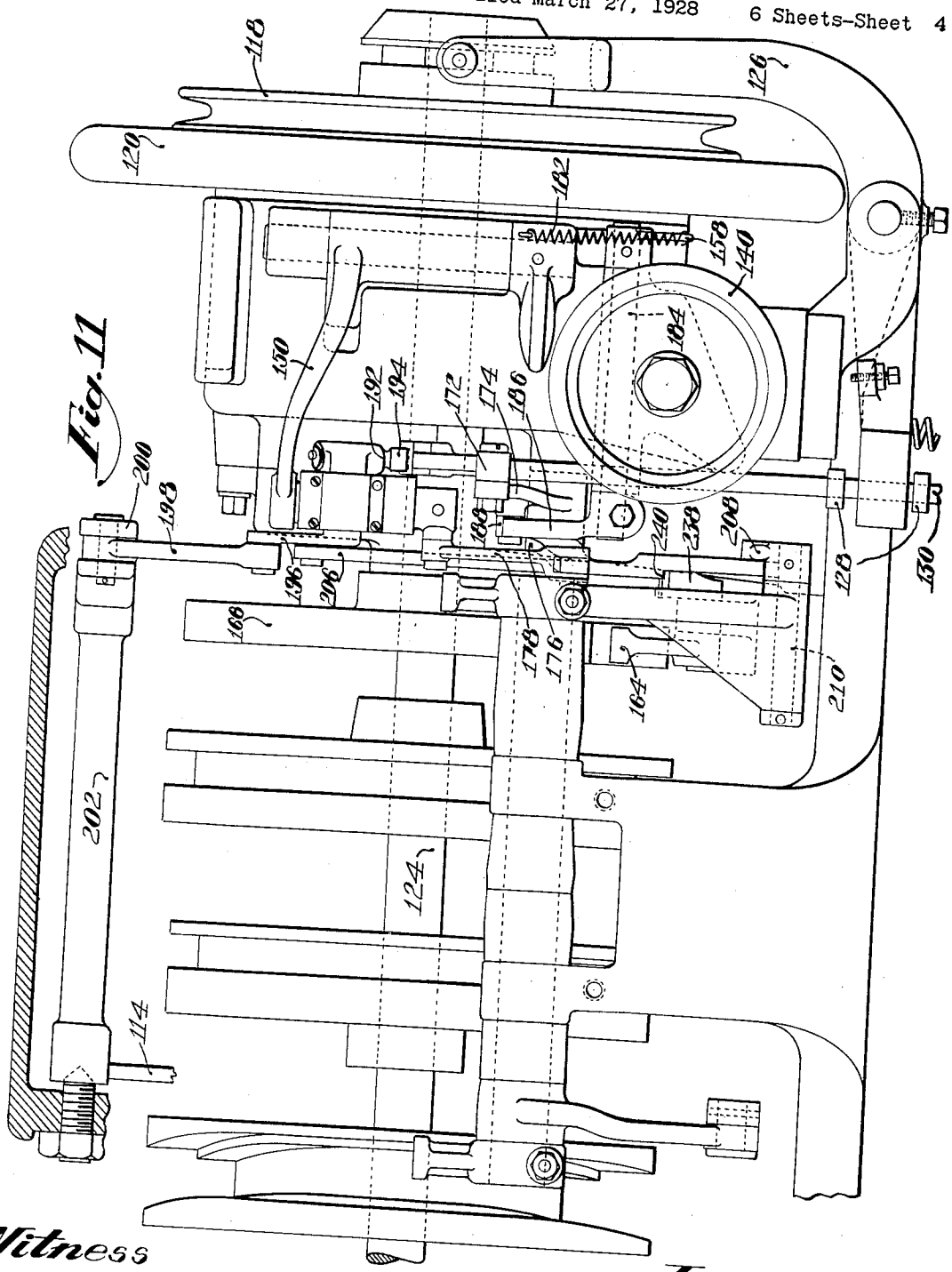
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Fig. 11



