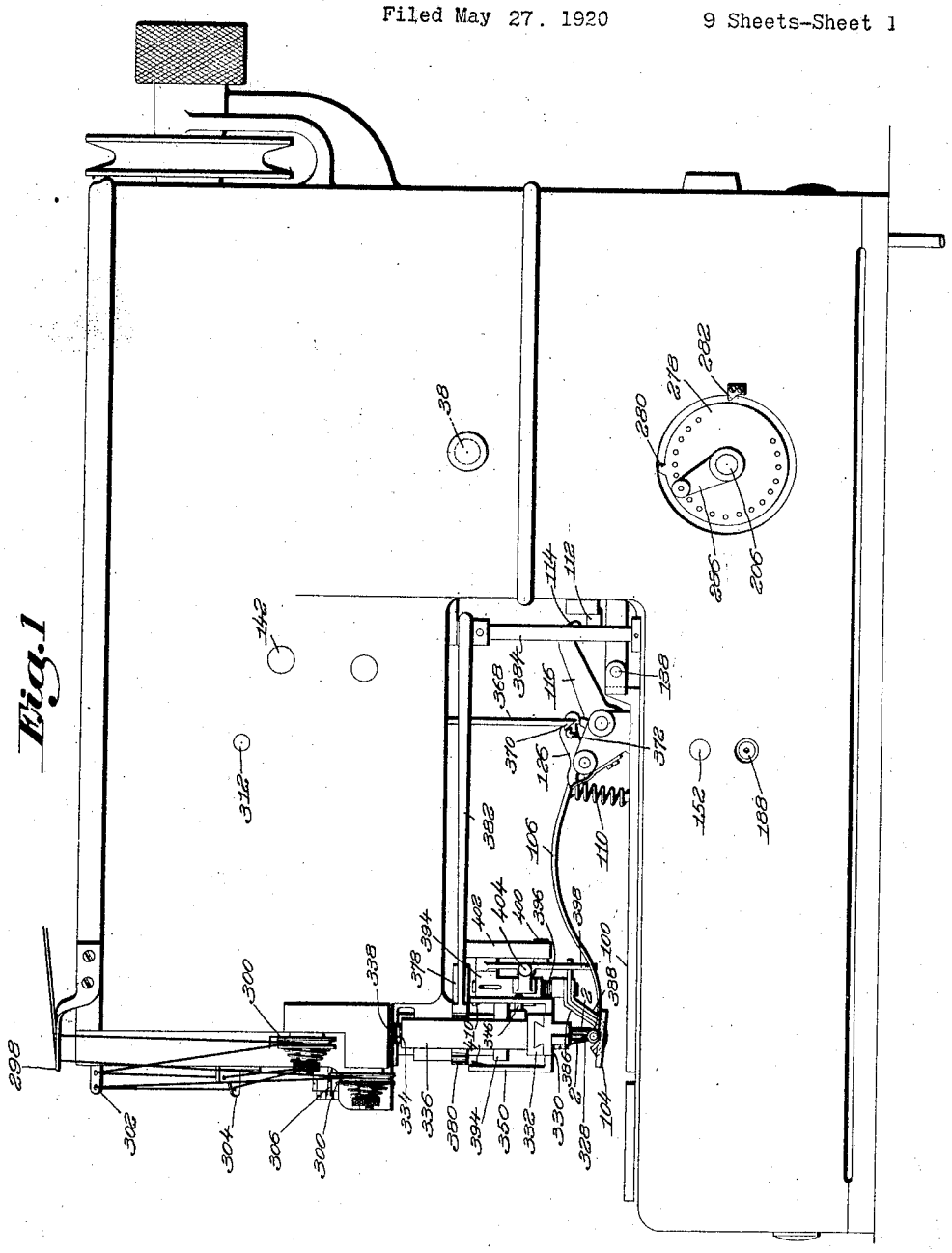
April 1, 1924. 1,488,591

J. FOSSA

BUTTONHOLE SEWING MACHINE

Filed May 27, 1920 9 Sheets-Sheet 1

Fig. 1



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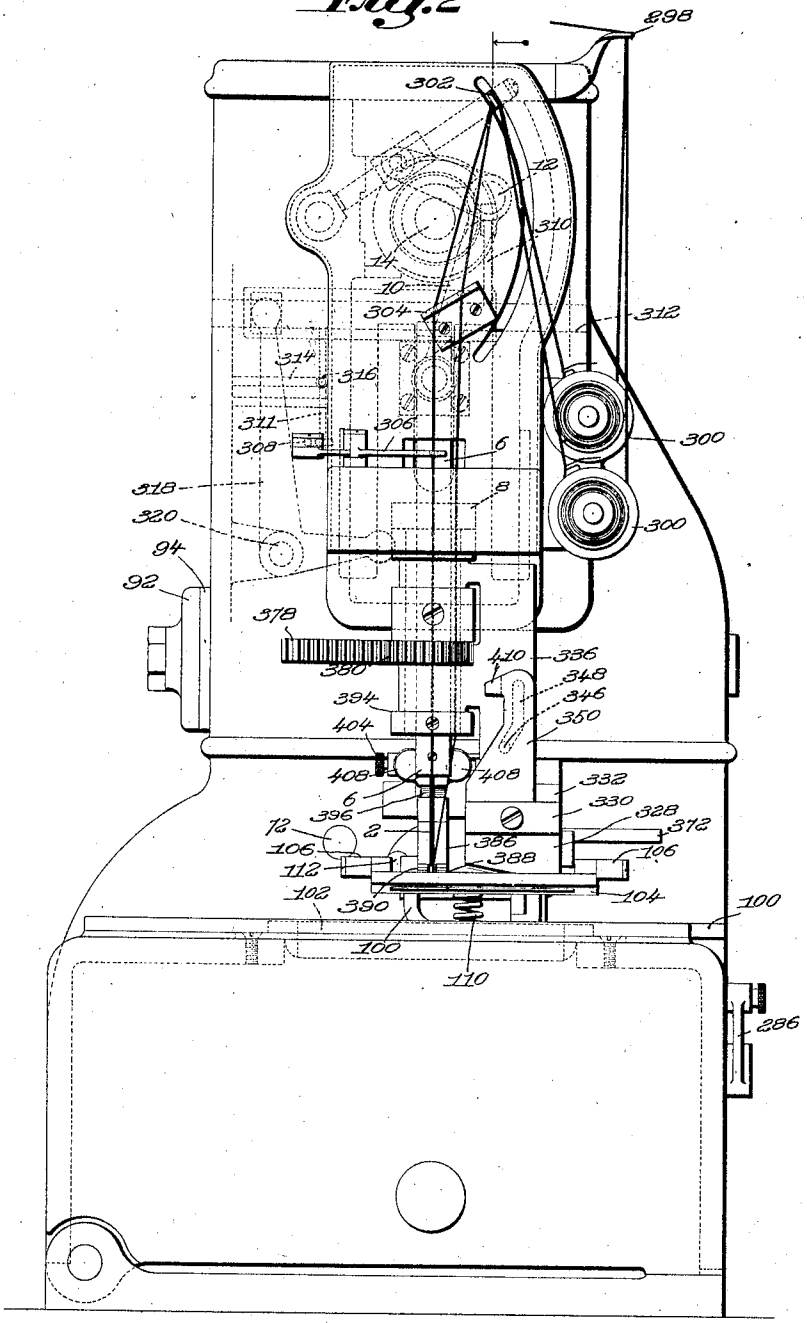
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BUTTONHOLE SEWING MACHINE

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Fig. 2



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BUTTONHOLE SEWING MACHINE

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Fig. 3

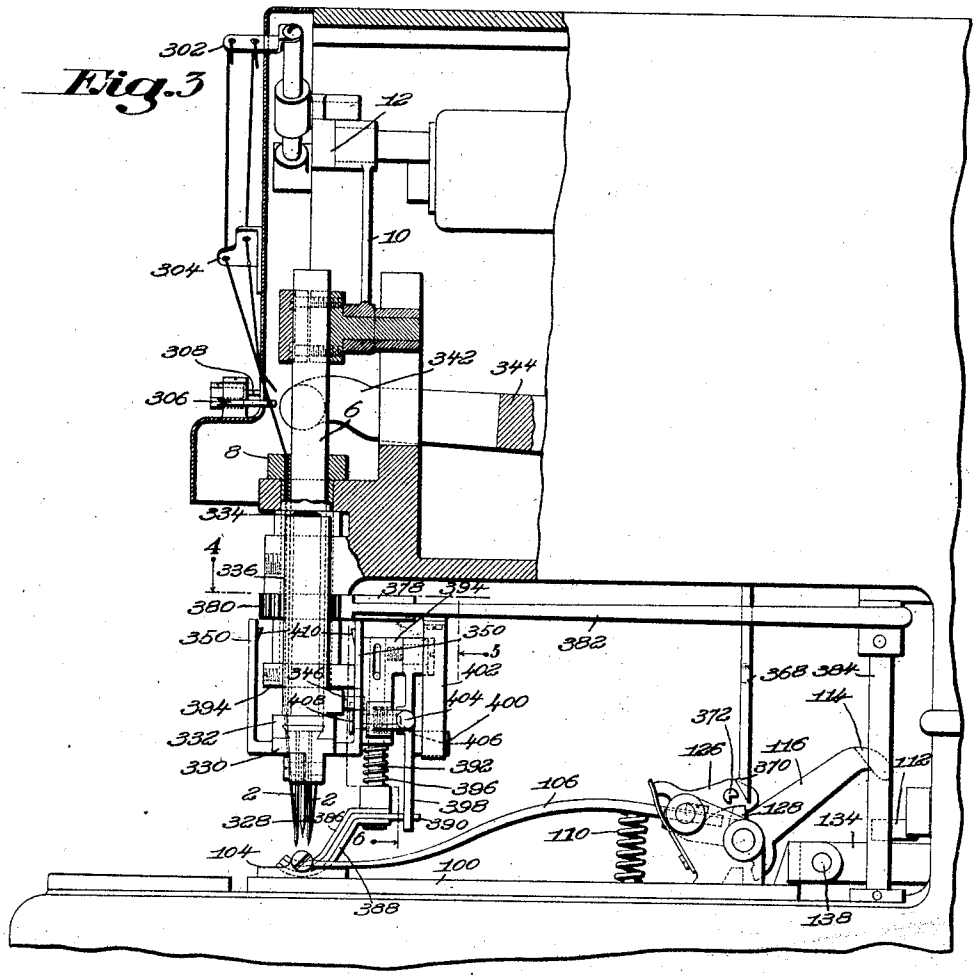


Fig. 4

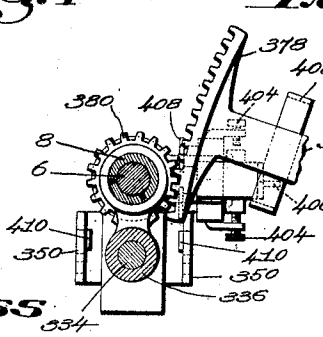


Fig. 5

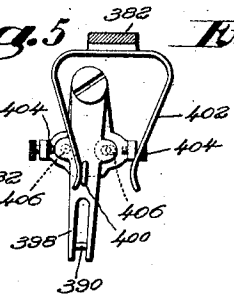
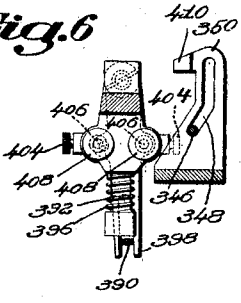


