Jan. 18, 1944. A. B. CLAYTON 2,339,240

SEWING MACHINE

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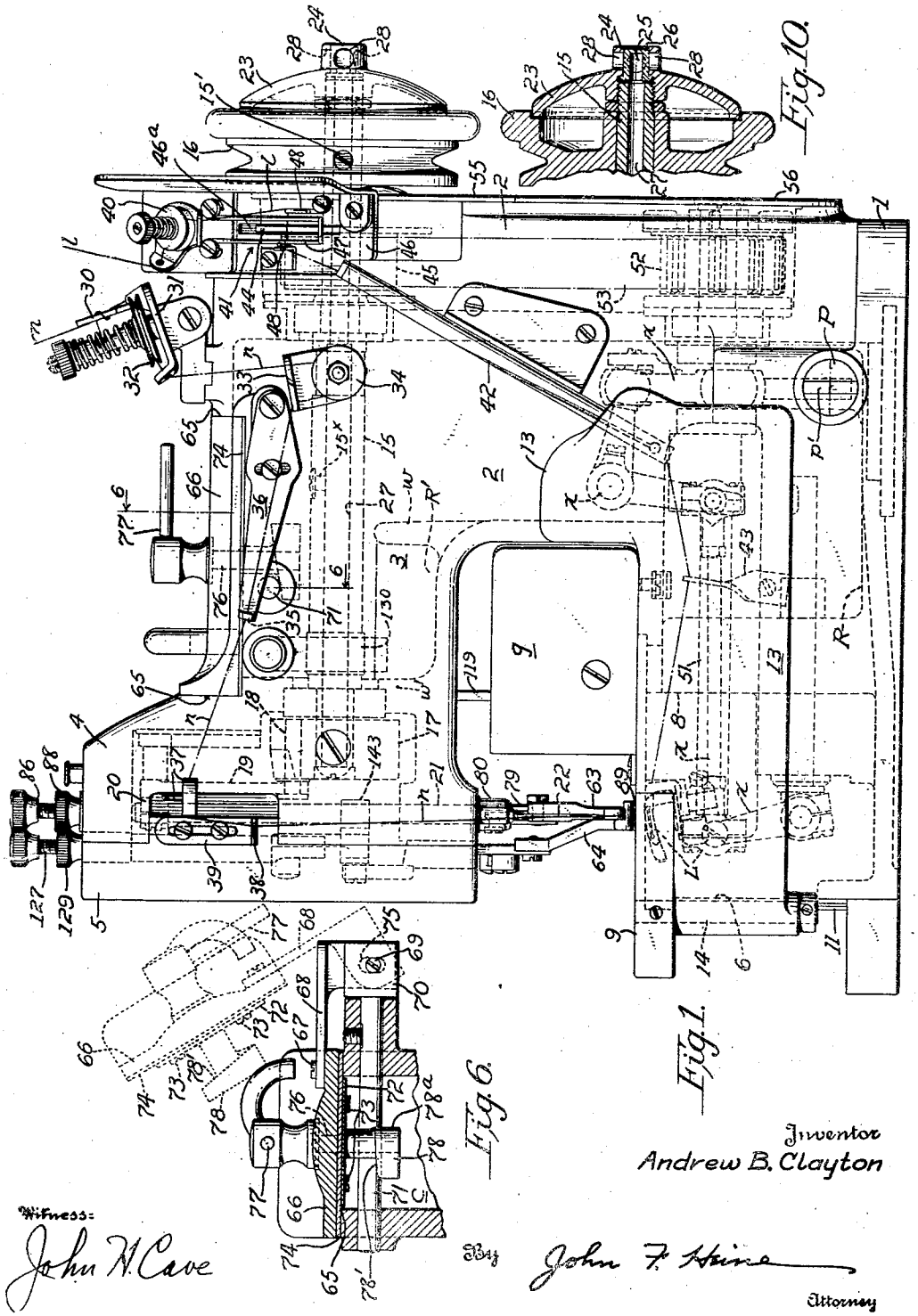


Fig. 10.

Fig. 1.

Fig. 6.

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SEWING MACHINE

Filed Aug. 29, 1941 7 Sheets-Sheet 2

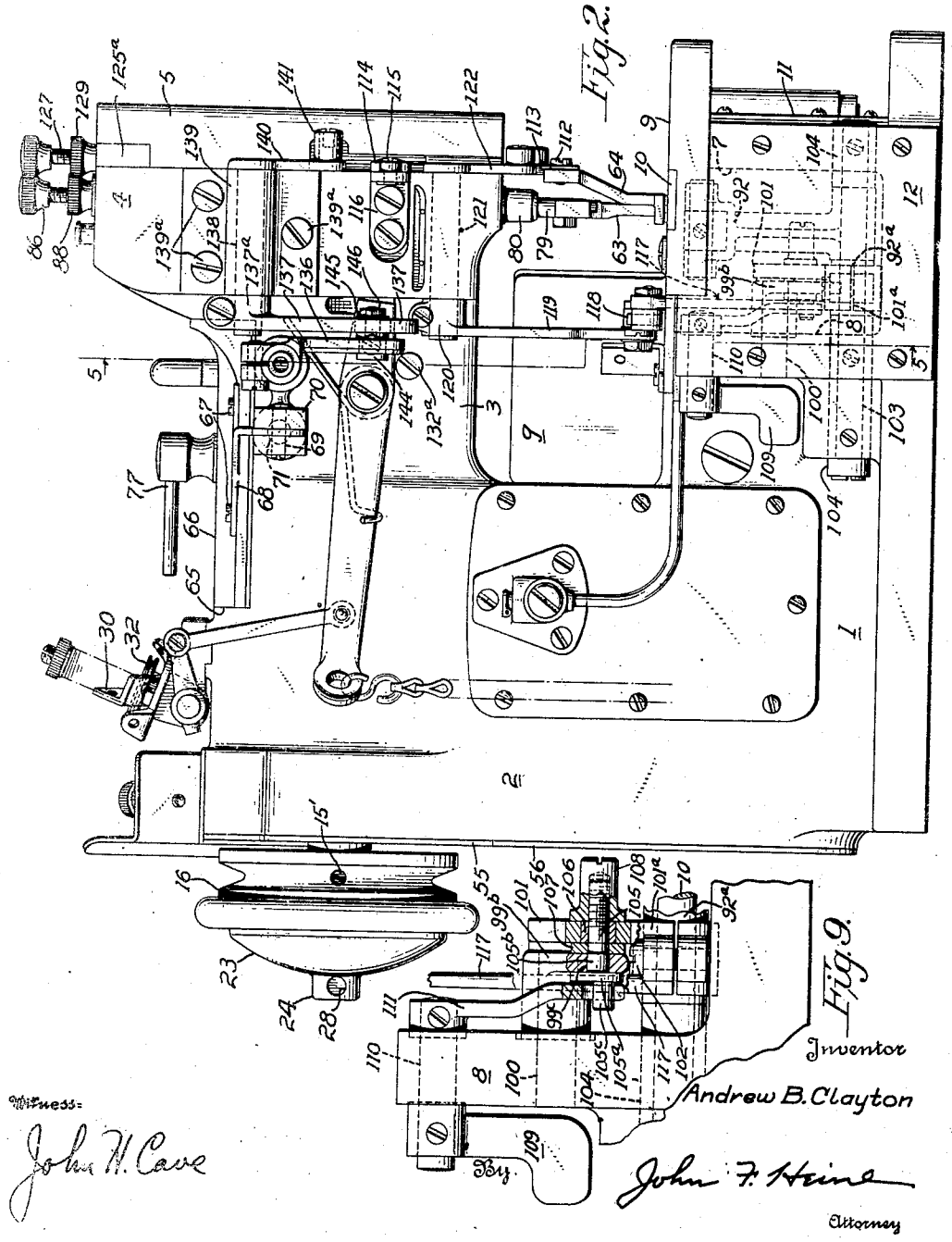


Fig. 2.

