

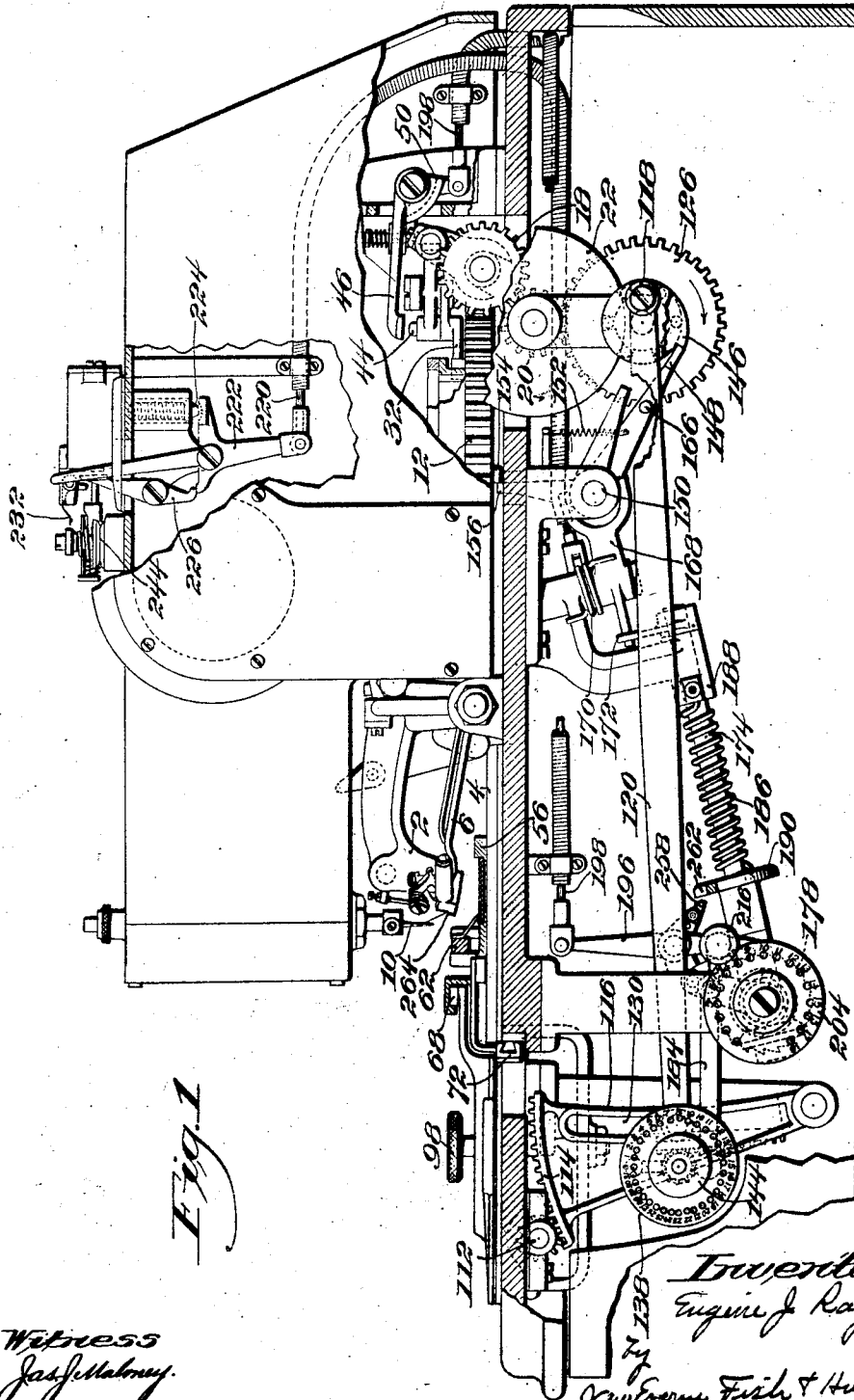
Jan. 12, 1926.

1,569,394

E. J. RAY

BUTTONHOLE SEWING MACHINE

Original Filed June 28, 1920 6 Sheets-Sheet 1



Jan. 12, 1926.