Fig. 6



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BUTTONHOLE SEWING MACHINE

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Fig.8

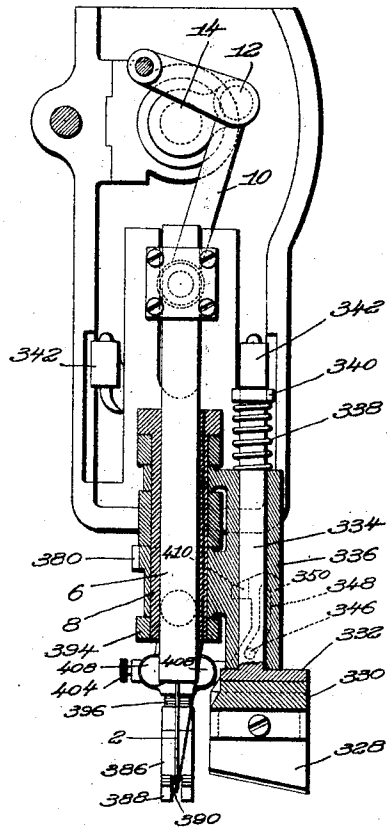


Fig.7

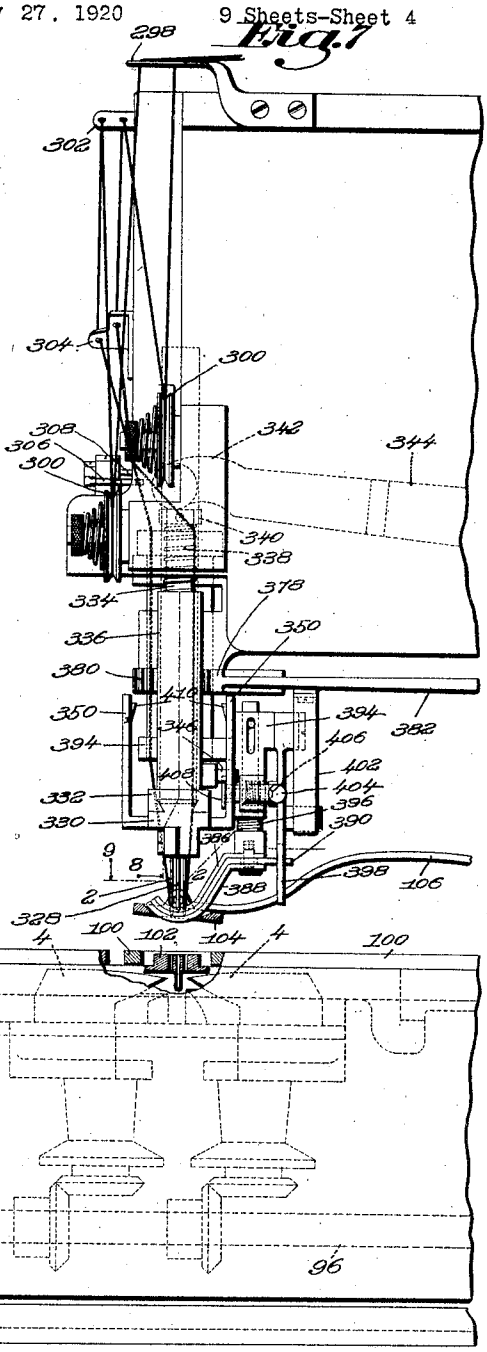
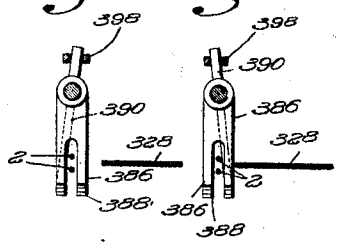


Fig.9 Fig.10



Witness

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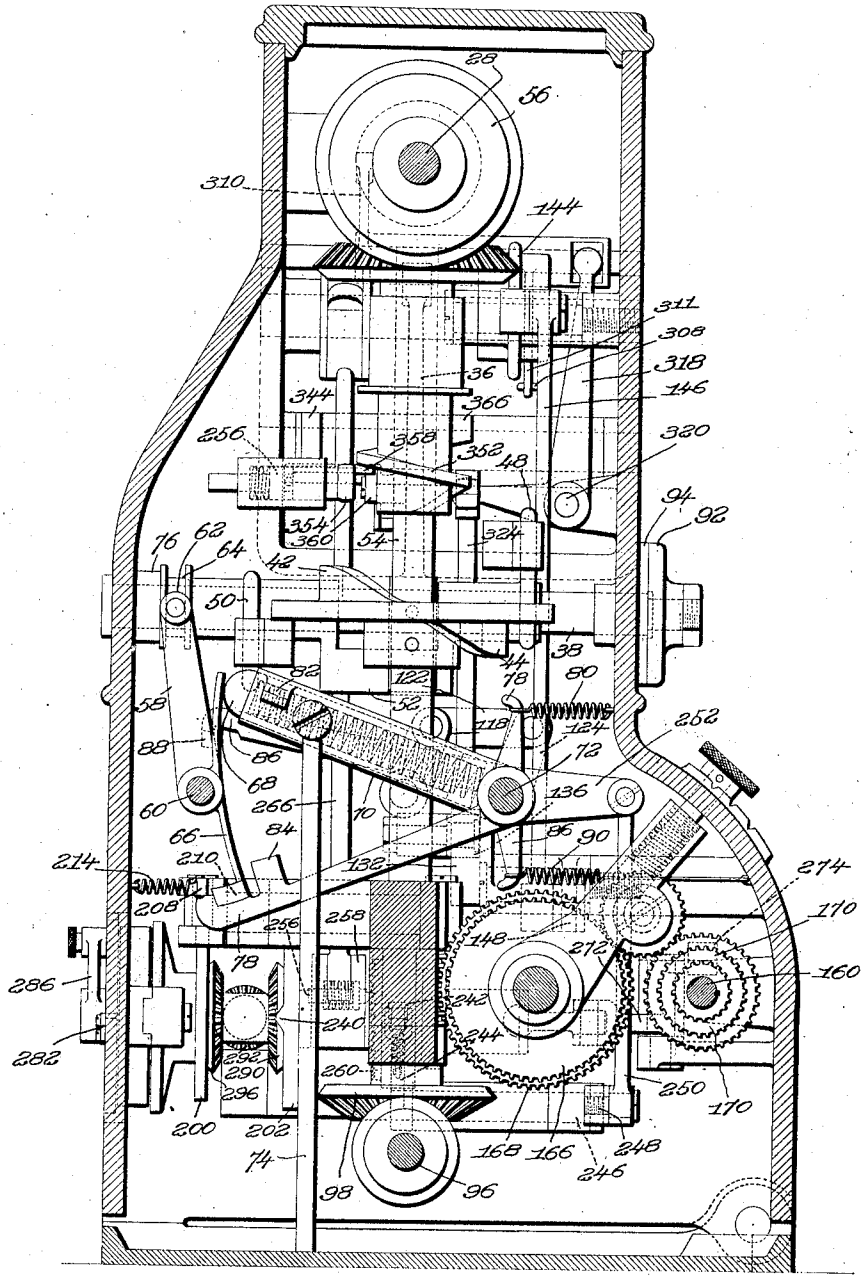
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BUTTONHOLE SEWING MACHINE