Fig. 9.

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SEWING MACHINE

Filed Aug. 29, 1941 7 Sheets-Sheet 3

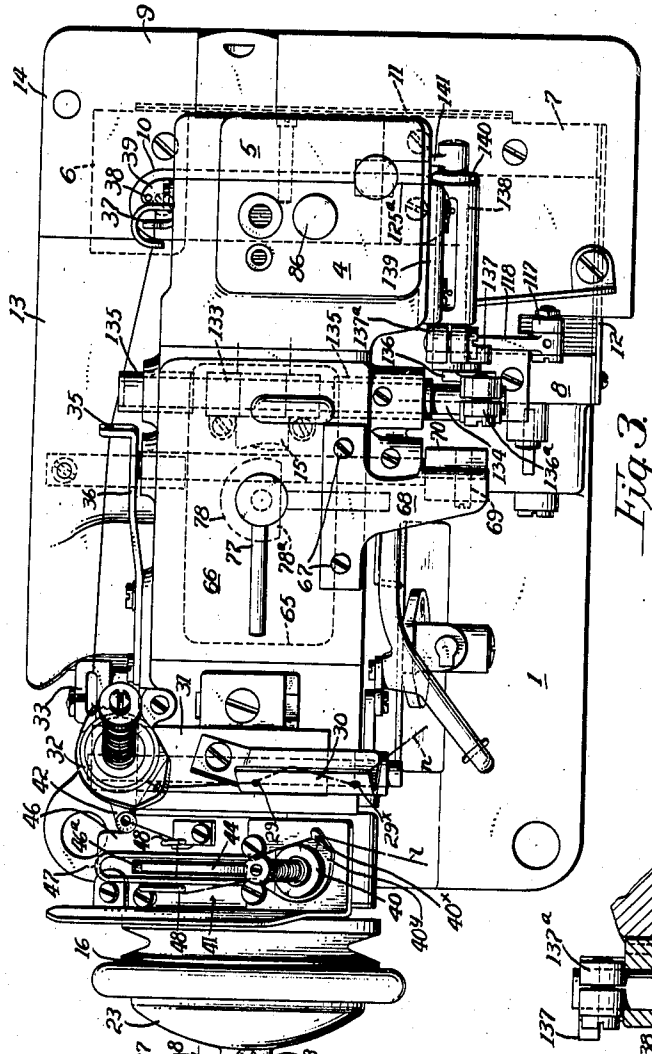


Fig. 3.

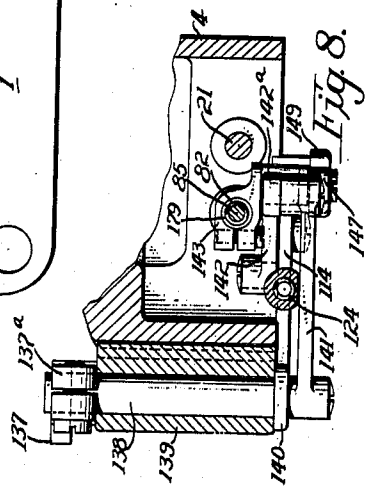


Fig. 8.

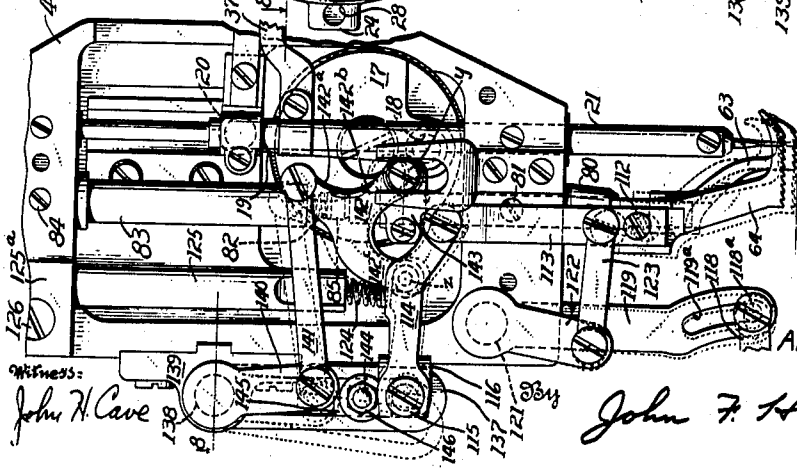


Fig. 7.

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SEWING MACHINE

Filed Aug. 29, 1941 7 Sheets-Sheet 4

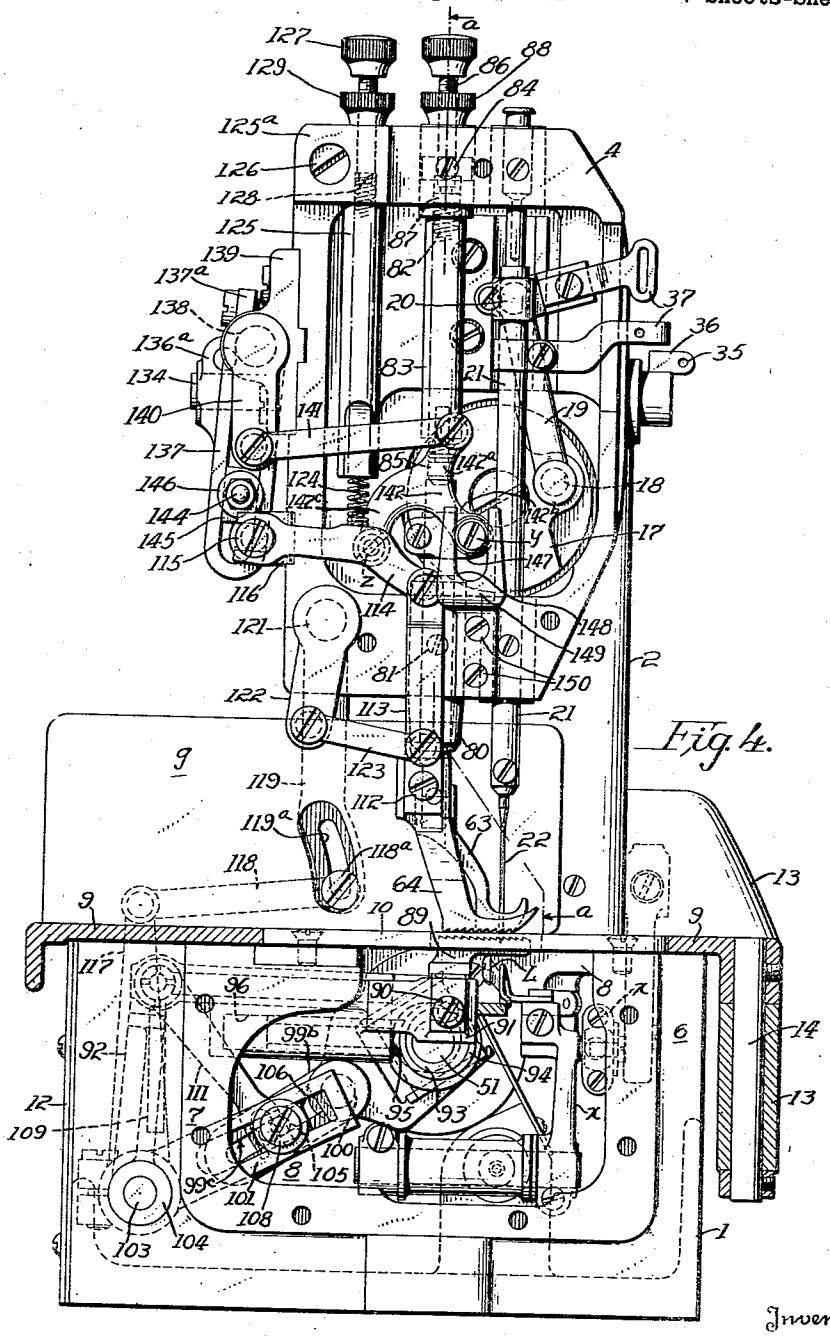


Fig. 4.