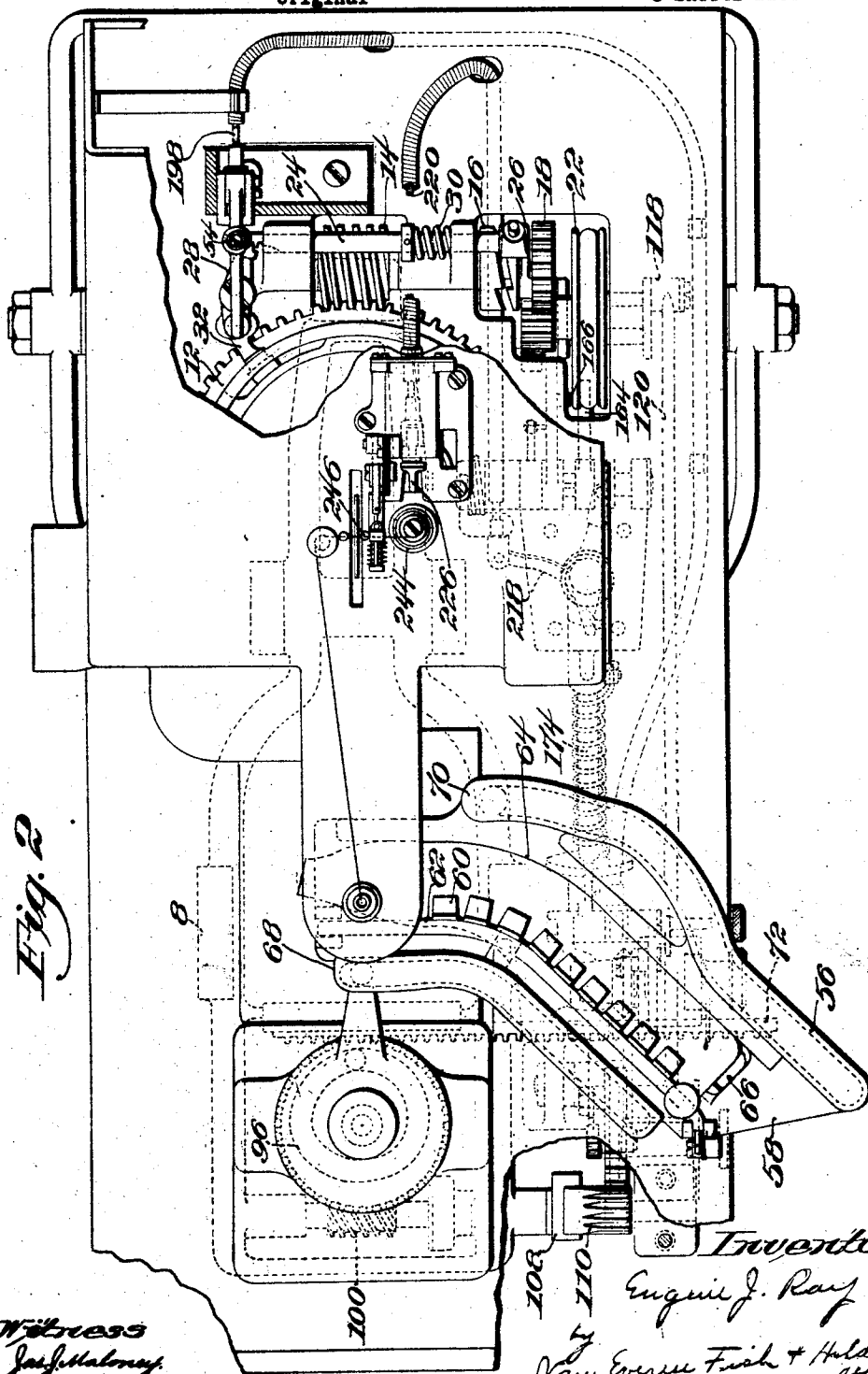
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BUTTONHOLE SEWING MACHINE