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Fig. 11



Witness

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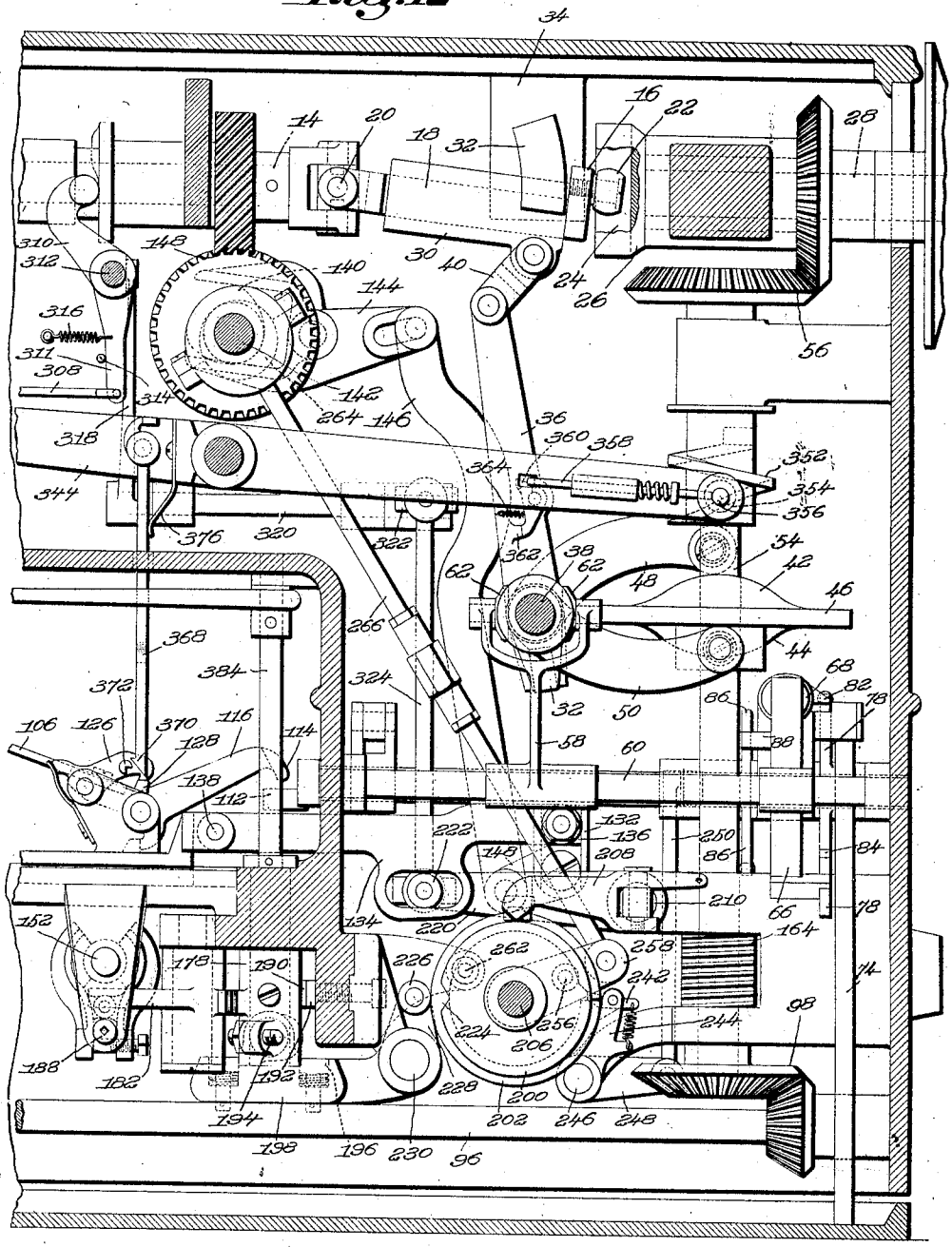
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BUTTONHOLE SEWING MACHINE

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Fig. 12



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BUTTONHOLE SEWING MACHINE

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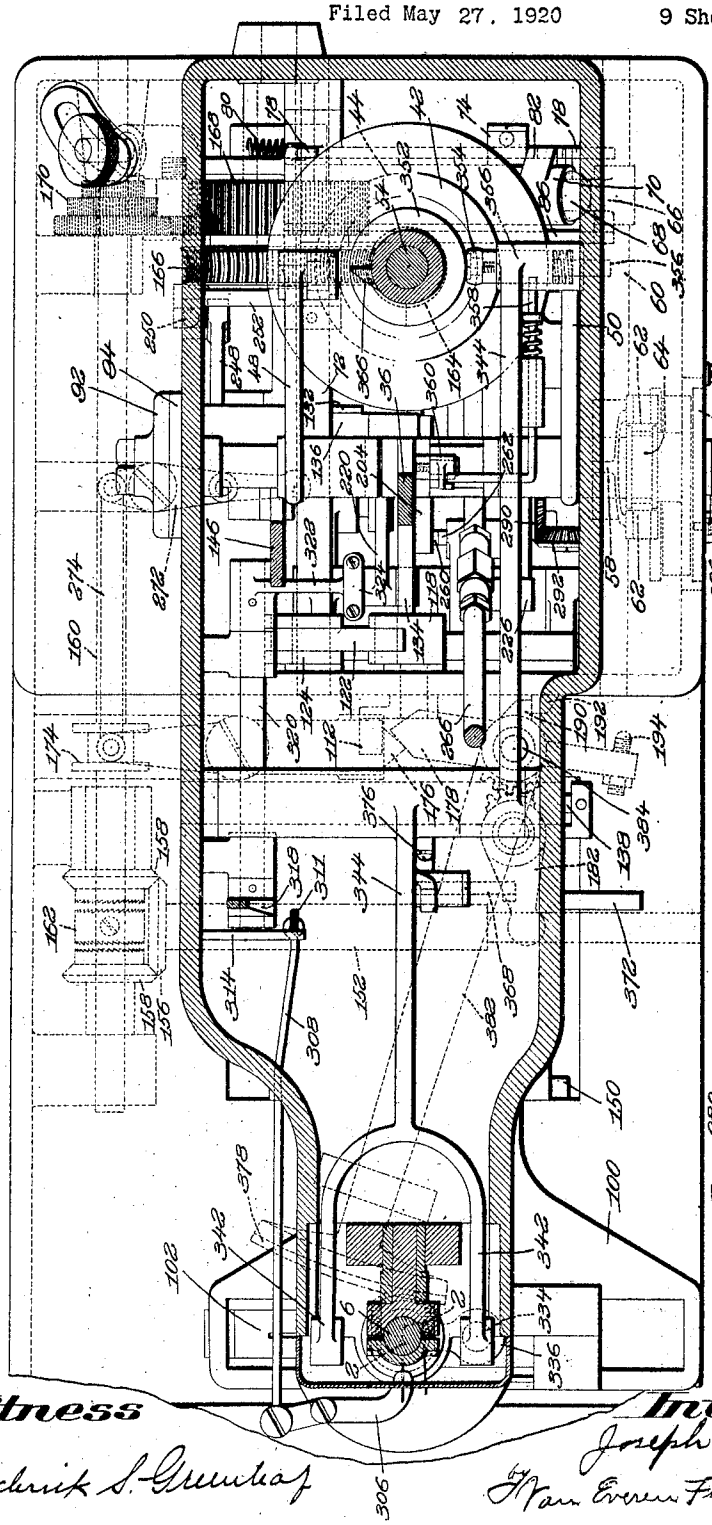


Fig. 15

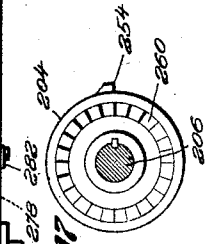


Fig. 17

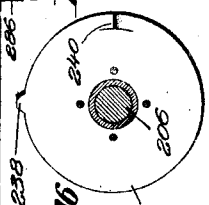


Fig. 16

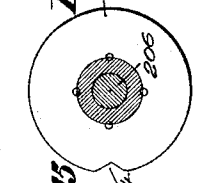


Fig. 15

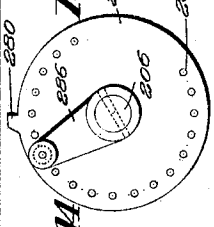


Fig. 14

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BUTTONHOLE SEWING MACHINE

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Fig. 18

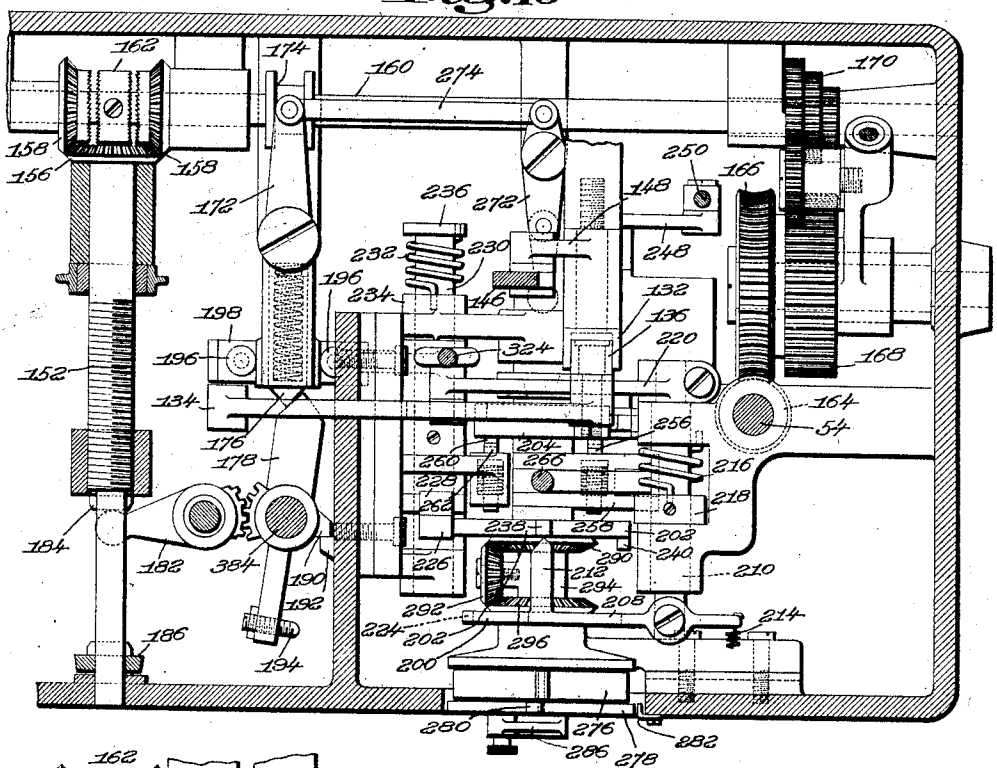


Fig. 19

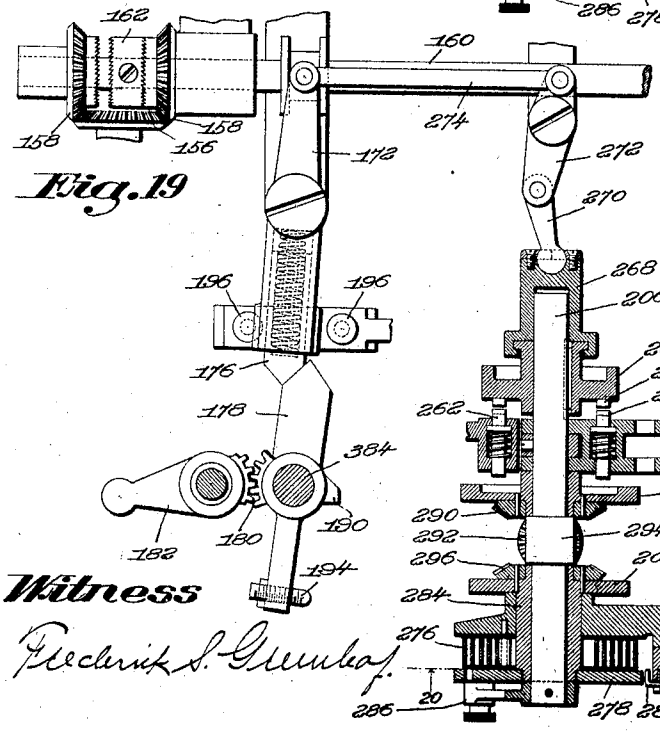
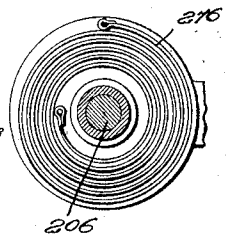