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Fig. 12

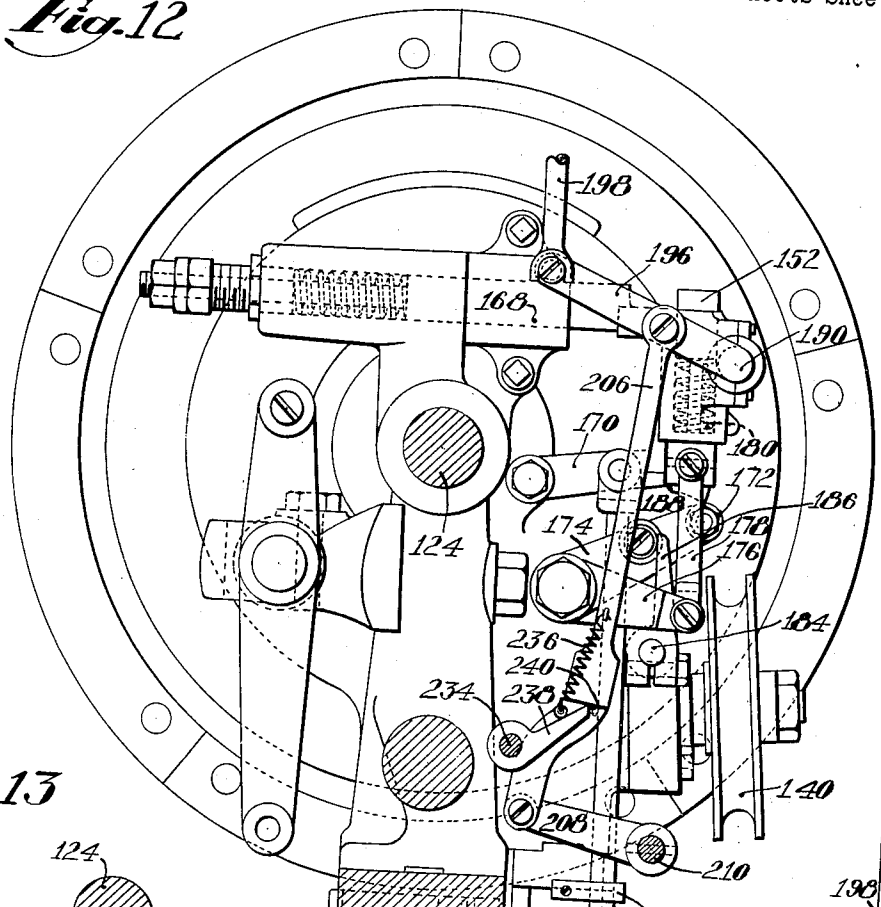


Fig. 13

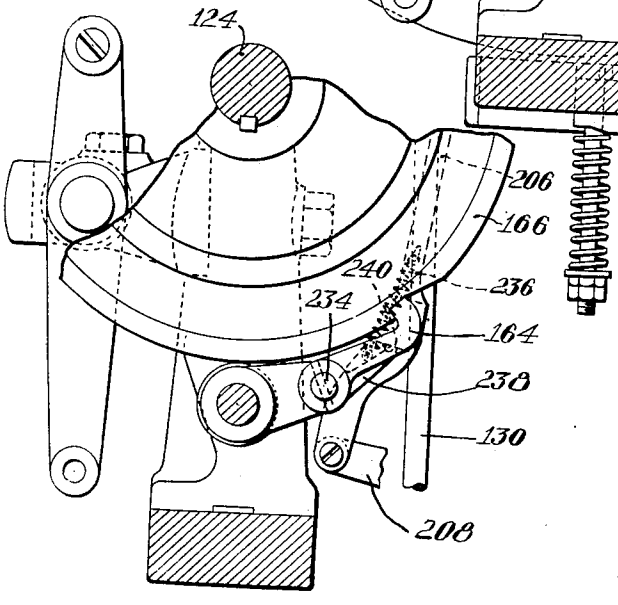
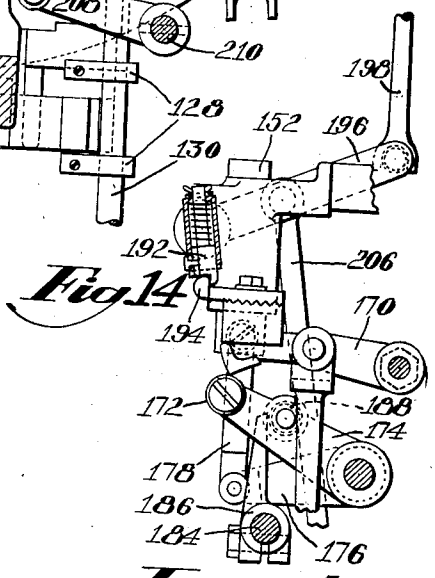