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SEWING MACHINE

Filed Aug. 29, 1941 7 Sheets-Sheet 5

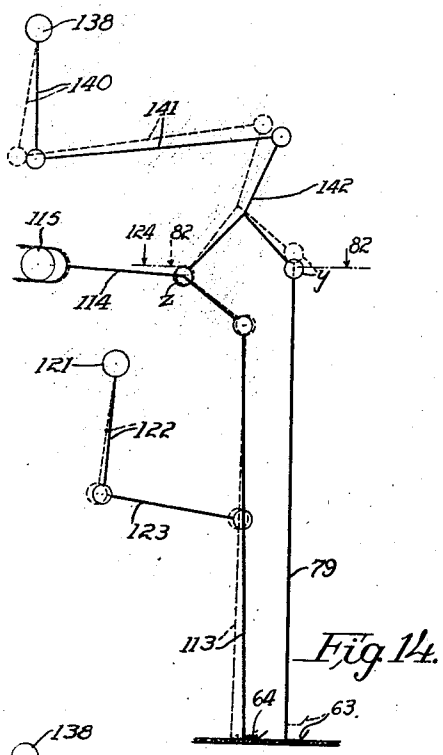


Fig. 14.

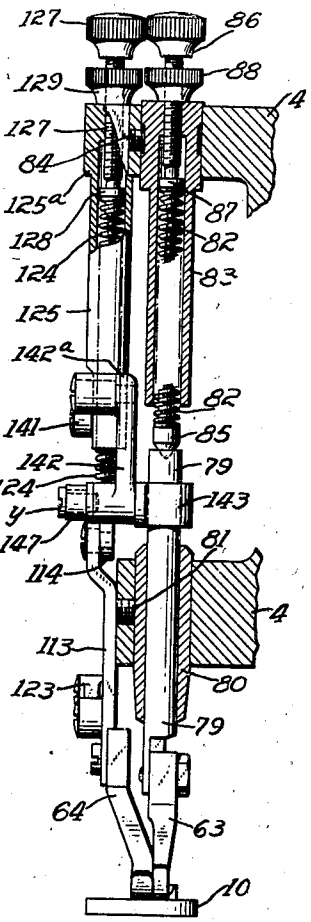


Fig. 4.a

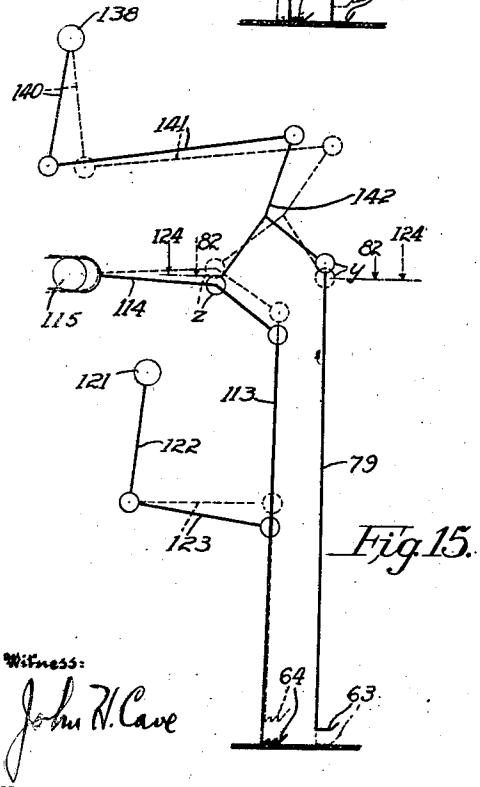


Fig. 15.

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SEWING MACHINE

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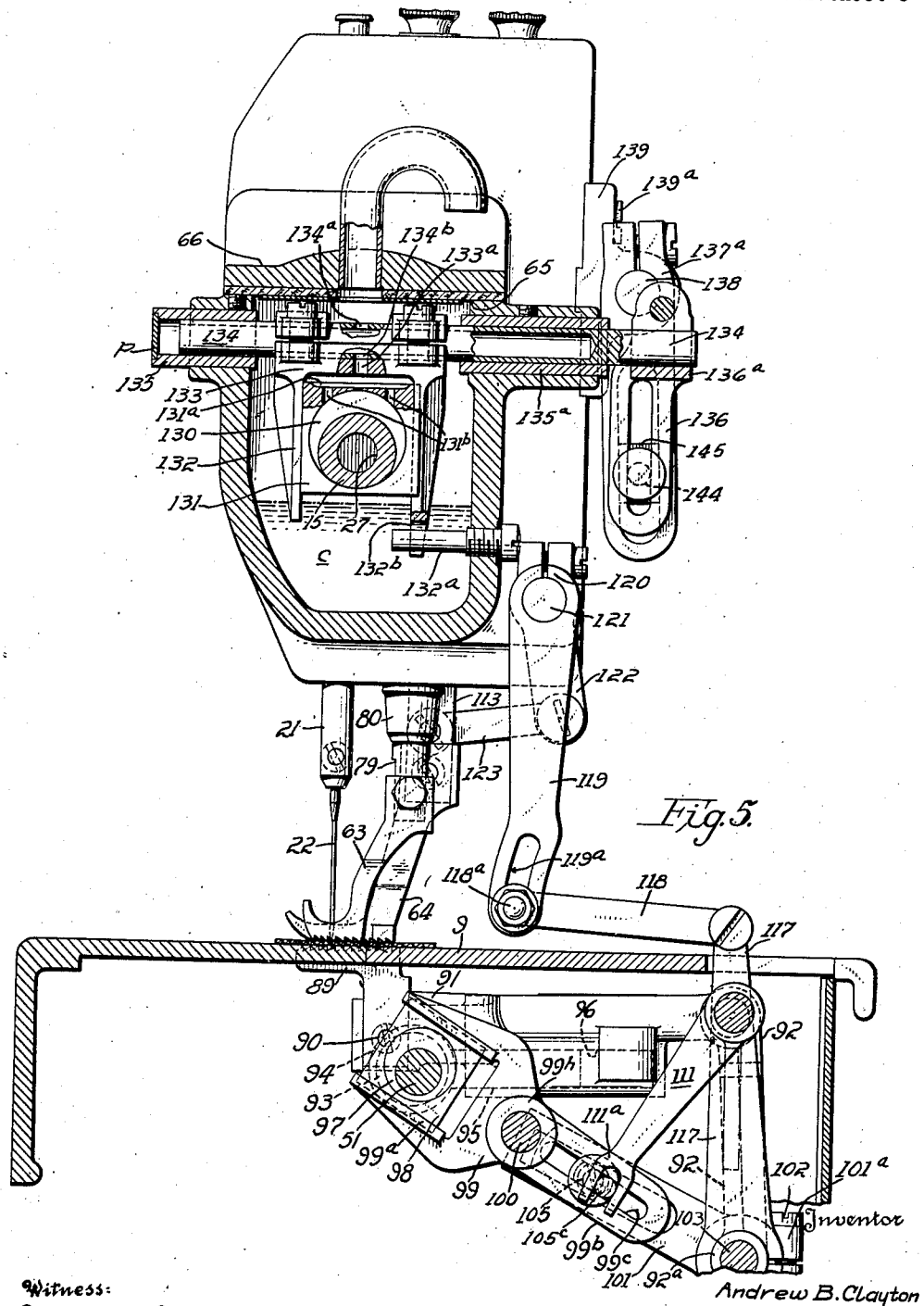


Fig. 5.