Fig. 20



Witness

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April 1, 1924. 1,488,591

J. FOSSA

BUTTONHOLE SEWING MACHINE

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Fig. 21

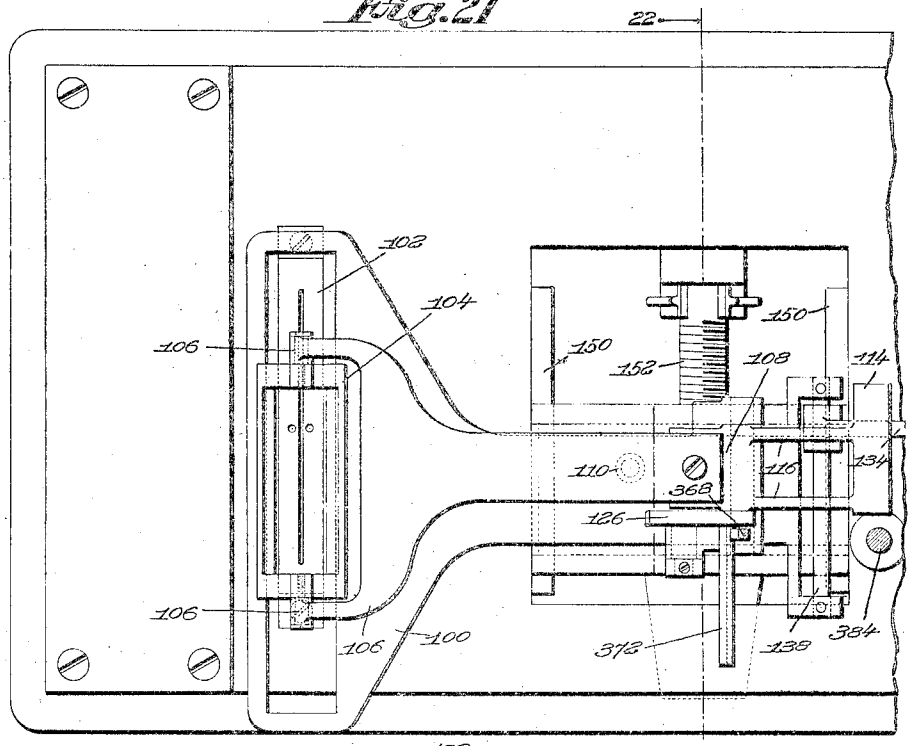
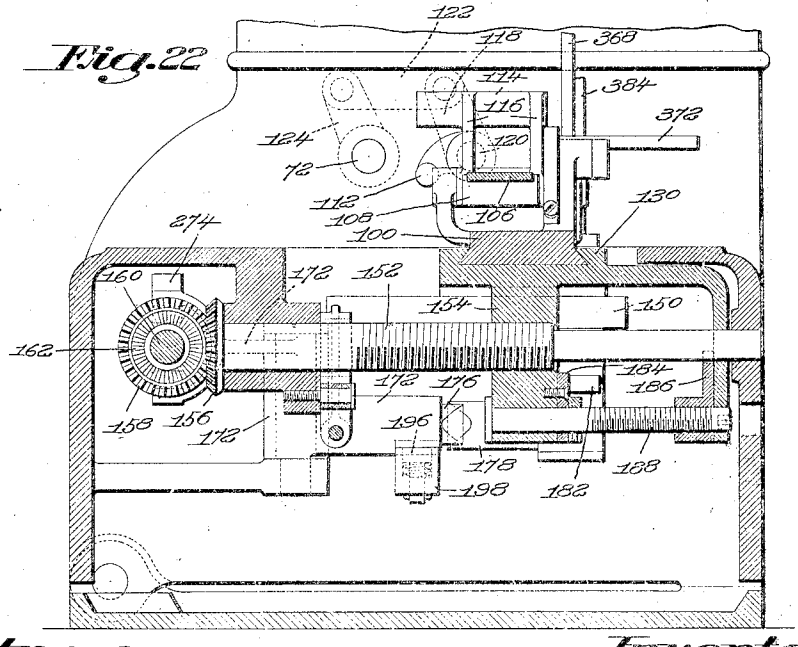


Fig. 22



Witness

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Patented Apr. 1, 1924. 1,488,591

UNITED STATES PATENT OFFICE

JOSEPH FOSSA, OF DANVERS, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

BUTTONHOLE-SEWING MACHINE.

Application filed May 27, 1920. Serial No. 384,624.

To all whom it may concern:

Be it known that I, JOSEPH FOSSA, a citizen of the United States, residing at Danvers, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Buttonhole-Sewing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to buttonhole sewing machines for making straight buttonholes having barred ends.

The object of the invention is to provide novel and improved means for simultaneously stitching both sides of the buttonhole, and for sewing barring stitches across its ends, and to otherwise improve the construction and mode of operation of this type of machine whereby the speed of operation and consequently the production of the machine is increased.

The machine in which the preferred form of the invention has been embodied comprises in general a stitch-forming mechanism including two vertically reciprocating needles so spaced that one makes its depth stroke on one side of the buttonhole while the other makes its edge stroke on the opposite side of the buttonhole, a work clamp which is fed in one direction during the sewing of one buttonhole and in the opposite direction during the sewing of the succeeding buttonhole, mechanism for relatively jogging the work and needles to alternately form depth and edge stitches on the opposite sides of the buttonhole, a barring mechanism which is inactive during the side stitching, but is actuated at the beginning and at the end of each stitching operation to so position and relatively move the work and needles that one of the needles forms comparatively long barring stitches across the end of the buttonhole while the other idly pierces the work on its depth strokes and preferably on its edge strokes also, a cutting mechanism for cutting the buttonhole slit, a thread cutter and holder for cutting and holding the needle threads and mechanism for stopping the reciprocation of the needles at the end of each buttonhole stitching operation.

This machine is illustrated in the accompanying drawings in which Fig. 1 is a side elevation of the machine, Fig. 2 an end elevation looking to the right in Fig. 1, Fig. 3 a sectional side elevation, Figs. 4, 5 and 6 detailed sectional views on lines 4, 5 and 6 respectively of Fig. 3, Fig. 7 a partial side elevation showing the parts at the sewing point, Fig. 8 a sectional end view on line 8, Fig. 7, Figs. 9 and 10 sectional plan views on lines 9, Fig. 7. Fig. 11 is a sectional end view looking toward the left in Fig. 1 and showing the mechanism within the machine casing. Fig. 12 is a sectional side elevation showing the mechanism within the machine casing. Fig. 13 is a sectional plan view of the mechanisms within the casing. Figs. 14, 15, 16 and 17 are detailed views of parts of the barring mechanism. Fig. 18 is a sectional plan view showing the feeding and barring mechanisms. Fig. 19 is a horizontal sectional view showing parts of the same mechanisms. Fig. 20 is a detailed section on line 20, Fig. 19. Fig. 21 is a plan view of the work clamp and Fig. 22 is a sectional elevation on line 22, Fig. 21.

In the machine shown, the stitch-forming mechanism comprises two vertically reciprocating needles 2 and two cooperating hooks or shuttles 4, which take loops from the needles below the work and carry them about the under-thread bobbins in the usual manner. The needles are secured in a needle bar 6 and are so spaced crosswise of the buttonhole that when one pierces the work at the proper distance from the buttonhole for a depth stitch the other will pierce the work at the proper point for an edge stitch on the opposite side of the buttonhole.

The needle bar is mounted in a bearing sleeve 8, secured in the over-hanging arm of the machine, and its upper end is connected by a link 10 with a crank 12 carried by the forward end of the shaft 14 (Fig. 8).

The mechanism for driving the sewing shaft 14, and thus reciprocating the needle bar, comprises a crank so connected with the shaft, and with a driving shaft, that it may be shifted into the axis of the driving shaft to stop the sewing shaft and lock it in position and may be shifted into position at one side or eccentric to the axis of the driving shaft when the sewing shaft is to be again started and driven. As shown the crank 16 is carried on the rear end of a short shaft 18, the forward end of which

is connected by a universal joint 20 with the rear end of the shaft 14 (Figs. 11 and 12). The crank has a ball and socket connection with a block 22 which fits within a radially extending slot 24 formed in a disk 26 which is secured to the forward end of the continuously rotating driving shaft 28. The shaft 18, which forms a movable section of the sewing shaft, is mounted in a bearing sleeve 30 mounted for vertical movement to shift the crank 16 into and out of the axis of the driving shaft 28. The bearing sleeve is guided in its movements and held rigidly against lateral movements by cheek pieces 32 rising on opposite sides of the sleeve and fitting between the opposed parallel surfaces of the bearing lugs 34. When the crank 16 is in the axis of the driving shaft, as indicated in Fig. 12, the block 22 rotates idly about the crank and the sewing shaft remains locked in its stopped position. When the sewing shaft is to be started the bearing 30 is shifted as the slot 24 is approximately in its vertical position and the shaft section 18 brought into alinement with the driving shaft 28 and the shaft 14. The block 22 and crank 16 are thus brought into position eccentric or to one side of the axis of the driving shaft and form a crank connection between the driving and sewing shafts through which the sewing shaft is driven in unison with the driving shaft. The mechanism for thus shifting the bearing sleeve and crank comprises an arm 36 having its lower end pinned to a rock shaft 38, and its upper end connected by a link 40 with the bearing sleeve. The shaft and arm are rocked to start and stop the sewing shaft by cams 42 and 44 formed on a disk 46 and arranged to act alternately upon two arms 48 and 50, the hubs of which surround the shaft 38 on opposite sides of the arm 36 and are connected by a bar 52 which passed through the slotted lower end of the arm. The arms are thus connected to rock the shaft and arm 36 while being free to slide on the shaft to bring the cam rolls on the ends of the arms alternately into and out of the paths of the cams 42 and 44. The cam disk 46 is secured to a vertical shaft 54 which is continuously driven from the driving shaft 28 through gearing 56. The arms 48 and 50 are shifted into and out of the paths of the cams 42 and 44 by an arm 58 secured to a rock shaft 60 and provided at its upper end with shoes 62, engaging an annular groove 64 in the hub of the arm 50. The shaft 60 is rocked through a lever 66 secured to the shaft and provided with an arc-shaped surface extending above and below the shaft, which is engaged by the end of a spring-pressed plunger 68 carried in an arm 70, which is secured to a shaft 72. The arm 70 is connected by a link 74 with an operating treadle and is normally held in the position indicated in Fig. 11 so that the plunger 68 presses against the upper end of the lever 66 and tends to hold the hub of the arm 50 against the stop boss 76. When the parts are in stopped position, as indicated, the lower end of the lever 66 is engaged by a latch 78, which is mounted to swing on the shaft 72 and is held in engagement with the lever by a spring 80.