Fig. 14



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SHOE SEWING MACHINE

Original Filed March 27, 1928 6 Sheets-Sheet 6

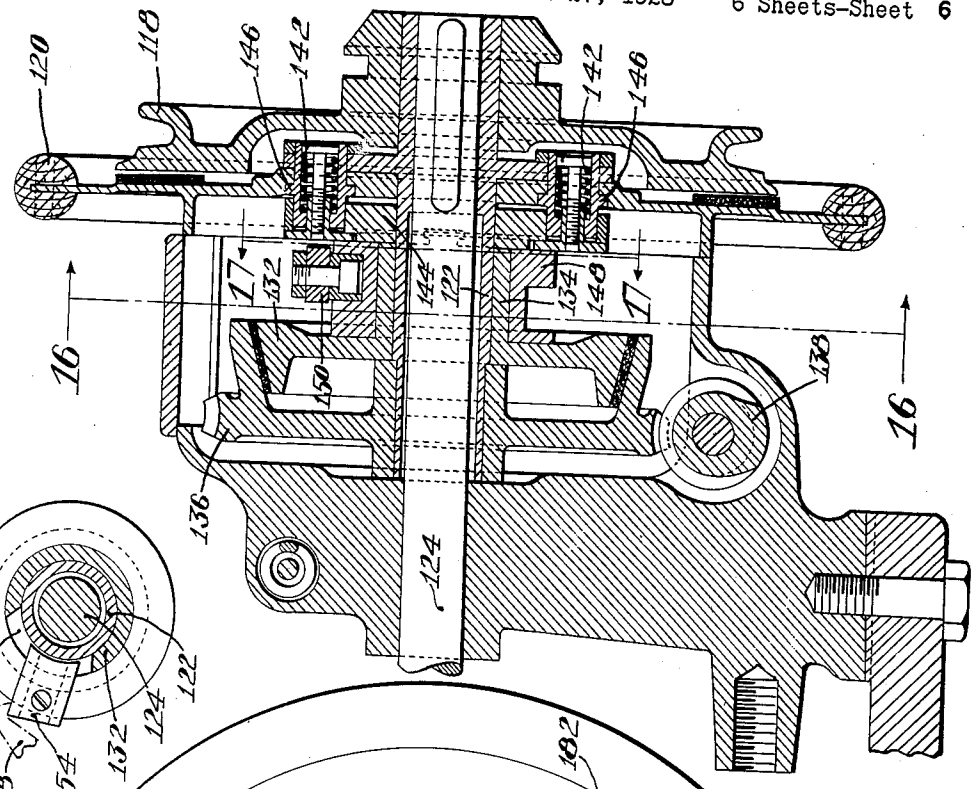


Fig. 15

Fig. 17

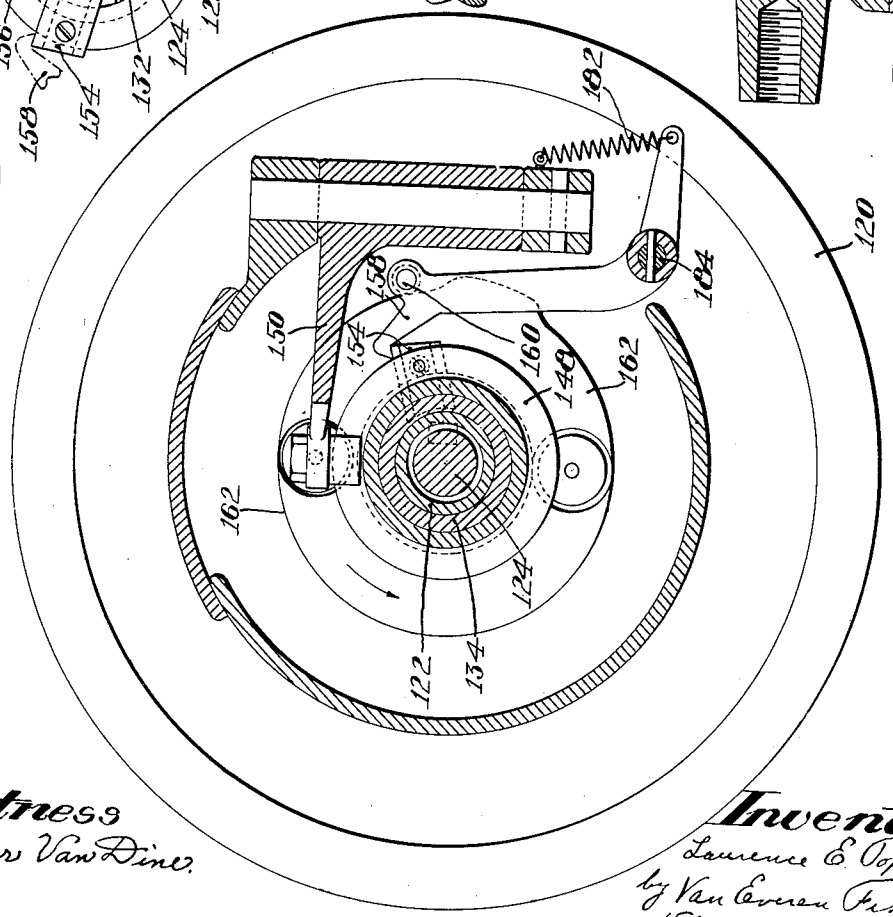


Fig. 16

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UNITED STATES PATENT OFFICE

1,921,897

SHOE SEWING MACHINE

Laurence E. Topham, Wenham, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a Corporation of New Jersey

Original application March 27, 1928, Serial No. 265,169. Divided and this application July 2, 1929. Serial No. 375,444

19 Claims. (Cl. 112—38)

The present invention relates primarily to shoe sewing machines and is herein disclosed as embodied in a machine adapted to sew the outseam connecting the outsole with the welt, lasted upper and insole of a Goodyear welt shoe.

The present application is a division of the inventor's pending application Serial No. 265,169, filed March 27, 1928, which discloses a machine of the same general type as that disclosed in the patent to French and Meyer, No. 473,370, dated April 26, 1892. The stitch-forming and work-feeding devices include a needle, an awl, a work support and a presser foot and are arranged to reciprocate back and forth in the line of feed to impart a continuous feeding movement to the work, as more fully described in the inventor's pending application above referred to.