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SEWING MACHINE

Filed Aug. 29, 1941 7 Sheets-Sheet 7

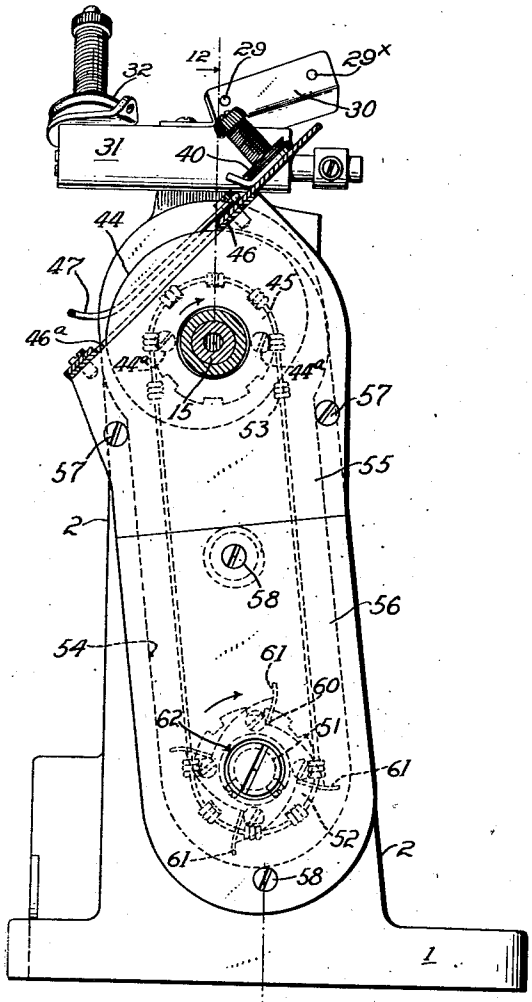


Fig. 11.

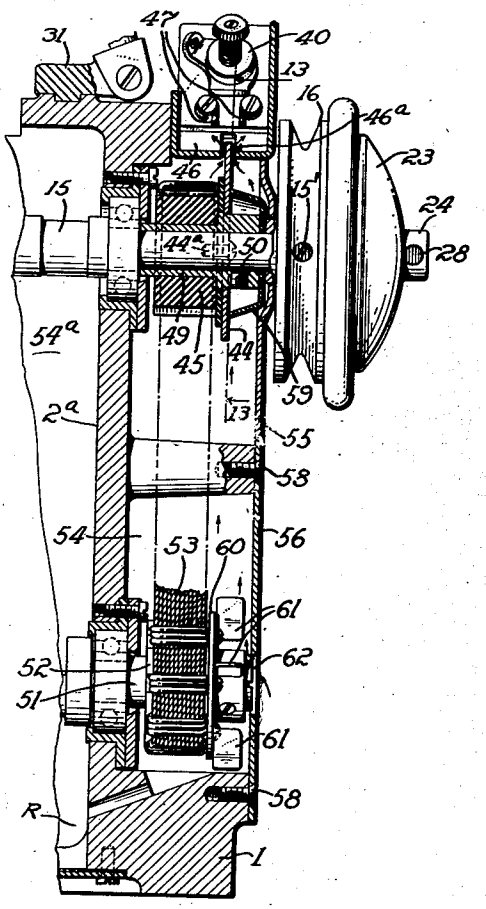


Fig. 12.

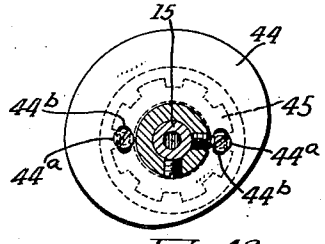


Fig. 13.

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Patented Jan. 18, 1944 2,339,240

UNITED STATES PATENT OFFICE

2,339,240

SEWING MACHINE

Andrew B. Clayton, Union, N. J., assignor to The Singer Manufacturing Company, Elizabeth, N. J., a corporation of New Jersey

Application August 29, 1941, Serial No. 408,701

16 Claims. (Cl. 112—207)

This invention relates to sewing machines and more particularly to sewing machines having a so-called "clamp" feeding mechanism, i. e., work-feeding mechanism having synchronously acting feeding elements engaging the work at opposite faces, and also automatic presser-foot lifting mechanism operated in timed relation with the feeding mechanism.

As heretofore constructed, sewing machines of this type, due to their complexity, weight of parts, inertia, etc., usually have had a maximum speed in the neighborhood of 3000 stitches per minute.

It is an object of this invention to provide, in a machine of this type, improved feeding and presser-foot lifting mechanisms which will enable the machine to be operated at a much higher speed than heretofore was possible, to wit, 4000 stitches or more per minute; which will lighten and render more uniform the load improved upon the driving shaft; and which will operate with a minimum of vibration and noise.

A further object of the invention is to provide a single means for simultaneously adjusting the feeding movement of both the top and bottom feed-dogs, other means for independently varying the feeding stroke of the top feed-dog, and means for varying the lift of the upper feeding foot and the presser-foot which holds the work on the throat-plate during the time that the feed-dogs are out of contact with the work.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations, and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings, Fig. 1 is a front elevation of a two-thread chain-stitch sewing machine embodying the present invention. Fig. 2 is a rear elevation thereof. Fig. 3 is a plan view of the machine shown in Fig. 2. Fig. 4 is an enlarged left end elevation, partly in section, of the machine illustrated in Fig. 1, with the face-plate removed. Fig. 4ª is a vertical sectional view substantially on the line *a*—*a* of Fig. 4 showing more particularly a presser-foot, an upper feeding foot and means for supporting and actuating the same, all later to be described. Fig. 5 is an enlarged vertical sectional view taken substantially on the line 5—5 of Fig. 2. Fig. 6 is a detail sectional view taken substantially on the staggered line 6—6 of Fig. 1 illustrating means for hingedly supporting an arm cover-plate and means for locking it in its operative position. Fig. 7 is a fragmentary left end view of the machine shown in Fig. 1 with the upper feeding foot, the presser-foot and their actuating mechanisms shown in full and dotted line positions. Fig. 8 is a horizontal sectional view taken substantially on the line 8—8 of Fig. 7. Fig. 9 is a fragmentary rear view of a portion of the sewing machine showing, partly in elevation and partly in section, means for simultaneously varying the feeding stroke of both the upper and under feed-dogs. Fig. 10 is a detail sectional view through the combined belt- and hand-wheel, showing means for indicating the amount of lubricant contained in the hollow main shaft, which lubricant is used to lubricate the needle-bar driving mechanism. Fig. 11 is a right end view, partly in section, of the machine shown in Fig. 1. Fig. 12 is a vertical sectional view taken substantially on the line 12—12 of Fig. 11. Fig. 13 is a detail sectional view taken substantially on the line 13—13 of Fig. 12 showing the looper-thread take-up cam and the means for adjustably securing it to a belt-sprocket fixed upon the main shaft of the machine. Figs. 14 and 15 are diagrammatic views illustrating, in full and dotted lines, the action of the means for alternately lifting the presser-foot and the upper feeding foot and for transferring to each the spring-pressure normally applied to the other.

Referring more specifically to the drawings, the invention is disclosed as embodied in a sewing machine having a frame comprising a base 1, upright standard 2, overhanging arm 3, terminating in a hollow head 4, closed at its forward face by a face-plate 5. The standard is formed with a vertical internal partition 2ª (Fig. 12) which extends from the bottom wall of the base 1 to the upper wall of the arm 3 and divides the space within the standard into a belt compartment 54 and a splash-lubrication compartment 54ª. This splash lubrication compartment overlies an oil reservoir R in the base 1 and permits the oil therein to be splashed into contact with the working parts therein by the action of a portion of the looper actuating mechanism therein. A transparent plug P (Fig. 1) secured in the base 1 and having a vertical bore *p'* in communication with the oil in the reservoir R indicates to the operator the level of the oil in the reservoir. The base is formed with upright portions 6, 7 and 8 (Figs. 1, 2 and 3) which support a work-plate 9, a throat-plate 10, and end and rear closure-plates 11 and 12, respectively.