When the sewing shaft is to be started the arm 70 is swung downward by depression of the treadle so that the plunger 68 presses against the lever 66 below the shaft 60 and tends to shift the arms 48 and 50 toward the right in Fig. 11. As the arm 70 completes its downward movement a lug 82 on the arm strikes a lug 84 on the latch 78 and disengages the latch from the lever 66 so that the arms 48 and 50 are shifted toward the right by the spring plunger 68. This movement of the arms moves the roll on the end of the lever 48 out of the path of the cam 42, and brings the roll on the end of the arm 50 into the path of the cam 44 so that the cam 44 rocks the shaft 38 and arm 36 to straighten the toggle formed by this arm and the link 40 and thus raise the crank 16 into driving position. When the lever 66 and shaft 60 are thus rocked to start the sewing shaft they are locked in shifted position by a latch 86, which engages a lug 88 on the lever. The latch is mounted to turn on the shaft 72 and is held in engagement with the lug by a spring 90 connected to an arm projecting downward from the hub of the latch. The latch holds the parts in shifted position against the pressure of the spring plunger 68 after the arm 70 and the plunger return to normal position upon release of the treadle, and until the sewing shaft is again to be stopped, when the latch 86 is disengaged from the lug 88 thus permitting the arms 48 and 50 to be shifted by the spring plunger 68 toward the left and into the position indicated in Fig. 11. This movement of the arms carries the roll on the end of the arm 50 out of the path of the cam 44, and brings the roll on the arm 48 into the path of the cam 42, so that this cam acts on the arm 48 to rock the shaft 38 and arm 36 to break the toggle formed by this arm and the link 40 and draw the crank 16 down into the axis of the driving shaft 28. When the shaft 38 is rocked in either direction it is held in position by a friction disk 92, secured to the end of the shaft, and engaging a boss 94 on the side of the casing.

The loop-takers 4 are driven in the usual manner by a shaft 96, connected with the vertical shaft 54, through beveled gears 98, and continue to operate idly when the sewing shaft is stopped.

The work clamp for carrying the work comprises a base plate 100 slotted to embrace the throat plate 102, and a clamp 104

carried on pivots at the forward end of a spring arm 106 (Figs. 1, 2, 3, 21 and 23). The rear end of the spring arm is secured to a block 108, which is pivotally supported in arms rising from the rear end of the base plate 100. The clamp is opened by a spring 110, underlying the arm 106, and is closed by a crank pin 112 arranged to engage a bar 114 carried by arms 116 projecting rearwardly from the block 108. The bar is of such a length that it will overlie the crank pin when the clamp is at the end of its travel in either direction. The crank pin is operated to close the clamp when the arm 70 is operated by the depression of the starting treadle through an arm 118 secured to the shaft 120, which carries the crank pin, and connected by a link 122 with an arm 124 secured to the rock shaft 72. When the clamp is closed it is held in closed position by a spring pressed pivoted latch 126, which engages a lug 128 on the block 108. The latch is disengaged to open the clamp after the buttonhole slit has been cut at the end of the buttonhole making cycle through mechanism which will be hereafter described.

The base plate of the work clamp is mounted in a guideway formed in a clamp carriage 130, so that the clamp may be moved crosswise of the buttonhole to relatively jog the work and needles in sewing the depth and edge stitches, and in sewing the barring stitches. The mechanism for thus moving the work clamp comprises an oscillating lever 132, which is connected with the work clamp by a bar or link 134 (Figs. 11 and 12). The rear end of the bar is pivotally connected to a block 136 carried in a groove in the lever and the forward end of the bar is connected with the base plate 100 of the clamp by a rod 138, which is secured to the base plate and is adapted to slide through a bearing in the end of the bar. The lever 132 is oscillated during the operation of the stitch-forming mechanism by a three-cornered eccentric 140 carried by a shaft 142 and embraced by the arm of the lever 144, the rear end of which is connected by a link 146 with an arm 148 projecting from the hub of the lever 132. The upper end of the link 146 is adjustably connected to the lever 144 so that the oscillations of the lever 132 may be adjusted to secure the jogging movements requisite for properly locating the depth and edge stitches. The shaft 142 is driven from the sewing shaft 14 through spiral gears 148 which are so proportioned that the shaft 142 makes one revolution for each two revolutions of the sewing shaft. The mechanism for shifting the block 136 in the lever 132 to adjust the jogging movements for barring or side stitching will be described in connection with the barring mechanism.

The clamp carriage 130 is mounted to move endwise of the buttonhole in a guideway formed in the work plate of the machine, and is supported upon the guide flanges 150. The mechanism for feeding the clamp carriage, to properly space the stitches along the sides of the buttonhole, comprises a feed screw 152 mounted in bearings in the base of the machine and engaging a lug 154 on the under side of the carriage. The mechanism for rotating the feed screw in opposite directions during the sewing of successive buttonholes comprises a beveled gear 156 secured to the end of the feed screw and engaged by two oppositely arranged beveled gears 158 which are loosely mounted on a continuously running shaft 160 and are adapted to be alternately connected with the shaft by a clutch 162 which is secured to the shaft and may be engaged with the hub of either of the gears by lengthwise movement of the shaft. The shaft 160 is driven from the vertical shaft 54 through a worm 164, engaging a worm wheel 166, which is connected with a gear 168, in turn connected with the shaft 160 through change gearing 170. The clutch 162 is shifted to disengage it from the active gear 158 at the end of the travel of the work carriage in either direction through mechanism operated by the travel of the carriage and is held in neutral position during the barring at the end of the buttonhole making cycle and until the barring is completed at the beginning of the next succeeding buttonhole making cycle. In the construction shown the means for shifting the clutch comprises a lever 172, one arm of which is provided with rolls engaging a grooved collar 174 secured to the shaft 160, and the other arm of which carries a spring pressed plunger 176 provided with a V-shaped end adapted to engage the V-shaped end of the lever 178 (Figs. 18 and 19). The lever 178 is connected by intermeshing gear segments 180 with a lever 182, the end of which is arranged to be engaged by two relatively adjustable tappets or dogs 184 and 186 on the clamp carriage. The tappet 184 is secured in fixed position on the lug 154, while the tappet 186 is mounted on an adjusting screw 188, the end of which is provided with a wrench socket through which the screw may be turned to adjust the tappet 186 in accordance with the length of the buttonhole to be sewed. The engagement of the tappets with the end of the lever 182 rocks the lever 178 to shift its pointed end from one side to the other of the pointed end of the plunger 176 so that the engagement of the plunger with the end of the lever will act to shift the clutch 162 first in one direction and then in the other. During the movement of lever 178 toward the left, for instance in Fig. 19, the lever 172 is held from movement by engagement of the

clutch 162 with a gear 158 and the plunger 176 is forced back against its spring until the pointed end of the lever passes the pointed end of the plunger when the pressure of the spring forces the plunger forward and the inclined faces of the plunger and lever 178 cause a shifting of the clutch. When the lever 178 is moved in the opposite direction it cooperates in a similar manner with the plunger 176 to shift the clutch in the opposite direction. Movement of the lever 178 in one direction is determined by the engagement of a lug 190 on the lever with a fixed lug 192, while the movement of the lever in the opposite direction is determined by the engagement of a stop screw 194 on the lever with a fixed part of the machine casing. When the lever 178 is shifted into the position indicated in Fig. 18 by the engagement of the tappet 184 with the end of the lever 182 the engagement of the spring plunger 176 with the inclined surface at the end of the lever will swing the clutch shifting lever 172 in a direction to move the shaft 160 toward the right and thus disengage the clutch 162 from the left hand gear 158. When the clutch lever is thus shifted it is stopped and retained in position to hold the clutch out of engagement with both gears 158 by a spring-supported stop pin 196, which is mounted in a controlling lever 198, and is arranged to engage the side of the clutch lever. The lever 198 also carries a second spring-supported pin 196 arranged to engage the opposite side of the clutch lever when it is shifted to disengage the clutch from the right hand gear 158 as the clamp carriage reaches the end of its travel in the opposite direction and the lever 178 is shifted to the opposite side of the spring plunger 176 by engagement of the tappet 186 with the end of the lever 182. When the lever 198 is rocked to carry the active stop pin 196 below the clutch shifting lever the spring plunger 176 acts, as indicated in Fig. 19, to engage the clutch with the right hand gear 158, and thus start the travel of the clamp carriage in the opposite direction. This movement of the clutch shifting lever brings its end over the left hand pin 196 and the pin is spring-supported so that it may yield to permit the upward movement of the lever 198 which brings the other pin 196 into position to hold the feed clutch in neutral position when it is disengaged at the end of the travel of the work carriage in this direction. The lever 198 is operated from the barring mechanism.