In order to increase the speed, ease and smoothness of operation of machines of the type disclosed in the patent to French and Meyer, above referred to, it has been proposed to time the operation of the various parts of the machine so that the awl is caused to enter the work after the needle has withdrawn with the loop of thread and to withdraw from the work before the takeup sets the stitch. A machine having its various parts constructed and arranged to operate in this manner is disclosed in the patent to Topham, No. 1,462,587, dated July 24, 1923. The machine hereinafter described as embodying the several features of the present invention is also constructed and arranged to operate in this manner, the awl being timed to enter the work after the needle withdraws with its loop of thread, and before the needle loop has been drawn down from the shuttle. In machines having the needle and awl timed in this manner, if the machine is stopped at the completion of the sewing operation with both the needle and the awl out of the work and with the needle free of thread to permit the removal of the work, the machine must be manipulated by the operator before a new piece of work is inserted in the machine so as to bring the awl into position to immediately enter the work when the machine is started, as otherwise upon starting the machine the needle will at once enter the work and be liable to become bent or broken by reason of the fact that no awl hole has been made in the work to receive it. An object of the present invention is to relieve the operator of the necessity of manipulating the machine in this manner and accordingly an important feature of the present invention contemplates the provision in an outseam lockstitch sewing machine in which the awl is arranged to enter the work after the needle withdraws with its loop of thread and before the needle loop is withdrawn from the shuttle, of mechanism cooperating with the moving parts of the machine to bring the machine to rest after the needle loop has been drawn down from the shuttle, with the needle free of the thread, and at a point in the cycle so that when the machine is again started, the awl will immediately enter the work. This feature of the invention contemplates securing this result in any desired manner. In the embodiment of the invention hereinafter described, a stop mechanism is provided which acts when thrown into operation to reverse the direction of rotation of the cam shaft of the machine after the needle loop has been drawn from the shuttle and to finally stop the cam shaft with the awl at a point in the cycle of operations of the machine at which the awl, in a forward cycle, is about to enter the work.

Other features of the invention which are particularly applicable to an outseam shoe sewing machine relate to an improved mechanism for actuating the needle guide and to improved constructions and arrangements of parts for lifting the presser foot, opening the thread clamp and releasing the needle thread tension.

The several features of the present invention and the advantages secured thereby will be readily understood by those skilled in the art from the preceding discussion and from an inspection of the accompanying drawings and the following specific description thereof.

Referring to the drawings, Fig. 1 is a sectional end elevation of the machine embodying the several features of the present invention; Fig. 2 is a detail view of a portion of the mechanism for releasing the tension; Fig. 3 is a detail sectional plan view taken on the line 3—3 of Fig. 1, illustrating a portion of the mechanism for opening the thread clamp; Fig. 4 is a sectional end elevation of the machine; Fig. 5 is a detail sectional view of a portion of the presser foot unlocking and lifting mechanism; Fig. 6 is a sectional plan view taken on the line 6—6 of Fig. 5; Fig. 7 is a detail sectional view similar to Fig. 5 but showing the parts in a different position; Fig. 8 is a sectional plan view taken partly on the line 8—8 and partly on the line 8—9 of Fig. 7; Fig. 9 is a detail sectional view illustrating particularly the presser foot and its associated parts; Fig. 10 is an end view of the

machine partly in section and with many parts omitted; Fig. 11 is a view in rear elevation of the machine illustrating particularly the driving and stopping mechanism; Fig. 12 is a vertical sectional view of the machine looking towards the right in Fig. 11 and taken on a plane at the left of the driving and stopping mechanism; Fig. 13 is a detail sectional view taken on a plane slightly to the left of the plane of Fig. 12 in Fig. 11, illustrating particularly the positive stopping dog of the stop mechanism; Fig. 14 is a detail view of certain of the parts illustrated in Fig. 12 but looking in the opposite direction; Fig. 15 is a vertical longitudinal sectional view of the driving and stopping mechanism; Fig. 16 is a cross-sectional view taken on the line 16—16 of Fig. 15; Fig. 17 is a detail cross-sectional view taken on the line 17—17 of Fig. 15; and Figs. 18 and 19 are detail views illustrating the mechanism for actuating the needle guide.

The curved hook needle of the machine is indicated at 38, the needle guide at 40, the awl at 42, the thread arm at 44, the loop spreader at 46, the looper at 48, the shuttle at 49, the takeup at 50, the auxiliary takeup at 52, the thread clamp at 54, the tension wheel at 56, the work support at 58 and the presser foot at 60, all of these parts except as hereinafter specifically described having substantially the same construction and arrangement, and being operated through the same mechanisms as in the machine disclosed in the patent to French and Meyer, No. 473,870 hereinbefore referred to. The needle is mounted in a segment 62 as best shown in the detail views, Figs. 18 and 19, and the awl is similarly mounted. These parts, together with the actuating mechanisms, are fully described and illustrated in the inventor's pending application above referred to.

The needle segment is mounted directly on a pivot stud 64 and the needle guide is mounted on the hub of the needle segment. For actuating the needle guide a novel and improved mechanism is provided whereby the needle guide can be driven frictionally to cause it to move towards and from the work and also can be given a forward movement with relation to the needle to cover the empty hook of the needle after the loop of needle thread has been taken from the hook, and thereby prevent the needle thread from catching on the barb of the hook during the continued manipulation of the thread in forming the stitch. The needle guide actuating mechanism also includes a new and improved means for driving the needle guide frictionally from the needle segment. The needle guide actuating mechanism is best shown in Figs. 18 and 19. As shown in these figures, the needle guide is provided with an arm extending radially in the opposite direction from the portion engaging the needle in the outer end of which is mounted a friction shoe 65. This shoe is forced outwardly by a spring 66 set in a recess in the arm against a friction surface 68 formed on the needle segment concentric with the axis of the segment. A simple, reliable and efficient connection is thus provided between the needle segment and the needle guide which will act to move the needle guide frictionally back and forth and against the upper surface of the presser foot regardless of the varying thickness of the work.