Original Filed June 28, 1920

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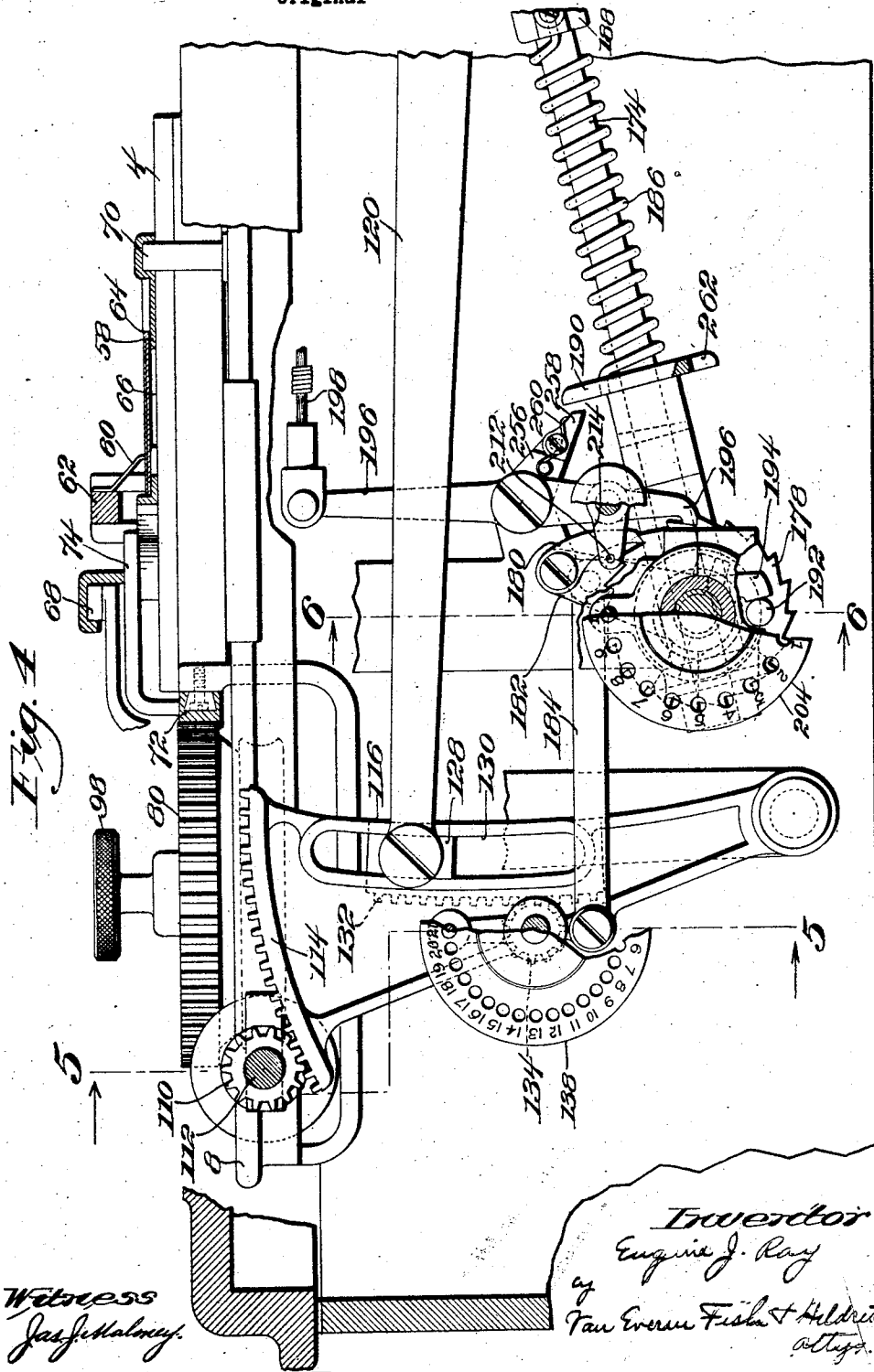
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BUTTONHOLE SEWING MACHINE