The barring mechanism controls the changes in the jogging movements requisite for sewing barring or side stitches. The barring mechanism controls the stopping of the stitch-forming and jogging mechanisms at the end of a buttonhole sewing operation and controls the feed for the side stitching after the barring stitches have been formed at the beginning of a buttonhole sewing operation. It also controls mechanism which discontinues the active operation of one of the needles while the barring stitches are being formed by the other. In the construction shown the barring mechanism comprises a cam disk 200 for controlling the amplitude of the jogging movements imparted to the work clamp, a cam disk 202 for controlling the starting of the work clamp feed for the side stitching, a cam disk 204 for controlling the stopping of the sewing shaft and jogging mechanism, all of which are carried by a cam shaft 206, and rotate therewith during the operation of the machine after they have been relatively adjusted to secure the desired number of barring stitches at each end of the buttonhole (Figs. 12 to 20). The disk 200 is engaged by the downwardly projecting end of a lever 208, which is pivoted to swing laterally on the end of a rock shaft 210, and is provided with a laterally projecting finger 212 which rides against the face of the cam disk 202, and is yieldingly held in engagement therewith by the spring 214. The end of the lever is held in engagement with the periphery of the cam disk 200 by a coil spring 216 acting on a collar 218 secured to the rock shaft 210. The rock shaft also carries an arm 220, the end of which is provided with a roll 222 engaging a slot in the bar 134 which connects the jogging lever 132 with the work clamp. When the lever 208 rides on the circular periphery of the disk 200 the arm 220 so positions the bar 134 that proper jogging movements are given to the work clamp to form comparatively long barring stitches which are substantially double the length of the side stitches, and to so position the work at each limit of its transverse movement that the right hand needle will pierce the work substantially in line with the depth stitches on opposite sides of the buttonhole. When the transverse finger 212 rides on the periphery of the cam disk 200, or when the end of the lever 208 enters the recess 224, the rear end of the bar 134 is moved nearer the axis of the jogging lever 132 and the work clamp is given the proper jogging movements to form edge and depth stitches along both sides of the buttonhole.

The cam disk 202, which controls the starting of the work feed, is engaged by a roll 226 on the end of an arm 228 which rises from the hub of the lever 198. The lever 198 is secured upon a rock shaft 230 and is held in raised position with the roll 226 in engagement with the cam disk 202 by a coiled spring 232, one end of which is connected with one of the bearings 234 for the shaft and the other end of which is connected to a collar 236 on the end of the

shaft. The cam disk 202 is provided with a cam projection 238 for engaging the roll 226 and rocking the lever 198 to release the feed clutch shifting lever and start the feed screw for the work clamp carriage. The face of the cam disk is also provided with a cam projection 240 for engaging the finger 212 and thus moving the lever 208 so that the finger, instead of the end of the lever, will ride on the disk 200, thus changing the jogging mechanism for side stitching when the lever 198 is operated to start the feed of the work.

The cam disk 204 which controls the stopping of the sewing shaft and jogging mechanism is engaged by a spring finger 242, carried on the end of an arm 244, which is secured to a rock shaft 246. The rock shaft also carries an arm 248, which is connected by a link 250 with an arm 252 projecting from the hub of the latch 86. The disk is provided with a cam projection 254 which engages the finger 242 and rocks the shaft 246 to disengage the latch 86 and thus render active the mechanism which stops the sewing shaft and jogging mechanism.

The cam shaft 206 of the barring mechanism is intermittently advanced during the barring by a spring pressed pawl 256, mounted in a pawl carrying lever 258, and arranged to engage the teeth of a ratchet wheel 260 formed on the face of the cam disk 204. A spring pressed stop pawl 262 is also arranged to engage the teeth of the ratchet wheel and prevent reverse movement of the cam shaft so long as the pawls are in active relation to the ratchet wheel. The pawl carrying lever is oscillated from an eccentric 264, on the shaft 142, through an eccentric rod 266, the lower end of which is connected to the lever (Fig. 12). The actuating pawl and ratchet are in active relation during the barring, and are in inactive relation so that the barring mechanism remains at rest during the side stitching in either direction of feed. As shown they are moved into and out of active relation by movement of the ratchet wheel 260 lengthwise of the cam shaft 206, the disk 204 being keyed to the shaft to permit such movement. This movement is effected through connection with the clutch shifting lever 172, the movement of the ratchet wheel into active position being effected by the movement of the lever which stops the feed, and the movement out of active position being effected by the movement of the lever which starts the feed in either direction. For this purpose a sleeve 268 is mounted on the end of the cam shaft 206, and is connected with the disk 204, as indicated in Fig. 19. The sleeve is connected by a link 270 with one arm of a lever 272, the other arm of which is connected by the link 274 with the clutch shifting lever 172. The arm 272 and link 270 form a toggle which is straightened to engage the ratchet wheel 260 with the operating and stop pawls 256 and 262, when the feed clutch 162 is shifted into neutral position, and which is broken to withdraw the ratchet wheel from engagement with the pawls when the clutch 162 is moved into engagement with either of the beveled gears 158. When the ratchet wheel is thus disengaged from the pawls the cam shaft 206, and the cams carried thereby, are returned to initial position by a coiled spring 276, one end of which is connected to the machine casing, and the other end of which is connected to a disk 278, which is connected to rotate with the shaft. The disk 278 is provided with a stop lug 280 arranged to engage a stop lug 282 on the machine casing, and to determine the initial position of the cam shaft. The barring mechanism is started from its initial position by the shifting of the work feed clutch into neutral position as the work clamp reaches the end of its travel in either direction. At this time the stitch forming and jogging mechanisms are in action and the end of the lever 208 is in the recess 224 of the cam disk 200 so that the jogging mechanism is adjusted for side stitching. The first advance movement of the barring mechanism lifts the end of the lever 208 out of the recess 224 so that the jogging mechanism is immediately positioned for sewing the barring stitches, and thereafter during the continued advance movement of the barring mechanism the end of the lever rides on the periphery of the cam disk and retains the jogging mechanism in this position. The advance movement of the barring mechanism continues and barring stitches are sewed across the final end of the buttonhole until the cam lug 254, on the disk 204, engages the finger 242 and stops the sewing shaft and jogging mechanism. This occurs after the barring mechanism has completed one half of its advance movement. The position of the barring mechanism at this point in the buttonhole making cycle is shown in Figs. 12, 13 and 18. The barring mechanism remains in this position until the stitch forming and jogging mechanisms are started at the beginning of the next buttonhole making cycle, when the advance movement of the barring mechanism is resumed and continues until the cam projection 238, on the disk 202, swings the lever 198, and thus permits the work feed clutch to be shifted into engagement with one of the gears 158 to start the feed of the work clamp. This movement of the clutch withdraws the ratchet wheel 260 from the actuating and stop pawls so that the barring mechanism is immediately returned to initial position by the spring 276. As the cam projection 238 operates the lever 198 the cam projection 240 moves the lever 208 laterally so that its end is moved off of the cam disk

200, permitting the lever to swing downward until the finger 212 rests on the periphery of the disk. This immediately shifts the jogging mechanism into position for side stitching during the feed of the work clamp. As the barring cam shaft reaches its initial position the recess 224 registers with the end of the lever 208 so that the lever moves laterally into the recess preparatory to the next forward movement of the barring mechanism.

Since the stitch forming and jogging mechanisms are stopped after the barring mechanism has completed one half its advance movement the arc through which the cam projection 254 is moved, before it strikes the finger 242, should be one half the arc through which the cam projection 238 must be moved before it acts upon the roll 226. If, therefore, the barring mechanism is to be adjusted to vary the number of barring stitches at the ends of the buttonholes this relation between the cam projections 254 and 238 must be maintained. Such adjustment, therefore, involves a shifting of the cam projection 238 through twice the arc that the cam projection 254 is shifted in adjusting for different numbers of barring stitches. To conveniently secure this adjustment the construction shown has been provided. In this construction the stop disk 278, and the cam disk 200, are secured upon a sleeve 284 and are connected with the cam shaft by means of an arm 286 secured to the end of the shaft and carrying a spring pin adapted to engage anyone of a series of holes 288 in the disk 278. The cam disk 202 is loosely mounted on the cam shaft and is connected therewith through a beveled gear 290, engaging a gear 292 mounted on a block 294, secured to the shaft, and also engaging a beveled gear 296, secured to the disk 200. When the arm 286 is adjusted and connected to the stop disk 278 the gearing connecting the disks 200 and 202 locks the disk 202 in position on the shaft so that all parts rotate together. Assuming that the disk 278, and the parts secured thereto, are held by the spring 276 in fixed position with the stop lug 280 in engagement with the stop lug 282, and that the relative positions of the cam disks are to be adjusted to vary the number of barring stitches, then the pin is disengaged from the holes 288 and the arm 286 is turned to adjust the cam disk 204 through the required angle. In making this adjustment the cam shaft 206 is turned within the sleeve 284 and the beveled gear 292, riding on the then stationary gear 296, will turn the cam disk 202 and will give the disk 202 an angular movement which is twice that of the shaft and disk 204, thus maintaining the proper relation between the cam projections 238 and 254. When the jogging mechanism is shifted for the sewing of the barring stitches one only of the needles cooperates with its loop-taker to form stitches, while the other needle pierces the work idly during its depth stroke at least. To secure this result means is provided for preventing the thread carried by one of the needles from being taken by its loop-taker, and this means is rendered active and inactive by the barring mechanism in shifting the jogging mechanism.