After the needle loop has been taken from the needle, it is desirable to advance the needle guide to close the needle hook and thereby prevent the thread from catching on the barb of the needle during the continued manipulation of the thread in forming the stitch. Accordingly, means are provided for imparting such a movement to the needle guide. As a convenient means for producing this movement, the thread arm is utilized in the illustrated construction, a projection 70 being provided on the needle guide arranged to extend into a notch 72 formed on the thread arm slide when the needle guide is in its retracted position, and a movement being imparted to the thread arm at the proper point in the cycle of operations to cause the lower end of the notch to engage the projection and move the needle guide with relation to the needle.

The presser foot 60, as shown in Fig. 4, is secured to the front portion 74 of the presser foot lever which is pivotally mounted upon a hollow bushing 76 secured in a projection 78 forming a portion of the machine frame. As more fully described in the inventor's pending application above referred to, the presser foot is arranged to reciprocate back and forth in the line of feed with the work support and to allow it to so move, the presser foot lever is made in two parts, the rear portion 80 being mounted on the bushing 76 so as to be held against movement, while the front portion 74 is adapted for movement back and forth in the line of feed.

The mechanism for actuating the presser foot lever and for locking the lever with the presser foot in engagement with the work is similar to that disclosed in the patent to French and Meyer hereinbefore referred to and comprises actuating and locking pawls 82 and 84 engaging respectively the actuating lever 86 (see Fig. 4) and the rear portion of the presser foot lever 80.

An efficient and novel mechanism is provided, however, for unlocking and lifting the presser foot manually, and also for unlocking and lifting the presser foot automatically upon stopping the machine. The mechanism for unlocking and lifting the presser foot comprises a lifting lever 88 (see Figs. 9 and 10) pivotally mounted upon a portion of the machine frame and having its forward end extending into convenient position to be manipulated by the operator while its rear end extends over the harp-shaped member 90 pivotally supported upon the rear end of the presser foot lever 80 and forming a part of the usual thread measuring mechanism. With this arrangement of the lever 88 a downward movement of its rear end depresses the rear end of the lever 80 after the pawls 82 and 84 have been moved out of engagement with their cooperating ratchets and lifts the presser foot from the work. In order to move the pawls 82 and 84 into inoperative position so as to allow the presser foot to be lifted, a pawl disengaging member 92 is provided mounted to slide in a substantially horizontal direction and provided with arms at its rear end adapted to engage pins on the pawls and move the pawls to an inoperative position when a rear movement is imparted to the member 92. At its forward end the member 92 is mounted in a slot formed in a web 94 forming a part of the machine frame. On each side of the web 94 the member 92 is provided with projecting flanges 96 which flanges limit the movement of the member 92 in each direction as clearly shown in Figs. 5, 6, 7 and 8. For moving the member 92 forwardly and backwardly, an actuating member 98 is provided pivotally mounted upon the bushing 76. An

actuating connection between the member 98 and the member 92 is formed by a segmental portion of the member 98 which extends through the slot in the web 94 at one side of the member 92. A ball 100 is seated in a perforation in the member 92 which ball cooperates with a recess 102 formed in the member 98 and with a recess 106 formed in one wall of the web 94. The member 98 is actuated from the lifting lever 88 through a pin 108 projecting from the member 98 through a slot 110 in a flange projecting from the hub of the lifting lever. The construction and arrangement of the connections between the lifting lever and the pawl releasing member 92 are such that during the first portion of the downward movement of the rear end of the lever 88, the member 98 is moved from the position indicated in Figs. 5 and 6 to a position in which the ball 100 is in engagement with the recess 106 in the web 94. The member 92 is thus moved to release the pawls 82 and 84 from their ratchets before the rear end of the lever 88 comes in contact with the harp-shaped member 90. As the ball 100 enters the recess 106, further movement of the member 92 is prevented by the engagement of a flange 96 with the web 94 and a continued movement of the member 98 is permitted during the continued movement of the lifting lever 88 in lifting the presser foot from the work. The final position of the parts when the presser foot has been lifted from the work is indicated in Figs. 7 and 8. The return movement of the lifting lever 88 to permit the presser foot to again engage the work first moves the member 98 from the position indicated in Figs. 7 and 8 while the member 92 remains stationary and finally after the recess 102 in the member 98 comes opposite the recess 106, the ball 100 enters recess 102 and the forward end of the member 98 engages a flange 112 on the forward end of the member 92 and returns the member 92 to its original position indicated in Figs. 5 and 6. To unlock and lift the presser foot automatically upon stopping the machine, a vertically arranged rod 114 is provided as indicated in Fig. 10, which extends through a perforation in the rear end of the lever 88. This rod is depressed upon stopping the machine through connections from the stopping mechanism hereinafter described and when so depressed actuates the lifting lever 88 to unlock and lift the presser foot by the engagement of a collar 116 secured to the lower end of the rod above the rear end of the lever 88.

The driving and stopping mechanism of the machine comprises a forwardly driving friction clutch which normally drives the machine at a high speed during the sewing operation, a reversely driving friction clutch which is thrown into operation in stopping the machine which retards, stops and reversely rotates the cam shaft at a low speed to final stopping position, and a timing cam for throwing the reversely driving friction clutch into and out of operation.