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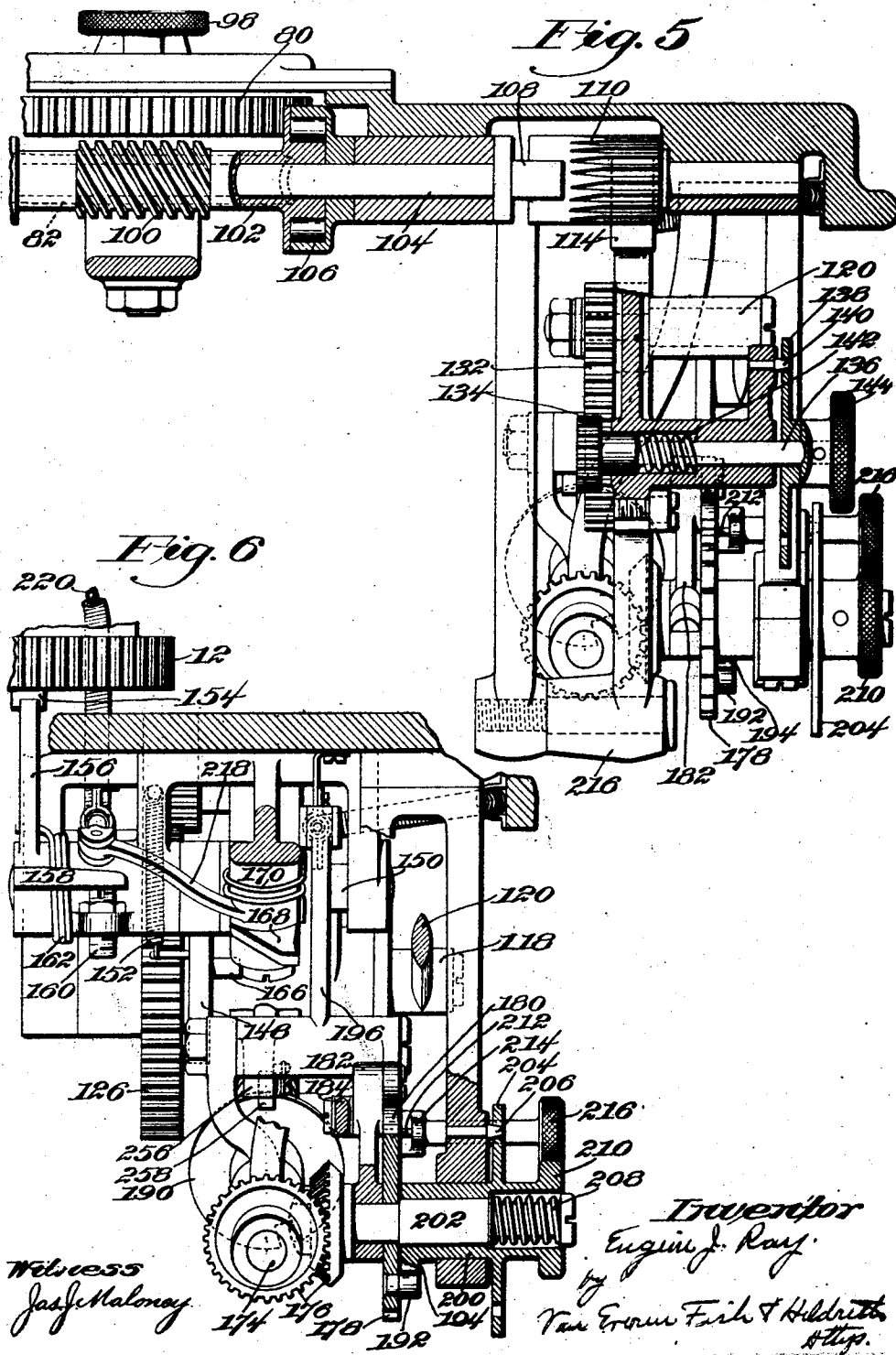
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BUTTONHOLE SEWING MACHINE