In the construction shown the needle threads are led from the thread supplies through a thread guide 298, through the tension 300, and through thread eyes of a take-up 302 to thread guide 304, from which they lead down through holes in the sleeve 8 to the needles (Figs. 1, 2 and 3). During the barring the thread for the left hand needle is acted upon by a device which takes up the slack in the thread and holds the thread taut as the needle starts its return stroke after carrying its loop through the work so that no loop of needle thread is thrown out by the upward movement of the needle to be entered and taken by the loop-taker 4. The device thus acts as a loop-robbing device for withholding the needle thread from the loop-taker. In the construction shown the thread controlling or loop-robbing device consists of a take-up lever 306, the forward end of which is provided with a thread eye through which the thread for the left hand needle passes on its way from the thread guide 304 to the upper end of the sleeve 8, and the rear end of which is connected by a link 308 with the lower end of the lever 310. The lever is mounted on a shaft 312, and is held normally in engagement with a stop 314 by a spring 316. The hub of the lever is provided with a slot engaged by the upper end of an arm 318 secured to a rock shaft 320, which is also provided with an arm 322 connected by a link 324 with the arm 220, which raises and lowers the bar 134 of the jogging mechanism. When the jogging mechanism is in position for side stitching the lever 310 is held idly against the stop 314 and the loop-robbing lever 306 has no effect on the needle thread. When the jogging mechanism is shifted for the barring the lever 310 is moved laterally and its upper end is brought into the path of a cam 326, which is so timed with relation to the reciprocation of the needle bars that it will operate the lever 306 to prevent the thread of the left hand needle from being taken by the loop-taker 4 during that stroke of the needle which corresponds to its depth stroke when side stitching. In the construction shown the cam 326 is mounted on the sewing shaft 14 so that it acts on the lever 310 during each reciprocation of the needle bar, and prevents the thread from being taken by the loop-taker during each stroke of the needles. When the jogging mechanism is re-positioned for side stitching at the end of the barring the lever 310 is moved later-

ally out of the path of the cam 326 so that the take-up lever 306 is rendered inactive.

In the machine shown the buttonhole slit is cut, after the buttonhole sewing operation has been completed, by mechanism which is thrown into operation in stopping the sewing shaft, and the jogging mechanism is so timed that it will stop with the work properly positioned for the cutting of the slit by a knife blade acting midway between the paths of the two needles, and cooperating with a slit formed in the throat plate midway between the needle holes. The cutter consists of a cutting blade 328, secured in a slide 330, which is mounted in a guideway formed in the lower end of a carrier 332 (Figs. 3, 7 and 8). The carrier is formed on the lower end of a rod 334, mounted to slide vertically in a support 336, which is mounted to swing about the sleeve 8 to position the cutter on either side of the sewing point. The cutter carrier is held in raised position by a spring 338, which underlies a collar 340, secured to the upper end of the rod 334. When the cutter carrier is in raised position the upper end of the rod 334 is directly under one or the other of two arms 342 formed at the forward end of the cutter operating lever 344. When the cutter carrier is depressed to effect the cutting the slide 330 carrying the cutter blade is first moved inward toward the sewing point, to position it close to the needle path, and then moves vertically with the carrier 332 to effect the cutting. These movements of the slide are determined by a pin 346 projecting from the side of the support 336 into a guiding slot 348, formed in one of two side plates 350, which project upward from opposite sides of the slide 330.

The cutter operating lever 344 is operated at the end of the buttonhole making cycle by spiral cam 352 carried by the vertical shaft 54, and arranged to act upon a roll 354 mounted on the end of the lever when the roll is projected into the path of the cam (Figs. 11, 12 and 13). The roll is carried on the end of a spring pressed slide 356, which is mounted in the end of the lever, and is normally latched in retracted position by a spring pressed latch pin 358. The latch pin has a laterally projecting rear end which extends through a hole in the lever and into the path of a dog 360 carried on the arm 36 of the stop mechanism. The dog is pivoted on the arm and is held yieldingly in position against a stop 362 by a spring 364.

During the sewing the dog 360 is to the right of the latch pin in Fig. 12. When the arm 36 is shifted toward the left to stop the sewing shaft the end of the dog engages the laterally projecting end of the latch pin and withdraws it from the slide 356 so that the slide moves forward and brings the roll 354 into the path of the spiral cam 352. The cam now acts to raise the lower end of the cutter operating lever 344, thereby depressing its forward end so that the cutter is operated by one of the arms 342. As the cutter operating lever reaches the upper end of the cam 352 the slide 356 is pressed back by a cam projection 366, so that the roll 354 is withdrawn from the path of cam 352, and the slide 356 re-latched in retracted position. The cutter carrier and cutter operating lever are then immediately returned to initial position by the spring 338. When the arm 36 is again swung toward the right the dog 360 yields and passes idly by the latch pin. The movements of the cutter operating lever 344 are also utilized to open the work clamp after the buttonhole slit has been cut. For this purpose a bar 368 is pivoted at its upper end to the lever, and is provided at its lower end with a hook 370, adapted to engage a pin 372 projecting from the latch 126, which holds the work clamp in closed position. The bar 368 is held normally in position against a stop 374 by a spring 376. When the cutting operating lever is moved to depress the cutter the lower end of the bar 368 passes down into engagement with the pin 372 so that on the return of the lever to its initial position the hook at the end of the bar will lift the latch 126, and thus permit the work clamp to open.

Since a buttonhole is completed during the travel of the work clamp in each direction the cutter must operate alternately on opposite sides of the sewing point. The mechanism for shifting the cutter from one side to the other of the sewing point, between successive operations of the cutter operating lever, comprises a gear sector 378 arranged to engage a gear segment 380 formed on the swinging support 336. The gear sector is formed on the forward end of an arm 382, which is secured to a vertical shaft 384, the lower end of which carries the lever 178 of the work feed clutch shifting mechanism. The shaft 384 is, therefore, rocked to swing the cutter support from one side of the sewing point to the other, when the lever 178 is swung, as the work clamp reaches the end of its travel in either direction, to shift the feed clutch into neutral position, preparatory to forming the barring stitches at the end of the buttonhole.

The machine shown is also provided with means for automatically cutting and holding the needle threads at the end of each buttonhole making cycle. As shown the cutter and holder comprises two plates 386 and 388, spaced to receive a thread engaging finger 390 between them, and also slotted for the passage of the needles, and to form spaced fingers on opposite sides of the needle path to cooperate with the swinging finger 390 (Figs. 3 to 10). The space plates

and swinging finger are carried on the lower end of a rod 392, which is mounted to slide in a bracket 394, secured to the lower end of the sleeve 8. The plates are held against the upper side of the work clamp and close to the work by a spring 396 which yields to allow the plates to rise as the clamp opens. The thread engaging finger 390 is swung across the needle path to carry the needle threads between the cutting and holding fingers on opposite sides of the needle path by a lever 398, which is pivoted to the bracket 394 at its upper end, and is slotted at its lower end to embrace the rearwardly projecting end of the swinging finger. The lever 398 is provided with a rearwardly projecting arm 400 arranged to be engaged and pressed in opposite directions by the arm 402 of a U-shaped spring secured to the sector arm 382. When the lever 398 is swung in either direction its movement is limited by an adjustable stop screw 404, and the lever is latched in position by one or the other of two spring pressed latch pins 406 arranged to engage holes in the face of the lever. The latch pins are provided with flanged outer ends 408 adapted to be engaged by cams 410 on the side plates 350.

When the sector lever 382 is moved to shift the buttonhole cutter into position to cut the buttonhole which is being sewed, for instance, into the position indicated in Figs. 3, 7 and 8, the left hand spring arm 402, in Fig. 5, is brought against the arm 400 and tends to swing the lever 398 toward the right and thus swing the thread finger 390 across the needle path from the position indicated in Fig. 9 to the position indicated in Fig. 10. At this time, however, the pin 406 retains the lever 398 in position against the pressure of the spring arm. When the cutter carrier is depressed to cut the buttonhole slit, after the sewing shaft has been stopped, the cam 410 on the right hand side plate 350 engages the flange on the forward end of the pin 406 and withdraws this pin so that the spring arm 402 swings the lever 398 and operates the thread finger 390 to sever and hold the threads between the spaced fingers at the right of the needle path, as indicated in Fig. 10. When the sector arm 382 is moved in the opposite direction to swing the buttonhole cutter into position on the opposite side of the sewing point the other spring arm 402 acts in a similar manner to press the lever 398 in the opposite direction, while the pin 406 at the right in Fig. 5 retains the lever in position until the pin is withdrawn by the cam 410 on the left hand side plate 350, when the cutter is operated to cut the buttonhole slit at the completion of the succeeding buttonhole making cycle.

The starting and stopping mechanism shown and described is claimed in a divisional application No. 433,779, filed December 29, 1920.

While it is preferred to employ the specific construction and arrangement of parts shown and described, it will be understood that this construction and arrangement is not essential to the broader features of the invention, and may be varied or modified as found desirable or best suited to the construction and mode of operation of the machine in which any particular feature is to be embodied.

What is claimed is:

1. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, barring mechanism comprising a controlling cam, operating mechanism therefor inactive during the side stitching, means for rendering said operating mechanism active upon starting the stitch-forming mechanism, inactive at the beginning of the side stitching, and again active at the end of the side stitching in either direction, and means for stopping the stitch-forming mechanism and barring mechanism after the cycle of the barring mechanism is partially completed.

2. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, a barring mechanism comprising a controlling cam adapted to establish and maintain barring conditions for a pre-determined number of stitch-forming cycles, mechanism for actuating the barring mechanism, which is rendered active at the end of the side stitching in either direction of feed, and is rendered inactive at the beginning of the side stitching in either direction of the feed, and mechanism for stopping the stitch-forming mechanism after the latter has been operated through one half its cycle at the end of the side stitching in either direction.

3. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, barring mechanism, actuating mechanism therefor, rendered active upon starting the stitch-forming mechanism, means controlled by the barring mechanism to render its actuating mechanism inactive and to start the feed mechanism, means controlled by the feed mechanism as the feed in either direc-

tion is completed for again starting the barring mechanism, and means for stopping the barring mechanism while the parts are still in barring relation.

4. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles spaced to simultaneously form a depth stitch on one side and an edge stitch on the opposite side of the buttonhole, jogging mechanism, a rotary feed mechanism for relatively feeding the work alternately in opposite directions, and a barring mechanism for controlling the jogging mechanism, the starting the rotation of the feed mechanism in either direction, and the stopping of the stitch-forming, jogging and barring mechanisms.

5. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, barring mechanism adapted to establish and maintain barring conditions for a pre-determined number of stitch-forming cycles at each end of the feed in either direction, and means for adjusting the barring mechanism to vary said number of cycles.

6. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, barring mechanism, mechanism for actuating the barring mechanism to establish barring relations for a pre-determined number of stitch-forming cycles at each end of each buttonhole, and means for adjusting the barring mechanism to vary said number of cycles.

7. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, barring mechanism, mechanism for actuating the barring mechanism in two stages, one at the finish of a stitching operation, the other at the beginning of the succeeding stitching operation, and mechanism for returning the barring mechanism to its initial position after the completion of the second stage.

8. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism, a barring mechanism, means for actuating the barring mechanism in two stages, one at the finish of a stitching operation, and the other at the beginning of the succeeding stitching operation, and mechanism for returning the barring mechanism to its initial position after the completion of the second stage.

9. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, mechanism comprising a controlling cam for changing the relation of the parts to sew side or barring stitches, means for stopping the feed in either direction and starting said changing mechanism, and means for stopping said changing mechanism and starting the feed in the opposite direction.

10. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism alternately in opposite directions, a barring mechanism, means controlled by the feed mechanism for starting the barring mechanism, mechanism controlled by the barring mechanism for stopping the sewing, and means for controlling the feed mechanism by the barring mechanism.

11. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles spaced to simultaneously stitch both sides of a buttonhole, a work clamp, mechanism for feeding the clamp in opposite directions during the sewing of successive buttonholes, jogging mechanism, barring mechanism actuated at the beginning and at the end of each stitching operation, means for causing one of the needles to idly pierce the work during the barring, and means for cutting the buttonhole slit.

12. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two needles and complementary under-thread mechanisms, mechanism acting to reciprocate both needles throughout the sewing of a barred buttonhole, mechanism for relatively actuating and feeding the stitch-forming mechanism and the work to simultaneously stitch both sides of a buttonhole, and mechanism for relatively actuating them to sew barring stitches across the end of a buttonhole with one needle and its complementary mechanism while withholding from the under-thread mechanism the thread carried through the work by the other needle.

13. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles and cooperating loop-taking devices below the work, mechanism for relatively feeding and jogging the work and stitch-

forming mechanism to form depth and edge stitches simultaneously along both sides of the buttonhole and barring stitches across the end of the buttonhole, and means for causing one of the needles to idly pierce the work on its depth stroke during the barring.

14. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles and cooperating loop-taking devices below the work, mechanism acting to reciprocate both needles throughout the sewing of a barred buttonhole, mechanism for relatively feeding and jogging the work and stitch-forming mechanism to form depth and edge stitches simultaneously along both sides of the buttonhole and barring stitches across the end of the buttonhole, and means for preventing the thread of one of the needles from being taken by the loop-taking devices on the depth stroke of that needle during the barring.

15. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles and cooperating loop-taking devices below the work, mechanism acting to reciprocate both needles throughout the sewing of a barred buttonhole, mechanism for relatively feeding and jogging the work and stitch-forming mechanism to form depth and edge stitches simultaneously along both sides of the buttonhole and barring stitches across the end of the buttonhole, and means for preventing the thread of one of the needles from being taken by the loop-taking devices on each stroke of the needle during the barring.

16. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles and cooperating loop-taking devices below the work, mechanism acting to reciprocate both needles throughout the sewing of a barred buttonhole, mechanism for relatively feeding and jogging the work and stitch-forming mechanism to form depth and edge stitches simultaneously along both sides of the buttonhole and barring stitches across the end of the buttonhole, and a loop-robbing device rendered active on the thread of one of the needles during the barring.

17. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles and cooperating loop-taking devices below the work, mechanism acting to reciprocate both needles throughout the sewing of a barred buttonhole, mechanism for relatively feeding and jogging the work and stitch-forming mechanism to form depth and edge stitches simultaneously along both sides of the buttonhole and barring stitches across the end of the buttonhole, and a loop-robbing device for one of the needle threads inactive during the side stitching, and means for rendering it active during the barring.

18. A buttonhole sewing machine having, in combination, stitch-forming mechanism, a work clamp, a feed screw for feeding the work clamp, mechanism for reversing the screw at the end of the travel of the clamp in either direction, barring mechanism, means for retaining the reversing mechanism in neutral position during the barring, and means for stopping and starting the sewing while the parts are in barring relation.

19. A buttonhole sewing machine having, in combination, stitch-forming mechanism, a work clamp, a feed screw for feeding the work clamp, mechanism for rotating the screw in opposite directions, barring mechanism, means for stopping the screw and starting the barring mechanism, means for stopping the sewing while the parts are still in barring relation, and means controlled by the barring mechanism when restarted for stopping the barring and starting the screw in the opposite direction.

20. A buttonhole sewing machine having, in combination, stitch-forming mechanism, work clamp, a feed screw for feeding the work clamp, and mechanism for reversing the screw operated by the travel of the clamp and controlled by the barring mechanism.

21. A buttonhole sewing machine having, in combination, stitch-forming mechanism, a work clamp, feeding mechanism for the clamp, including a reversing clutch, barring mechanism including controlling cams, actuating mechanism therefor, and connections for throwing the actuating mechanism into action in shifting the clutch to neutral position and out of action in shifting the clutch to start the feed in the opposite direction.

22. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism in opposite directions in sewing successive buttonholes, a cutter, and mechanism for shifting the cutter from one side of the sewing point to the other at the end of the feed in either direction.

23. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism in opposite directions in sewing successive buttonholes, a cutter, means for supporting the cutter in fixed relation to the sewing point during the feed, and for shift-

ing it from one side of the sewing point to the other at the end of the feed in either direction.

24. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for relatively feeding the stitch-forming mechanism and work in opposite directions during successive buttonhole making cycles, mechanism for relatively actuating them to simultaneously stitch both sides of a buttonhole and to form barring stitches across its end, a cutter, and means for shifting the cutter from one side to the other of the sewing point between successive side stitching operations.

25. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for relatively feeding the stitch-forming mechanism and work in opposite directions during successive buttonhole making cycles, mechanism for relatively actuating them to simultaneously stitch both sides of a buttonhole and to form barring stitches across its end, a cutter, and a support for the cutter mounted to swing about the sewing point to shift the cutter from one side to the other of said point.

26. A buttonhole sewing machine having, in combination, stitch-forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch-forming mechanism in opposite directions in sewing successive buttonholes, a cutter, and a support for the cutter mounted to swing about the sewing point to shift the cutter from one side to the other of said point.

27. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles, mechanism for relatively feeding the stitch-forming mechanism and work in opposite directions during successive buttonhole making cycles, and for relatively jogging them to form depth and edge stitches simultaneously along both sides of the buttonhole, a cutter, a support for the cutter, and means for swinging the support from one side to the other of the needles.

28. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles for simultaneously stitching both sides of a buttonhole, mechanism for relatively feeding the work and stitch-forming mechanism in opposite directions during successive buttonhole making cycles, and means for cutting and holding the needle threads at the end of each stitching operation.

29. A buttonhole sewing machine having, in combination, stitch-forming mechanism including two vertically reciprocating needles for simultaneously stitching both sides of a buttonhole, mechanism for relatively feeding the work and stitch-forming mechanism in opposite directions during successive buttonhole making cycles, and means for cutting the needle threads at the end of each stitching operation and alternately holding them on opposite sides of the needle path.

30. A buttonhole sewing machine having, in combination, stitch-forming mechanism, a barring mechanism provided with a cam for controlling the stopping of the stitch-forming and barring mechanisms, a cam which controls the return of the barring mechanism to initial position, a stop for determining the initial position, and means for simultaneously adjusting the cams in relation to the stop to proportionately vary the barring stitches in each stage of the advance movement of the barring mechanism.

31. A buttonhole sewing machine having, in combination, stitch-forming mechanism, a barring mechanism provided with a cam for controlling the stopping of the stitch-forming and barring mechanisms, a cam which controls the return of the barring mechanism to initial position, a stop for determining the initial position, and adjusting means for giving the second cam double the adjustment with relation to the stop given to the other cam.

32. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, cams for changing the relation of the parts to sew side or barring stitches, actuating mechanism therefor, means for rendering said actuating mechanism active upon starting the stitch forming mechanism, inactive after the change from barring to side stitching and again active at the end of the side stitching, and means for stopping the sewing while the parts are in barring relation.

33. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, barring mechanism comprising a cam for changing the relation of the parts to sew side or barring stitches, actuating mechanism for the cam, means for rendering said actuating mechanism active upon starting the stitch forming mechanism, inactive at the beginning of the side stitching and again active at the end of the side stitching in either direction, and means for

stopping the stitch forming mechanism and cam after the cam has been moved through one half of a barring cycle.

34. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, a controlling cam adapted when actuated to establish and maintain barring conditions, actuating mechanism for the cam which is rendered active at the end of the side stitching in either direction and is rendered inactive at the beginning of the side stitching in either direction, and means for stopping the sewing after the cam has been moved through one half its barring cycle at the end of the side stitching in either direction.

35. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, a barring mechanism comprising a controlling cam, and means controlled by the feed mechanism for starting the barring mechanism.

36. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, a barring mechanism comprising a controlling cam, means controlled by the feed mechanism for starting the barring mechanism at the end of the feed in either direction, and means for stopping and starting the sewing while the parts are still in barring relation.

37. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, a barring mechanism, means controlled by the feed mechanism for starting the barring mechanism at the end of the feed in either direction, means for stopping and starting the sewing while the parts are still in barring relation, and means controlled by the barring mechanism for stopping the barring mechanism and starting the feeding.

38. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, a barring mechanism, means controlled by the feed mechanism for starting the barring mechanism at the end of the feed in either direction, means for stopping and starting the sewing while the parts are still in barring relation, and means controlled by the barring mechanism for stopping the barring mechanism and starting the feeding and for returning the barring mechanism to initial position.

39. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, a controlling cam adapted when actuated to establish and maintain barring relations, mechanism for advancing the cam in two stages, one at the finish of a stitching operation and the other at the beginning of the succeeding stitching operation, and means for retracting the cam to initial position at the completion of its second advance movement.

40. A buttonhole sewing machine having, in combination, stitch forming mechanism for simultaneously stitching both sides of a buttonhole, feeding mechanism for relatively moving the work and stitch forming mechanism alternately in opposite directions, barring mechanism comprising cams for controlling the relative movements of the work and stitch forming mechanism to sew side or barring stitches, the stopping of the sewing at the completion of a buttonhole and the starting of the feed after the completion of the barring at the beginning of the buttonhole sewing operation, mechanism for actuating the cams which is rendered active at the end of the side stitching in either direction and is rendered inactive at the beginning of the side stitching in either direction.

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