The high speed forwardly driving friction clutch comprises a clutch surface formed on the driving pulley 118 and a cooperating friction surface on the hand wheel 120. The hand wheel is rigidly secured to a sleeve 122 keyed to the cam shaft 124 of the machine, and the pulley 118 is mounted to rotate loosely and slide on the sleeve 122. The driving pulley 118 is moved into and out of engagement with the hand wheel 120 by a clutch shifting lever 126 one end of which engages the hub of the pulley 118 and the other end of which extends between collars 128 secured to the rod 130 connected to the starting and stopping treadle.

The reversely driving clutch which is thrown into operation in stopping the machine comprises a driven clutch member 132 integral with a sleeve 134 mounted on the sleeve 122 and a driving clutch member 136 mounted to rotate loosely on the sleeve 122, and driven continuously at a comparatively low speed by a continuously rotating worm shaft 138 engaging a worm wheel formed on the clutch member. The worm 138 is driven by a belt passing over a pulley 140 secured to the rear end of the shaft carrying the worm 138. The driven clutch member 132 of the reverse driving clutch is connected to the hand wheel 120 so as to rotate at all times with the hand wheel and with the cam shaft 124 but is mounted to slide longitudinally on the sleeve 122 and is normally held out of engagement with the driving clutch member 136 by springs 142 acting on plungers secured to a flange 144 rigid with the member 132 and operating with hollow studs 146 secured to the hand wheel 120 and projecting into perforations formed in the flange 144. While the members 118 and 120 are in engagement and the cam shaft is being driven in a forward direction, the clutch members 132 and 136 are out of engagement and rotating in opposite directions.

The timing cam for moving the clutch member 132 into and out of engagement with the reversely rotating clutch member 136 is indicated at 148 and is mounted on the clutch member 132 so as to move longitudinally therewith and except as hereinafter described to rotate with said clutch member. The groove of the timing cam is engaged by one end of a horizontally arranged bell crank 150 which, while the cam shaft is being driven by the forwardly driving clutch, is vibrated idly so that the cam has no effect on the clutch member 132 of the reverse driving clutch and the members of the reverse driving clutch remain out of engagement. The other end of the bell crank 150 extends over a vertical movable pin or bolt 152 and is provided with a perforation into which the pin 152 can rise when allowed to do so. This occurs after the forward driving clutch is thrown out of operation by the upward movement of the treadle rod 130. The bell crank 150 is thus held against movement during the continued rotation of the cam shaft 124 under its momentum, the cam 148 together with the member 132 of the reverse driving clutch is forced to the left into the position illustrated in Fig. 15, and thereby the reverse driving clutch is thrown into operation. The reversing clutch acts first as a friction brake to retard and stop the forward rotation of the cam shaft 124 and then drives the cam shaft backwardly until the clutch members are thrown out by the action of the timing cam 148.

As has been stated, the stitch forming devices of the machine are timed so that the awl enters the work after the needle withdraws from the work with its loop of thread and before the needle loop is drawn from the shuttle, and withdraws from the work before the stitch is set by the takeup. In order that the machine may be stopped after the loop of needle thread has been drawn from the shuttle, the timing cam and reverse driving clutch are so constructed that the reversal in the direction of rotation of the cam shaft takes place at this point in

the cycle of operations and in order that the cam shaft may be finally stopped in the position in which the awl will at once enter the work when the machine is again thrown into operation, the reverse rotation of the cam shaft is continued until the awl during such reverse rotation has entered and again withdrawn from the work. To permit this backward rotation of the cam shaft and cause the timing cam to disconnect the members of the reverse clutch at the proper point in the rotation of the shaft, the timing cam 148 is mounted on the driven member 132 of the reverse driving clutch through a lost motion connection which permits a certain amount of angular movement of the clutch member with relation to the cam. This lost motion connection comprises a radially arranged key 154 (see Figs. 16 and 17) secured in the cam and projecting into a segmental recess 156 in the sleeve portion of the clutch member 132 upon which the cam is mounted to have a rotary movement limited by the ends of the segmental recess.

As the driven member 132 of the reverse driving clutch starts to rotate in a reverse direction, the timing cam tends to rotate with the clutch member. Accordingly, a latch 158 is provided pivotally mounted in the frame of the machine and arranged to engage the outer end of the key 154 and hold the timing cam against rotation during the first portion of the reverse rotation of the clutch member. The latch 158 is provided with a pin 160 which bears against a cam 162 formed on the clutch member 132 and this cam operates to lift the latch 158 out of engagement with the key 154 before the key is engaged by the rear end of the recess 156. After the reverse driving clutch is thrown out, the cam shaft is positively stopped in its final position by a stop dog 164 (see Fig. 13) which engages a stop shoulder formed on one of the cam discs 166 of the machine.

The locking pin or lock bolt 152 is mounted in a horizontally arranged spring pressed carrier 168 and is controlled from the treadle rod 130 through connections which comprise an arm 170 (see Figs. 12 and 14) pivotally mounted on the machine frame and connected to the upper end of the treadle rod. At its outer end the arm 170 is provided with a cam surface arranged when the treadle rod is depressed to engage a roll 172 on a lever arm 174 and swing said lever arm downwardly. A lever arm 176 is formed integrally with the arm 174 and is connected by a link 178 to the lower end of the lock bolt 152. The lock bolt is acted upon by a spring 180 which raises the bolt into engagement with the bell crank 150 when the treadle rod 130 is allowed to rise and the bolt is lowered out of engagement with the bell crank through the connections described when the rod is depressed.