These elements provide a substantially closed compartment in which is located feeding mechanism later to be described. A guard member or apron 13, hinged on a pin 14 supported by the cloth-plate 9, overlies a portion of the actuating mechanism, designated generally as *x*, of a chain-stitch looper L, and prevents accidental contact therewith.

Journaled lengthwise within the arm 3 is a main or needle-bar actuating shaft 15, having secured to it, at its rear end, by set screws 15', a combined belt- and balance-wheel 16 by means of which the machine may be driven from any suitable source of power. The forward end of the shaft 15 has secured to it a crank-disk 17 carrying a crank-pin 18 connected, by a link 19, with a collar 20, secured upon a hollow needle-bar 21 reciprocably mounted in the head 4. At its lower end the needle-bar carries an eye-pointed needle 22 which cooperates with the looper L in the formation of stitches. The shaft 15 is preferably hollow and serves as a reservoir for oil for lubricating the needle-bar actuating mechanism as shown and described more fully in my United States Patent No. 2,120,210, July 7, 1938. Threaded upon the rear end of the main shaft, beyond the balance-wheel 16, is a curved disk 23 (Fig. 10) having its convex surface outward. The disk 23 has a central hollow hub 24 into which is inserted a transparent plug 25 having an open ended bore 26 in communication with the lubricant-holding bore 27 in the shaft. Transverse openings 28 formed in the hub 24 permit the operator to see through the plug 25 and thereby ascertain whether there is sufficient oil in the reservoir in the main shaft.

Thread *n* for the needle passes from a suitable source of supply through a thread-eye 29^x formed in a kink-removing plate 30 (Figs. 1 and 3) secured to a tension-bracket 31 thence around the edge of the plate and back through a thread-eye 29. From the eye 29 the thread extends through a tension 32 thence through a self-threading thread-guide 33, thread-nipper 34, back through the thread-guide 33, through a thread-eye 35 formed in an adjustable arm 36, secured to the machine arm, through a take-up 37, to a thread-eye 38 formed in a plate 39 adjustably secured to the face plate 5, and thence to the eye of the needle.

The looper thread *l* extends from a suitable source of supply to a thread-eye 40^x formed in a tension-supporting plate 40^y thence through a thread tension 40, through a take-up 41, down through a thread-guiding tube 42, through a thread-guide 43, to the looper L.

The take-up 41 comprises a thread-controlling cam disk 44, adjustably secured to a belt-sprocket 45 fixed upon the main shaft 15. The cam disk 44 is secured to the sprocket 45 by screws 44^a which pass through slots 44^b in the disk and are threaded into the sprocket. The cam disk operates through a slotted stripper-plate 46 carrying a U-shaped thread-stripper 47 and thread-guides 48.

As shown most clearly in Figs. 11 and 12, the belt-sprocket 45 is frictionally secured upon a sleeve 49 which, in turn, is secured to the shaft 15 by means of a set-screw 50 and forms a part of a driving connection between the rotary main shaft 15 and a rotary looper- and lower-feed actuating shaft 51 journaled in bearings provided by the base of the machine. The other elements of the driving connection between the two shafts consist of a similar belt-sprocket 52 secured upon the shaft 51 and a connecting clip-belt 53 surrounding the sprockets. The driving connection between the two shafts is located in the compartment 54, formed in the rear portion of the standard 2, which compartment is normally closed by upper and lower cover-plates 55 and 56, respectively, secured to the standard by screws 57 and 58.

It is sometimes required that the timing of the take-up cam be varied relative to the timing of the looper mechanism. This may readily be effected by adjusting the take-up disk angularly about the axis of the shaft 15. To accomplish this the hand-wheel 16, plate 55, and a cup-like guard element 59 (Fig. 12) which surrounds the shaft 15 and the hub of the sleeve 49 are first removed. After those elements have been removed the screws 44^a may be released and the cam-disk rotated slightly about the axis of the shaft after which the screws 44^a are again tightened and the guard element, cover-plate and hand-wheel are replaced.

As shown most clearly in Figs. 1, 11 and 12, the periphery of the take-up disk 44 projects through a slot 46^a in the take-up stripper plate 46. To prevent dust, lint or other foreign matter from entering the compartment 54 through the slot 46^a and also to prevent the end of the thread from passing into the slot and becoming entangled with or wound about the parts in the compartment 54, should the thread break, means is provided for maintaining, during the operation of the machine, a continuous flow of air outwardly through the slot 46^a, as indicated by the arrows in Fig. 12. This is effected by an air pump preferably in the form of a rotary fan 60 secured to the sprocket 52 on the looper- and feed-actuating shaft 51. During running of the machine the fan 60, which has radially extending and backwardly inclined vanes 61, draws air into the compartment 54 through an opening 62 formed in the cover-plate 56, coaxial with the fan, and forces it upwardly and discharges it through the slot 46^a in the stripper-plate 46.

The overhanging bracket-arm 3 is hollow as indicated at *c* in Figs. 5 and 6, and has located therein the primary actuating means, later to be described, for alternately lifting a presser-foot 63 and an upper feeding foot 64 also later to be described. For the purpose of permitting entry into the cavity *c* thereby to give access to the actuating means therein and to a screw-closed filling hole 15^x formed in the shaft 15, whereby lubricant may be supplied to the reservoir formed in the shaft, the upper wall of the arm is cut away to form an opening 65. This opening is normally closed by a cover-plate 66 secured, by screws 67, to a bracket 68, loosely hinged at 69, within a head 70 formed at one end of a horizontally disposed bar 71 secured in the arm of the machine. Fixed to the under side of the cover-plate 66, by means of a plate 72 and screws 73 (see Fig. 6), is a gasket 74 which effects an oil-tight seal between the cover-plate and the arm 3. The downturned portion of the bracket 68 is formed with a slot 75 which is slightly larger than the pivot-screw 69 passing therethrough thereby permitting the bracket and the cover-plate carried thereby to float both vertically and horizontally relative to the arm 3 thus insuring complete contact between the gasket 74 and the upper surface of the arm upon which it is seated. To draw the gasket into oil-tight contact with

its seat the cover-plate has journaled therein a vertically disposed pin 76 having, at its upper end, a finger-piece 77 by means of which the pin may be rotated. At its lower end the pin 76 has secured thereto a cam element 78 having an inclined upper surface 78' adapted, upon rotation of the pin, to engage beneath the bar 71 and thus draw the gasket 74 and cover-plate 66 into oil-tight contact with the arm 3 about the opening 65. One side of the cam element 78 is cut away, as indicated at 78a, in Fig. 3. Thus when the finger-piece is rotated to the position shown in dot-dash lines in that figure, the cutaway portion 78a clears the bar 71 and permits the cover-plate 66 to be tipped upwardly as indicated in dotted lines in Fig. 6.

The presser-foot 63, above mentioned, is secured upon the lower end of a presser-bar 79 slidingly mounted in a bushing 80 secured by a screw 81 in the lower portion of the bracket-arm head 4. The presser-bar is normally depressed by a coil-spring 82 fitted within a sleeve 83 secured in the upper portion of the head 4 by a screw 84. As shown most clearly in Fig. 4a, the lower end of the spring 82 bears upon a plug-head 85 which, in turn, bears upon the upper end of the presser-bar. The tension of the spring 82 may be varied, thereby to increase or decrease the pressure transmitted to the presser-foot, by an adjusting screw 86 threaded through the upper end of the sleeve 83 and bearing on a plug-head 87 seated upon the upper end of the spring. The screw 86 may be locked in adjusted position by a clamp-nut 88 threaded thereon and adapted to engage the upper surface of the head 4.