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Fig. 7

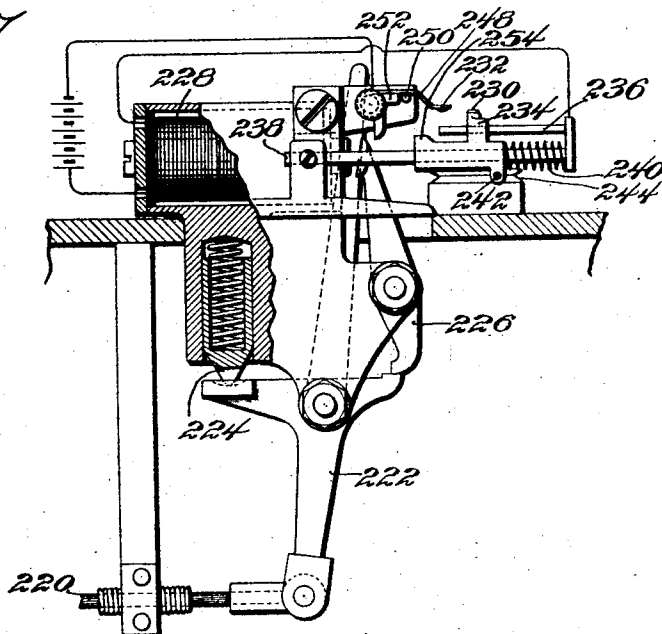
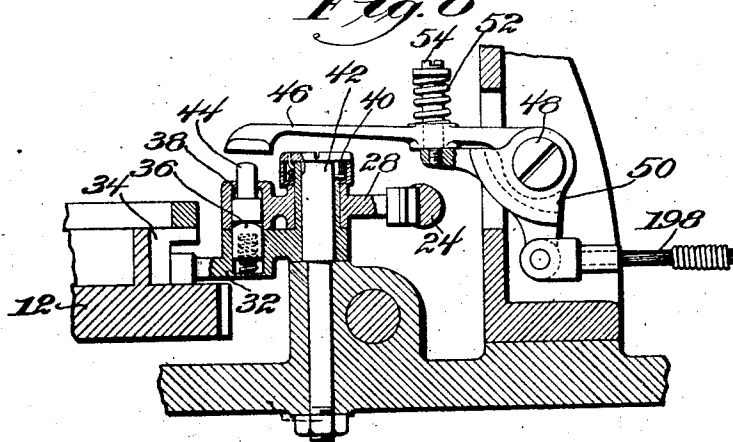


Fig. 8



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BUTTONHOLE-SEWING MACHINE.

Application filed June 23, 1920, Serial No. 392,208. Renewed October 20, 1923.

To all whom it may concern:

Be it known that I, EUGENE J. RAY, a citizen of the United States, residing at Beverly, 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, and more particularly to machines for automatically sewing a series of buttonholes in shoe flies, gaiters or similar pieces of work.

The machine in which the invention has been embodied comprises, in general, a buttonhole making mechanism for cutting and sewing an eye-ended buttonhole, a work carrier which is shifted after each buttonhole making cycle to space the work and re-position it in the work clamp of the buttonhole making mechanism, and mechanism for stopping the machine after a pre-determined number of buttonholes have been sewed.

One feature of the invention consists in the provision in a machine of this type of means for stopping the machine in case the thread breaks. The machine is preferably stopped at the completion of the buttonhole making cycle during which the thread breaks so that the operator may re-thread the machine and re-sew the unfinished buttonhole before the spacing mechanism acts to re-position the work for the succeeding buttonhole.

Further features of the invention which contribute to the simplicity of the construction and the efficiency of its operation relate to the work spacing mechanism and to the mechanism for determining the number of buttonholes to be automatically sewed.

The invention will be readily understood from an inspection of the accompanying drawings and the following detailed description of the mechanism illustrated therein.

In the drawings Fig. 1 is a sectional side elevation showing so much of a buttonhole sewing machine as is necessary to illustrate the application of the present invention thereto, Fig. 2 is a plan view partly in section, Fig. 3 is a similar view, some of the

parts being broken away or removed, Fig. 4 is a detailed side elevation showing parts of the spacing and counting mechanisms, Fig. 5 is a sectional view on line 5—5, Fig. 4, Fig. 6 is a sectional view on line 6—6, Fig. 4, Fig. 7 is a detailed view of the mechanism for stopping the machine upon the breaking of the thread, and Fig. 8 is a detailed view showing a part of the mechanism for starting the machine.

In the drawings the invention is shown embodied in a machine in which the buttonhole making mechanism is similar in general construction and mode of operation to that of the machine shown and described in Patent No. 1,063,880, June 3, 1913, and that of the machine shown and described in my application No. 187,194, filed August 20, 1917. This mechanism comprises in general a cutter 2, for cutting the buttonhole slit, a work clamp, comprising work supporting plates 4 and pivoted clamping arms 6, mounted upon a traveling clamp carriage 8, which is moved lengthwise and laterally of the buttonhole, and a stitch-forming mechanism which is rotated during the sewing about the eye and about the opposite end of the buttonhole, the upper needle of which is indicated at 10. The feed cam gear through which the various parts and mechanisms are operated or controlled in this type of buttonhole making mechanism is indicated at 12. As is usual in this type of machine the feed cam gear is rotated at high speed prior to the beginning of the sewing operation, to close the work clamp, operate the cutter, and move the work clamp from cutting to sewing position, is driven at slow speed from the sewing shaft during the sewing, and is again driven at high speed, after the sewing is completed, to move the work clamp from sewing to cutting position, and to open the clamp. The specific construction of the mechanisms for thus driving the feed cam gear, and of the mechanisms and connections through which it controls and operates the various parts of the buttonhole making mechanism, is not material to the present invention, and only that part of the mechanism which directly co-operates with the work spacing mechanism and with the mechanism for determining the number of buttonholes sewed is shown. As indicated in Figs. 1 to 3 the feed cam