The latch 158 is forced into the path of the key 154 by a spring 182 connected with a rearward extension from the latch. In order to hold the latch out of the path of movement of the key 154 during the normal forward rotation of the cam shaft and out of engagement with the cam 162, the latch is secured to a rock shaft 184 to which is also secured an arm 186 which extends into a position to be engaged by a roll 188 on the arm 174.

In throwing the reverse driving clutch into operation a slight movement to the right as viewed in Fig. 12 is imparted to the lock bolt carrier 168 from the timing cam 148. In the machine illustrated, this movement of the lock bolt carrier is utilized to lift the presser foot, release the tension and open the thread clamp. To this end, a rock shaft 190 is mounted in the carrier 168 and is provided at one end with a spring pressed pawl 192 arranged to be engaged by a detent 194 on the arm 170 when the arm is in its uppermost position. To the other end of the rock shaft 190 an arm 196 is secured which arm is swung upwardly by the rocking of the shaft 190 when the pawl 192 engages the detent 194 during the movement of the lock bolt carrier 168 as the reverse clutch is thrown into operation. The arm 196 at its outer end is pivotally connected to the lower end of a link 198, the upper end of which is connected to a lever arm 200 projecting from a rock shaft 202 mounted in the upper portion of the machine frame. An arm 204 projecting from the rock shaft 202 is connected to the upper end of the rod 114 and the arrangement of the lever arms 204 and 200 is such that as the arm 196 moves upwardly, the rod 114 is depressed, thereby unlocking and raising the presser foot as hereinbefore described.

To the arm 196 is also pivotally connected a link 206, the lower end of which is connected to an arm 208 projecting from a rock shaft 210. To this rock shaft is secured an arm 212 (see Figs. 1 and 3) the forward end of which has a slotted connection with the center joint of toggle links 214 which links are normally in line and form the connection between the thread clamp cam 218 on the rock shaft 220 through which the thread clamp is actuated as in the machine of the French and Meyer patent. With this construction, upon stopping the machine, the shaft 210 is rocked to move the arm 212 downwardly thereby breaking the toggle joint formed by the links 214 and opening the thread clamp.

Simultaneously with the lifting of the presser foot and the opening of the thread clamp upon stopping the machine, the tension on the needle thread is released through connections from the rock shaft 220. To release the tension, the upper end of a rod 222 is connected to an arm 224 on the rock shaft 220 and the lower end of this rod is connected to the horizontal arm of a bell crank 226. The bell crank 226 is pivotally mounted in a block 228 through which the stationary stud 230 on which the tension wheel 56 is mounted passes. The upper end of the vertical arm of the bell crank 226 engages a slot in the stud 230 so that this end of the bell crank is held stationary and as the rod 222 is raised by the rocking of the shaft 220 in stopping the machine, the bell crank is moved bodily and the block 228 is moved out of frictional engagement with the tension wheel 56 against which it is normally pressed by the tension spring 232.

The stop dog 164 (see Figs. 12 and 13) is secured to a pivot shaft 234 and is forced towards the cam disc 166 by a spring 236 one end of which is connected to the link 206 and the other end of which is connected to an arm 238 secured to the rock shaft 234. The outer end of the arm 238 engages beneath a shoulder 240 on the link 206 and by reason of this construction the stop dog 164 is held out of engagement with the cam disc 166 while the machine is in operation and is permitted to move into engagement with the disc as the link 206 rises during the operation of the stopping mechanism.

The nature and scope of the invention having been indicated and a specific embodiment of the several features of the invention having been described, what is claimed is:

1. A lockstitch sewing machine having, in combination, stitch forming devices including a hook needle, an awl, a shuttle and stitch setting takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the stitch is set, and mechanism acting when thrown into operation to bring the machine to rest with the last stitch completed, and at a point at which the awl in a forward cycle is about to enter the work.

2. A lockstitch sewing machine having, in combination, stitch forming devise including a hook needle, an awl, a shuttle and takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the needle loop is drawn from the shuttle, and mechanism acting when thrown into operation to bring the machine to rest after the needle loop has been drawn from the shuttle, with the needle free of the thread, and at a point in the cycle of operations of the machine at which the awl, in a forward cycle, is about to enter the work.

3. A lockstitch sewing machine having, in combination, stitch forming devices including a hook needle, an awl, a shuttle and a takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the needle loop is drawn from the shuttle, a cam shaft and suitable connections for actuating the moving parts of the machine, and mechanism acting when thrown into operation to reverse the direction of rotation of the cam shaft after the needle loop has been drawn from the shuttle by the takeup and to finally stop the shaft after the awl, during the reverse movement, enters and withdraws from the work.

4. A lockstitch sewing machine having, in combination, stitch forming devices including a hook needle, an awl, a shuttle and a takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the needle loop is drawn from the shuttle, a cam shaft and suitable connections for actuating the moving parts of the machine, and driving and stopping mechanism for said shaft including a clutch arranged when thrown into operation to reverse the rotation of the shaft and a timing cam driven by the shaft for throwing the reversing clutch into and out of operation, said cam having a lost motion connection with said shaft to allow a limited reverse rotation of the shaft independently of the cam.