Cooperating with the presser-foot 63 in the feeding of work is a lower four-motioned feeding mechanism including a serrated feed-dog 89 secured, by a screw 90, in the forward free end of a main feed-bar 91 pivotally mounted at its rear end in a feed-rocker 92 and adapted to be given the usual up and down and endwise reciprocatory motions common to four-motioned feeds. Up and down motions are transmitted to the forward end of the feed-bar and the feed-dog carried thereby, by a feed-lift eccentric 93 carried by the rotary shaft 51. The eccentric 93 is surrounded by a strap 94 formed integral with a pin 95 slidingly mounted in a socket 96 formed in the feed-bar. Oscillatory motions are transmitted to the feed-rocker 92, thereby to give to the feed-bar and feed-dog their back and forth motions, from a feed-drive eccentric 97, also secured upon the shaft 51. A block 98 surrounding the eccentric 97 is embraced by the forked end 99a of a lever 99 the hub 99h of which is journaled on a stud 100 secured in the upright wall portion 8 of the machine frame. The other arm 99b of the lever 99 is slotted, as at 99c, and lies adjacent an oppositely extending slotted arm 101, having a split hub 101a secured, as by pinch screw 102, upon the hub 92a of the feed-rocker 92. The feed-rocker is journaled on a rod 103 held in bushings 104 secured in the upright portions 7 and 8 of the machine frame. Oscillatory motion is adapted to be transmitted from the lever 99 to the arm 101 by means of a stud 105 (Fig. 9) having a head 105a, one portion 105b located within the slot 99c and another portion projecting through the slotted arm 101 where it carries a slide-block 106 fitted within the slot in said arm. A washer 107 surrounds the stud 105 between the arms 99b and 101. The stud 105 may be adjusted lengthwise of the arms 99b and 101 thereby to vary the amplitude of motion transmitted to the latter arm and thence to the feed-rocker 92, feed-bar 91 and feed-dog 89 from the constant throw of the eccentric 97. A screw-driver actuated nut 108 threaded on the outer end of the stud 105 serves to clamp the stud in its various positions of adjustment. To facilitate shifting of the stud 105 after the nut 108 has been released, a hand-actuated adjusting lever 109 is located in a readily accessible position at the rear side of the machine. This lever is secured upon one end of a rock-shaft 110 journaled in the upstanding portion 8 of the machine frame. The other end of the rock-shaft has secured to it an arm 111 the free and forked end 111a of which engages a pin 105c projecting from the head 105a of the stud 105. The pin 105c is preferably located eccentric to the axis of the stud 105 so as to prevent interference between the forked end of the arm 111 and the hub 99h of the lever 99 when the stud is shifted to one extreme position. It will be apparent that with the nut 108 released, actuation of the hand-lever 109 will shift the pivotal connection between the arms 99b and 101 thereby to vary the feed-and-return strokes of the feed-dog.

Cooperating with the above described lower feeding mechanism is an upper four-motioned feeding mechanism including the upper serrated work-feeding foot 64 above mentioned. The foot 64 is secured, by a screw 112, to the lower end of a vertically disposed feed-bar 113 pivotally connected, at its upper end, to one end of a lever 114, of the third order. The opposite end of the lever 114 is forked and pivotally and slidingly connected at 115 to the machine frame, preferably through the medium of a bracket 116 secured upon the rear side of the head 4. Oscillatory movements are transmitted to the feed-bar 113, thereby to give the feeding foot 64 its feed-and-return strokes, by the feed-rocker 92, hereinbefore mentioned. As shown most clearly in Figs. 5 and 9, the split hub 101a, of the arm 101, has formed integrally therewith an upstanding arm 117 to the upper end of which is pivotally connected one end of a link 118. The other end of the link is adjustably connected to the lower end of a rock-arm 119, secured, by a split clamping hub 120, to one end of a rock-shaft 121 journaled in the lower portion of the bracket-arm head 4. At its other end the rock-shaft has secured to it a rock-arm 122 connected by a link 123 to the upper feed-bar 113. A guard-plate g secured upon the work-plate 9, prevents accidental contact with the rock-arm 119.

From the foregoing it will be understood that rocking motions of the feed-rocker 92 will effect feed-and-return movements of both the lower feed-dog 89 and the upper feeding foot 64 and that the amplitude of the motion transmitted thereto from the eccentric 97 may be varied by adjusting the position of the stud 105 connecting the lever 99 and the arm 101. The stroke of the upper feeding foot may be additionally varied relative to the feed-dog by reason of an adjustable pivotal connection between the link 118 and the rock-arm 119.

As shown most clearly in Figs. 4, 5 and 7 the lower end of the arm 119 is formed with an arcuate slot 119a in which one end of the link 118 is adapted to be adjustably secured by a clamping bolt 118a. With the link 118 pivotally connected in the lower end of the slot 119a, as shown in the drawings, the feed-and-return motions transmitted to the feed-dog 89 and feeding foot 64 are equal. In certain classes of work it is desirable that the upper ply be fed slightly faster

than the lower ply. This may be accomplished by adjusting the pivot bolt 118a upwardly in the slot 119a and clamping it in its adjusted position thereby increasing the feed-and-return strokes of the upper feeding foot.

In order that the feeding movement of the foot 64 may effect feeding of the work it is essential that the foot be forced downwardly into pressure contact with the work. This is effected partially, as hereinafter will be described, by a coil spring 124 located mainly within a vertically disposed tube 125 having at its upper end a head 125a secured to the bracket-arm head 4 by a screw 126. The lower end of the spring protrudes from the tube 125 and bears upon the lever 114. The tension of the spring may be varied, thereby to cause more or less pressure to be transmitted to the feeding foot 64, by the adjustment of a screw 127 threaded through the head 125a and having its lower end bearing against a plug-head 128 seated upon the upper end of the spring 124. The tension-adjusting screw may be locked in its various positions of adjustment by a clamp nut 129 threaded on the screw 127 and abutting against the head 125a.

As is customary in feeding mechanisms of this nature, the lifting presser-foot and the feeding-foot are each alternately depressed onto the work and lifted therefrom, the lifting presser-foot being raised during the work-feeding stroke of the feeding-foot and bearing on the work to hold it against movement during the time that the needle is in the work and the upper and lower feeding elements are being retracted after a feeding stroke. This alternate raising and lowering of the feet is effected from an eccentric 130 formed on the main shaft 15 and located within the cavity *c* hereinbefore mentioned, in the bracket-arm 3 (see Fig. 5). The eccentric is surrounded by a block 131 which is embraced by a fork 132 projecting downwardly from a split sleeve 133 clamped upon a hollow rod 134 mounted, for endwise sliding movements, in bushings 135 and 135a secured in the arm 3. A stud 132a secured in the rear wall of the arm 3 is slidingly fitted within a slot 132b formed in one arm of the fork 132 to guide the fork in its lateral movements and to prevent it from turning about the axis of the rod 134. Upon the rear end of the rod 134 there is clamped the split-hub 136a of a vertically disposed slotted arm 136. Located adjacent the arm 136 is a second slotted arm 137 the split upper end 137a of which is clamped upon one end of a rock-shaft 138 journaled in a bracket 139 secured by screws 139a to the rear side of the bracket-arm head 4. At its opposite end the shaft 138 carries a downwardly extending rock-arm 140 to the lower end of which is pivoted one end of a link 141 connected at its opposite end to part 142a of an angle lever 142. A second part 142b of that lever is pivotally connected at *y* to a clamp-collar 143 secured upon the presser-bar 79. A third part 142c of the lever 142 is pivotally connected at *z* to the lever 114 hereinbefore mentioned.

A stud 144, adjustably mounted in the slotted arm 136 carries a block 145 slidingly fitted within the slot in the arm 137. This stud and block serve as a connecting means between the arms 136 and 137 whereby endwise reciprocation of the rod 134, under the influence of the eccentric 130, is translated by the arms 136 and 137 into oscillatory motion in the shaft 138, which through the rock-arm 140 results in endwise reciprocations of the link 141. The amount of oscillatory motion transmitted to the shaft 138, link 141 and lever 142 and thereby the amount of vertical movement given to the feet 63 and 64 may be varied by adjusting the stud 144 and block 145 lengthwise of the arms 136 and 137. A clamp-nut 146 serves to clamp the stud and block in their various positions of adjustment.