gear is engaged and driven by a worm 14 formed on a sleeve, one end of which is provided with one member of the high speed clutch 16. The other member of the high speed clutch is formed on the hub of a gear 18 which engages a gear 20 connected with the constantly rotating driving pulley 22. The gear 18 is shifted to engage or disengage the high speed clutch through a clutch shifting rod 24, the forward end of which carries an arm 26, engaging a groove in the hub of the gear 18, and the rear end of which is provided with a rack, engaging teeth formed on the clutch shifting lever 28. The rod is forced in a direction to engage the clutch by a spring 30. The clutch shifting lever is mounted upon the hub of a cam lever 32, the end of which is arranged to be acted upon by cams carried by the feed cam gear and one of which is indicated at 34 (Fig. 8). The two levers are normally connected by a spring pressed latch pin 36 mounted in lever 32 and entering a hole 38 in the lever 28. A coiled spring 40, which is connected with the hub of the lever 32, and with the head of the fixed stud 42 on which the lever is mounted tends to hold the lever 32 in position for the pin 36 to enter the hole 38. A pin 44 is mounted in the hole 38 and underlies the end of the starting lever 46. This lever is mounted on a pivot stud 48 and is yieldingly connected with one arm of a bell crank lever 50 by a spring 52 and stud 54.

When the feed cam gear completes its rotation at the end of a buttonhole making cycle the cam 34 acts on the cam lever 32 which, at that time, is connected with the clutch shifting lever 28 and operates the levers to disengage the high speed clutch and thus stop the feed cam gear and consequently the buttonhole making mechanism. When the gear is to be started at the beginning of the succeeding buttonhole making cycle the starting lever 46 is operated to depress the pin 44 and thus disengage the latch pin 36 and the lever 28 so that the clutch lever and clutch shifting rod may be operated by the spring 30 to engage the high speed clutch 16. As soon as the cam lever 32 rides off of the cam 34 the lever 32 is moved with relation to the lever 28 by the spring 40 to bring the pin 36 again into register with the hole 38 when the pin enters the hole and again connects the two levers 32 and 28 so that during the continued rotation of the feed cam gear the cams on the gear may operate the levers to control the high speed clutch (and also the clutch connecting the worm 14 with the sewing shaft). At the completion of the buttonhole making cycle the cam 34 again engages the lever 32 and disengages the high speed clutch 16, thus stopping the feed cam gear and buttonhole making mechanism. The parts remain

in stopped position until the starting lever is again operated, to initiate the succeeding buttonhole making cycle.

The work is automatically shifted to space the buttonholes by the movement of a work carrier 56 which is mounted on the clamp carriage 8, and is automatically moved between successive buttonhole making cycles. The carrier is the same in construction as the carrier more fully shown and described in the above application, No. 187,194, and is provided with a work supporting plate 58 on which the work is held by a series of spring clamping fingers 60 carried by a bar 62 which may be operated by the operator to clamp or release the work. The work carrier is provided with an edge gage 64 against which the edge of the work is positioned by the operator and is also provided with an open slot 66 which registers with the buttonhole zone of the work. The work carrier is guided during its work spacing movements by fixed rolls 68 and 70 arranged to engage guiding slots formed on the carrier. The slots are so shaped and the rolls so arranged that the work is moved by the carrier in a path corresponding to the curvature of the edge guide to properly locate the series of buttonholes with relation to the edge of the work. The mechanism for advancing the work carrier to space the buttonholes includes a rack 72 provided with an arm 74, which is connected by a pivot pin with a block 76 arranged to slide within a slot 78 in the carrier. The rack is engaged by a gear 80, which is driven from a worm wheel 82, of equal diameter. The connections between the worm wheel and gear comprise a clutch bar 84 provided at its ends with clutch faces adapted to engage a conical clutch face in the upper side of the worm wheel, and two links 86, one of which is pivoted at 88 to the gear, and the other of which is pivoted at 90 to an arm 92 on the clutch bar. The pivot pin which connects the links carries a roll 94, which engages a cam groove 96, which acts to vary the movement imparted to the gear in accordance with the path of movement of the carrier so that the requisite movements are given to the carrier to equally space the buttonholes along the irregularly curved edge of the work. The clutch bar is forced into engagement with the worm wheel by a clamping nut 98, the upper end of which is provided with a knurled head by which the nut may be manipulated in clamping and releasing the clutch bar to permit movement of the work carrier into position to properly locate the first buttonhole in the series to be sewed.