5. A lockstitch sewing machine having, in combination, stitch forming devices including a hook needle, an awl, a shuttle and a takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the needle loop is drawn from the shuttle, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for said shaft including a friction clutch arranged when thrown into operation to retard, stop and reverse the cam shaft, a timing cam driven by the shaft for throwing the reversing clutch into and out of operation, said cam having a lost motion connection with said shaft to allow a limited reverse rotation of the shaft independently of the cam.

6. A lockstitch sewing machine having, in combination, stitch forming devices including a hook needle, an awl, a shuttle and a takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the needle loop is drawn from the shuttle, a cam shaft and suitable connections for actuating the moving parts of the machine, and driving and stopping mechanism for said cam shaft including a clutch arranged when thrown into operation to reverse the rotation of the cam shaft, a timing cam for throwing the reversing clutch into and out of operation mounted on the cam shaft to have a limited angular movement with relation thereto, a latch to prevent rotation in the reverse direction of the timing cam with the shaft, and a cam driven from the cam shaft for actuating said latch to release the timing cam.

7. A lockstitch sewing machine having, in combination, stitch forming devices including a hook needle, an awl, a shuttle and a takeup, means for causing the awl to enter the work after the needle withdraws with its loop of thread from the work and before the needle loop is drawn from the shuttle, a cam shaft and suitable connections for actuating the moving parts of the machine, and driving and stopping mechanism for the cam shaft including a clutch arranged when thrown into operation to reverse the rotation of the cam shaft, a timing cam driven by the shaft for throwing the reversing clutch into and out of operation arranged to cause the cam shaft to be reversed after the needle loop has been drawn from the shuttle by the takeup, said cam having a lost motion connection with said shaft to allow a limited reverse rotation of the shaft independently of the cam, and cause the cam shaft to come to rest after the awl, during the reverse rotation of the cam shaft, has entered and withdrawn from the work.

8. A sewing machine having, in combination, stitch forming devices including a curved hook needle, a looper, a thread arm, and a shuttle, a needle guide, a needle segment in which the needle is mounted, a friction shoe carried by the needle guide and engaging the needle segment to drive the needle guide from the segment, and means for actuating the thread arm to move the needle guide to cover the empty hook of the needle after the loop of needle thread has been taken from the hook.

9. A sewing machine having, in combination, stitch forming devices including a curved hook needle, a needle segment in which the needle is mounted provided with a friction surface concentric with the segment axis, and a needle guide mounted concentric with the segment axis and having a radial arm provided with a friction shoe engaging the friction surface of the segment.

10. A sewing machine having, in combination, stitch forming devices including a curved hook needle and a shuttle, a needle carrier in which the needle is mounted, a needle guide, means for frictionally driving the needle guide from the needle carrier, and means for moving the needle guide to cover the empty hook of the needle after the loop of needle thread has been taken from the hook.

11. A sewing machine having, in combination,

stitch forming devices including a curved hook needle, a looper, a thread arm, and a shuttle, a needle guide, means for frictionally driving the needle guide, and means for actuating the thread arm to move the needle guide to cover the empty hook of the needle after the loop of needle thread has been taken from the hook.

12. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot, a thread tension and an intermittently acting thread clamp, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, and means actuated from the timing cam in stopping the machine for raising the presser foot, releasing the tension and opening the thread clamp.

13. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot, a thread tension and an intermittently acting thread clamp, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, and means actuated from the timing cam in stopping the machine for releasing the tension and opening the thread clamp.

14. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot and a thread tension, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, and means actuated from the timing cam in stopping the machine for releasing the tension.

15. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot and an intermittently acting thread clamp, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, and means actuated from the timing cam in stopping the machine for opening the thread clamp.

16. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot, a thread tension, and an intermittently acting thread clamp, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, means for rendering the timing cam operative including a carrier and a lock bolt mounted thereon for operatively connecting the carrier and cam, a rock shaft mounted in the lock bolt carrier, mechanism for rocking the rock shaft from the movement of the carrier by the timing cam, and connections from the rock shaft for raising the presser foot, releasing the tension and opening the thread clamp.

17. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot, a thread tension, and an intermittently acting thread clamp, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, means for rendering the timing cam operative including a carrier and a lock bolt mounted thereon for operatively connecting the carrier and cam, a rock shaft mounted in the lock bolt carrier, mechanism for rocking the rock shaft from the movement of the carrier by the timing cam, and connections from the rock shaft for releasing the tension and opening the thread clamp.

18. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot, and a thread tension, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, means for rendering the timing cam operative including a carrier and a lock bolt mounted thereon for operatively connecting the carrier and cam, a rock shaft mounted in the lock bolt carrier, mechanism for rocking the rock shaft from the movement of the carrier by the timing cam, and connections from the rock shaft for releasing the tension.

19. A lockstitch sewing machine having, in combination, a needle, an awl, a shuttle, a work support, a presser foot, and an intermittently acting thread clamp, a cam shaft and suitable connections for actuating the moving parts of the machine, driving and stopping mechanism for the cam shaft including a timing cam driven by the shaft for throwing the stopping mechanism into operation, means for rendering the timing cam operative including a carrier and a lock bolt mounted thereon for operatively connecting the carrier and cam, a rock shaft mounted in the lock bolt carrier, mechanism for rocking the rock shaft from the movement of the carrier by the timing cam, and connections from the rock shaft for opening the thread clamp.

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