From the foregoing it will be understood that rotation of the main shaft 15 will, through the elements 130, 131, 132, 134, 136, 137, 138 and 140, effect endwise reciprocations of the link 141 and thereby oscillations of the three-armed lever 142 alternately about the fulcrum points *y* and *z* as later will be described.

In line with the fulcrum *y*, the lever 142 carries a roller 147 which tracks the walls of a slot 148 formed in a fork-like member 149 secured, by screws 150, to the head 4. This fork and roller guide the lever 142 in its vertical movements and prevent swinging of the collar 143 and the presser-bar 79 about the axis of the latter.

Within the cavity *c*, the machine frame is formed with an upstanding wall *w* (see Fig. 1) which connects the front and rear walls of the arm 3 and forms therewith, and with a main-shaft bearing supporting wall *w'* in the arm, an auxiliary reservoir R' into which lubricant is splashed from the main reservoir R by the actuating of the looper-operating mechanism. Oil in the reservoir R' is engaged by the fork 132 and the block 131 and is splashed thereby into contact with the presser-bar and feed-bar lifting mechanism located in the cavity, whereby those parts are kept well lubricated.

As shown most clearly in Fig. 5, the bore in the bushing 135 in which the rod 134 is slidingly mounted is closed by a welch plug *p*. The hollow rod 134 is formed with radial ports 134a and 134b which permit the escape of air and thus prevent the rod from building up pressure in the bearing bushing 135. The port 134b is aligned with a duct 133a in the sleeve 133 thereby permitting any oil which may enter the bore in the rod 134 to gravitate into a cavity 131a in the block 131 from which it passes through ducts 131b in said block to the bearing surfaces of the block and the eccentric 130.

As hereinbefore stated this invention has as one of its objects to provide a sewing machine which is capable of high speed and in which the load applied to the driving shaft will be relatively light and more nearly uniform than in prior machines. This has been accomplished largely by the construction and operation of the upper feeding mechanism and the automatic presser-foot lifting mechanism.

It is well known in the sewing machine art that the higher the speed of the machine the greater must be the spring pressure applied to the presser-foot so that it will quickly descend and grip the work after each upward movement thereof by the action of the under feed-dog. The same is true of upper feeding mechanisms.

Obviously, the greater the pressure applied to the presser-foot or the upper feeding foot the greater will be the load on the driving mechanism which is required to actuate those elements. Furthermore, it will be apparent that as this load is applied periodically, that is during the time when the springs are being compressed, the high pressure of the spring will not only apply an undue load on the mechanism but also a non-uniform one which results in excessive wear in the parts and causes noise and vibration.

The present top-feed and presser-foot lifting

mechanisms overcome these undesirable effects by the embodiment therein of a pair of relatively weak springs, each adapted to apply approximately one half of the required pressure, and means cooperating therewith whereby the combined pressures of those springs are applied first to one foot and then to the other. By reason of this construction the load on the machine is greatly reduced due to the fact that only half of the total spring pressure is required to be overcome at any one time. In other words, the loads imposed on the machine alternately by the top feed and presser-foot mechanisms are each so divided that one half thereof is applied at each one half rotation of the main shaft instead of each full load being applied once at a given point in a rotation, as in prior constrctions. Thus not only is the maximum load on the machine reduced but it is also applied more uniformly.

The action of the top feed and presser-foot lifting mechanisms will best be understood by reference to diagrammatic Figs. 14 and 15. In the position shown in full lines in Fig. 14, which corresponds to the position shown in Fig. 4, the lifting presser-foot 63 and the feeding foot 64 are in pressure contact with the work under the influence of the springs 82 and 124, respectively, as indicated by the full line arrows. Ignoring the action of the lower feed-dog which in its upward movement effects a slight vertical movement of the upper feeding foot, the actions of the upper feeding foot and the lifting presser-foot are as follows: During the first 90 degrees rotation of the main shaft, after the parts have reached the positions shown in full lines in Fig. 14, the feed-rocker is rocked rearwardly and both the lower feed-dog 89 and the upper feeding foot 64 are given their work advancing movements. During that 90 degree rotation of the main shaft the eccentric 130 shifts the rod 134 rearwardly, which, through the mechanism hereinbefore described turns the rock-shaft 138 and the rock-arm 140 clockwise, as viewed from the head end of the machine, from the position shown in full lines in Fig. 14 to the position indicated in dotted lines. Thus, through the link 141, the lever 142 is turned counterclockwise about its fulcrum z on the lever 114. This causes the fulcrum y of the lever 142 to be raised carrying with it the collar 143, the presser-bar 79 and the presser-foot 63 secured thereto to the position indicated in dotted lines in Fig. 14. It will be apparent that during this movement of the parts the spring 82 will react through the lever 142, on the lever 114 whereby the force of that spring is added to the force exerted by the spring 124 to depress the upper feed-bar and depress the feeding foot 64 into contact with the work with a pressure equal to the combined forces exerted by both springs.

During the next 60 degrees rotation of the main shaft the rock-shaft 138 and rock-arm 140 are turned counterclockwise, as viewed in Figs. 4 and 14 whereupon the link 141 turns the lever 142 clockwise about its fulcrum z thereby lowering the fulcrum y until the presser-foot 63 again bears on the work under the pressure of the spring 82, the feeding foot 64, at that time, engaging the work under the pressure of the spring 124 as indicated by the full line arrows in Fig. 15. Further rotation of 90 degrees of the main shaft causes continued counterclockwise movement of the rock-shaft 138 and rock-arm 140 and brings the parts to the position shown in Fig. 7 and indicated in dotted lines in Fig. 15. Inasmuch as the presser-foot is, during that movement, in pressure contact with the work and therefore cannot be further depressed, endwise movement of the link 141 causes the lever 142 to be turned clockwise about the fulcrum y thus lifting the fulcrum z and lever 114 connected therewith. This results in lifting the feed-bar 113 and the feeding-foot in opposition to the spring 124 whereupon the pressure of that spring reacts through the lever 142 to press downwardly on the fulcrum y and the presser-foot connected therewith. In this position the presser-foot is held upon the work under the combined pressures of both springs 82 and 124, as indicated by the arrows at the right in Fig. 15. Another 120 degrees rotation of the main shaft turns the shaft 138 clockwise, the lever 142 counterclockwise about the fulcrum y, thereby lowering the feeding foot 64 into contact with the work and restores the parts to the position shown in Fig. 4 and illustrated in full lines in Fig. 14, thus completing the cycle.

From the foregoing it will be seen that during one complete rotation of the main shaft the springs 82 and 124 are alternately compressed and their combined forces are transmitted first to one foot and then to the other. As hereinbefore stated the amount of pressure exerted individually by the springs 82 and 124 is capable of being varied by manipulation of the screws 86 and 127, respectively.

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

1. In a sewing machine having a frame and a work-support; the combination with a four-motioned feeding mechanism located beneath said work-support, of a complemental upper four-motioned feeding mechanism including a work-feeding foot located above said work-support; an operative connection between said feeding mechanisms to give to one feeding mechanism work-advancing movements from the other, a lifting presser-foot; individual springs reacting against said frame for depressing said upper feeding foot and said presser-foot; an angle lever having one part connected with each of said feet; means engaging another part of said lever to oscillate the lever to cause it alternately to lift and depress said feet and to transfer to the depressed foot the spring pressure normally applied to the other foot.