As thus far described the mechanism through which the work carrier is advanced corresponds to the mechanism more fully shown and described in the above applica-

tion No. 187,194. The worm wheel 82 is engaged by a worm 100 formed on a sleeve 102 which is connected with a shaft 104 by a one-way roller clutch 106. The shaft is mounted in a bearing in the clamp carriage and is rotated after each buttonhole making cycle by an intermittently acting mechanism mounted on a fixed part of the machine. As shown in Figs. 4 and 5 the outer end of the shaft 104 is provided with a tongue 108 fitting within a groove in the end of a pinion 110 which is so mounted that it is in axial alinement with shaft 104 when the clamp carriage is in its retracted position at the end of a buttonhole making cycle. During the buttonhole making cycle the pinion 110 is held in the position indicated in Fig. 5 and the tongue 108 moves idly back and forth through the slot in the end of the pinion during the travel of the clamp carriage. The pinion is secured on the end of a shaft 112 and is engaged by a gear segment 114 formed on the upper end of a lever 116. The lever is oscillated between buttonhole making cycles by a crank 118 connected with the lever by a link 120. The crank is secured to the end of a shaft 122 which is rotated through a single revolution, after each buttonhole making cycle, by a one-revolution Horton clutch 124 which connects the shaft with a gear 126 engaged by the continuously rotating gear 20. When the crank shaft 122 is rotated the segment lever 116 is advanced and retracted and oscillates the pinion 110 and the shaft 112. During the advance of the segment lever the one-way clutch 106 rotates the worm 100 so that the work carrier is advanced a step to space the work and position it in the work clamp for the succeeding buttonhole making operation. During the return movement of the segment lever the one-way clutch permits the shaft 104 to rotate idly with relation to the worm 100.

In order that the movement transmitted to the work carrier may be varied to secure the spacing requisite for properly positioning the buttonholes, means is provided for adjusting the pivotal connection between the link 120 and the segment lever 116. As shown in Figs. 1, 4 and 5 the link 120 is pivotally connected to a block 128 mounted in a guideway 130 in the lever and provided with a rack 132 engaged by a pinion 134. The pinion is secured on the inner end of a shaft 136, the outer end of which carries a dial plate 138 provided with a series of holes adapted to be engaged with a locking pin 140 fixed in an arm on the lever 116. The dial plate is held in engagement with the locking pin by a spring 142 acting upon the shaft 136 and the outer end of the shaft is provided with a knurled head 144 by which the shaft may be moved endwise to disen-

gage the dial plate from the pin and may be then rotated to bring any hole in the plate into register with the pin, thereby adjusting the pivot block 128 to secure the spacing corresponding to that hole in the plate.

The one-revolution clutch 124 which operates the work-spacing mechanism is provided with the usual controlling disk indicated at 146, Fig. 1, which is normally held in position to render the clutch inactive by a pawl 148, which engages a tooth on the disk. The pawl is loosely mounted on a shaft 150 and is held against the periphery of the disk by a spring 152. It is tripped to throw the spacing mechanism into operation at the end of a buttonhole making cycle by a cam lug 154 on the feed cam gear 12, which is arranged to engage the upper end of an arm 156 secured to the shaft 150. The hub of the arm is provided with a laterally projecting stop finger 158 which is yieldingly held in engagement with a stop screw 160 by a spring 162, Figs. 3 and 6. The shaft 150 carries a trip arm 164 adapted to engage a pin 166 on the pawl 148. The trip arm is keyed to slide lengthwise on the shaft so that it may be moved out of position to act on the pin 166 when the operation of the spacing mechanism is to be discontinued after the desired number of buttonholes have been sewed, or is to be omitted upon the breaking of the thread. When the machine is started the arm 164 is moved into position above the pin 166 and at the end of each buttonhole cycle is depressed by the action of cam lug 154 on the arm 156, and operates the pawl 148 to throw in the work spacing clutch. The final movement of the gear 12, as it comes into stopping position, carries the cam lug beyond the end of the arm 156 so that the pawl 148 is free to return to normal position and to throw out the clutch at the end of a single revolution.