2. A sewing machine combining a frame; a work-support; a work-feeding mechanism located above said work-support comprising an upright feed-bar; a feeding foot secured to the lower end of said feed-bar; a vertically movable presser-bar; a lifting presser-foot carried by the presser-bar; a first compression spring normally acting on said feed-bar and reacting on said frame to depress said feeding foot; a second compression spring normally acting on said presser-bar and reacting on said frame to depress the presser-foot; an angle lever having one part pivotally connected with said presser-bar and another part pivotally connected with said feed-bar; and means acting on a third part of said lever to rock it alternately in opposite directions about its pivots to cause it alternately to depress said feet into contact with work located on said work-support and alternately to lift said feet in opposition to the spring pressure thereon, said lever in its rocking movements serving to transfer to the depressed foot the spring pressure normally acting on the other foot.

3. A sewing machine as set forth in claim 2 in which the springs which depress the feeding foot

and the presser-foot are coil springs mounted for endwise compression in tubular supports carried by the machine frame, and in which individual means is provided for varying the pressure produced by each spring.

4. A sewing machine as set forth in claim 2 in which means is provided for varying the amount of rocking motion transmitted to the angle lever, thereby to vary the height of lift of the presser-foot and feeding foot.

5. A sewing machine combining a frame; a work-support; a work-feeding mechanism located above said work-support and comprising an upright feed-bar and a feeding-foot secured to the lower end of said feed-bar; a vertically movable presser-bar; a collar fixedly secured to said presser-bar; a presser-foot carried by said presser-bar; spring means for depressing said feed-bar and presser-bar; a lever having one part pivotally connected with said collar and another part pivotally connected with said feed-bar; means acting on another part of said lever to rock it alternately in opposite directions about its pivots to cause it alternately to depress said feet into contact with work located on said work-support and alternately to lift said feet in opposition to said spring means; a stud carried by and projecting laterally from said collar; and a rigid member secured to said frame and affording spaced and opposed vertically arranged bearing surfaces which engage the opposite sides of said stud to prevent oscillation of the presser-bar about its longitudinal axis under the influence of said presser-foot lifting means.

6. A sewing machine combining a frame; a work-support; a work-feeding mechanism located above said work-support comprising an upright feed-bar, a feeding foot secured to the lower end of said feed-bar, a lever having one end fulcrumed on said frame and affording at its other end a pivotal support for said feed-bar; a vertically movable presser-bar; a lifting presser-foot carried by the presser bar; a first compression spring normally acting on said feed-bar and reacting on said frame to depress said feeding foot; a second compression spring normally acting on said presser-bar and reacting on said frame to depress the presser-bar; an angle lever having one part pivotally connected to the first mentioned lever and another part pivotally connected with said presser-bar and means acting on a third part of said lever to rock it alternately in opposite directions about its pivots to cause it alternately to depress said feet into contact with work located on said work-support and alternately to lift said feet in opposition to the spring pressure thereon, said angle lever in its rocking movements serving to transfer to the depressed foot the spring pressure normally acting on the other foot.

7. A sewing machine as set forth in claim 6 in which the first mentioned lever has a floating fulcrum on the machine frame; in which the compression spring which depresses the feed-bar acts on the first mentioned lever and thereby transmitted to the feed-bar; and in which means engages the feed-bar below its pivotal connection with the first mentioned lever to give to the feed-bar feed and return movements in timed relation with its vertical movements.

8. A sewing machine as set forth in claim 6 in which the first mentioned lever has a sliding pivotal connection with a bracket secured to the machine frame, and in which the spring which depresses the feed-bar bears upon that lever intermediate its sliding pivot and the pivotal connection between the lever and the feed-bar.

9. In a sewing machine having a base, a standard, an overhanging bracket-arm and a head; a first rotary shaft journaled in said bracket-arm; a second rotary shaft journaled in said base; an upper four-motioned feeding mechanism including an upright feed-bar supported from said head and a work-feeding foot on the lower end of said feed-bar; means actuated by the second shaft for giving to said feed-bar feed and return movements; and means for giving to said feed-bar up and down movements in timed relation with its feed and return movements comprising an eccentric on said first shaft, a slide-bar mounted in said bracket-arm a fork secured to said slide-bar and embracing said eccentric, a rock-shaft supported by said head, an operative connection between asid slide-bar and said rock-shaft to give to the latter oscillatory motions from the sliding movements of the former, and means actuated by said rock-shaft to lift and depress said feed-bar.

10. In a sewing machine as set forth in claim 9, a lubricant reservoir formed in said bracket-arm and holding lubricant which is engaged by said fork and its actuating means, whereby said eccentric, fork and slide-bar are splash-lubricated.

11. In a sewing machine having an upper four-motioned feeding mechanism as set forth in claim 9, in which the operative connection between the slide-bar and the rock-shaft includes adjustable means for varying the rocking motion transmitted to the rock-shaft from the constant throw of the eccentric, thereby to vary the vertical movement of the feed-bar.

12. In a sewing machine having an upper four-motioned feeding mechanism as set forth in claim 9, in which the operative connection between the slide-bar and the rock-shaft comprises an arm on said slide-bar, an arm on said rock-shaft, said arms being arranged side-by-side, and an adjustable connection between said arms for transmitting oscillatory motions to the latter from reciprocatory motions of the former and for varying the amount of oscillatory motion transmitted to the rock-am.

13. A sewing machine combining a frame including a base, a standard, a bracket-arm and a head; a work-support; a first shaft journaled in said bracket-arm; a second shaft journaled in said base; an upper work-feeding mechanism operating above said work-support and including a substantially horizontal lever fulcrumed at one end on said head, a vertically and horizontally movable upright feed-bar pivoted at its upper end to the other end of said lever and a feeding foot carried by said feed-bar; means actuated by said second shaft for giving to said feed-bar its horizontal movements; and means to give vertical movements to the feed-bar in timed relation with its horizontal movements comprising an eccentric on said first shaft, a slide-bar mounted in said bracket-arm, a connection between said eccentric and said slide-bar for reciprocating the latter and an operative connection between said slide-bar and said lever for oscillating the lever about its fulcrum thereby to raise and lower said feed-bar.

14. A sewing machine as set forth in claim 13 in which there is a vertically movable presser-bar mounted in said head and in which the operative connection between the rock-shaft and the lever which supports the feed-bar includes a

rock-arm on said rock-shaft, an angle lever having one part pivotally connected with said lever and another part pivotally connected with said presser-bar, and a link connection between said rock-arm and a third part of said angle lever whereby oscillation of said rock-shaft effects alternate lifting and lowering of said feed-bar and presser-bar.

15. In a sewing machine having a frame affording a closed compartment and a rotary shaft in said compartment; a four-motioned feeding mechanism located within said compartment and comprising a feed-rocker, a feed-bar connected to said feed-rocker, a feed-dog carried by said feed-bar, means actuated by said shaft to give to said feed-bar rising and falling movements; means for vibrating said feed-rocker to give to the feed-bar feed and return movements comprising an eccentric on said shaft, a two-armed lever fulcrumed on said frame and having a first arm engaging said eccentric and a second arm projecting toward said feed-rocker, a rocker arm projecting from said feed-rocker and lying beside and adjacent the second arm of said lever, an adjustable coupling element between said rocker-arm and the second arm of said lever to transmit motion from said lever to said rocker-arm and thereby to said feed-rocker; and manually actuable means including a member located outside said compartment and a connection from said member to said coupling element for shifting said element to vary the amount of motion transmitted from said lever to said feed-rocker.

16. A feeding mechanism for sewing machines as set forth in claim 15 in which the means for shifting the coupling element comprises a rock-shaft journaled in and extending through a wall of the compartment, an arm secured to the inner end of said rock-shaft and engaging said coupling element, and a manually actuable lever secured to the outer end of said rock-shaft.

ANDREW B. CLAYTON.

CERTIFICATE OF CORRECTION.

Patent No. 2,339,240. January 18, 1944.

ANDREW B. CLAYTON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, first column, line 17, for "constrctions" read --constructions--; page 6, first column, line 65, claim 7, after "lever and" insert --is--; and second column, line 19, claim 9, for "asid" read --said--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of March, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.