After the work carrier has been advanced to space the work at the completion of the buttonhole making cycle the buttonhole making mechanism is again thrown into operation and this continues until a predetermined number of buttonholes have been completed, after which the machine is stopped by rendering the spacing mechanism inactive. In the construction shown the mechanisms for throwing in the buttonhole making mechanism, after the buttonholes have been spaced, and for stopping the machine at the completion of the series of buttonholes, are operated by the return movement of the segment lever 116 of the spacing mechanism. The mechanism for rendering the spacing mechanism inactive, and thus stopping the machine at the completion of the series of buttonholes, comprises a lever 168, the rear end of which is provided with a yoke embracing the hub of the trip arm 164 and carrying pins engaging an annular groove

in the hub. A coiled spring 170 acts on the lever and tends to hold the trip arm in position to operate the stop pawl 148 which controls the spacing clutch. The lever is operated to move the trip arm into inactive position, as indicated in Fig. 3, by an arm 172 secured to the rear end of a controller shaft 174, the forward end of which is connected by beveled gears 176 with a ratchet wheel 178. The ratchet wheel and controller shaft are advanced a step after each operation of the spacing mechanism by a pawl 180 carried on a pawl lever 182, which is connected by a link 184 with the segment arm 116. A coiled spring 186 connected to the shaft bearing 188 and to a disk 190, secured to the shaft, tends to hold the ratchet wheel and controller shaft in initial position with a stop pin 192 on the ratchet wheel in engagement with a stationary adjustable stop 194. Starting from initial position the controller shaft will be advanced after each operation of the spacing mechanism until the arm 172 engages the lever 168 and shifts the trip arm 164 into inactive position and thus stops the machine. Reverse movement of the controller shaft under the influence of the spring 186 is prevented by a stop pawl 196, which engages the teeth of the ratchet wheel 178. This pawl also forms one arm of a lever, the upper end of which is connected by a flexible cord 198 with the bell crank lever 50 through which the starting lever for the high speed clutch of the buttonhole making mechanism is operated. When the ratchet wheel is advanced by the pawl 180 the tooth of the wheel on which the lever 196 rides rocks the lever and thus operates the starting lever 46 for the buttonhole making mechanism.

The number of buttonholes in the series sewed will depend upon the initial position of the controller shaft and this may be adjusted for any desired number of buttonholes by adjustment of the stop 194. As shown in Figs. 4 and 6 the stop is formed on a sleeve 200 surrounding the shaft 202 on which the ratchet wheel 178 and beveled gear 176 are secured. This sleeve is provided with a dial plate 204, having a series of holes adapted to be engaged by a fixed pin 206. The sleeve is held yieldingly in position with one of the holes in engagement with the pin by a spring 208, and the outer end of the sleeve is provided with a head 210 by which the sleeve may be moved to disengage the dial from the pin and may be turned to adjust the stop 194 in accordance with the number of buttonholes in the series to be sewed.

After a series of buttonholes have been completed the operator breaks the connection between the work clamp and the worm wheel 82 by turning the clamping nut 98 and then, after removing the finished piece of

work, and inserting a fresh piece in the carrier, positions the carrier in proper relation to the sewing mechanism for sewing the first buttonhole. He then re-connects the clamp and worm wheel and after properly adjusting the spacing mechanism, if such adjustment is required in order to properly space the series of buttonholes so that the last buttonhole of the series will be in the proper relation to the end of the work, he starts the machine by swinging the lever 196 in a direction to operate the starting lever for the buttonhole making mechanism. By this movement of the lever 196 he disengages it from the ratchet wheel and also disengages the actuating pawl 180 so that the controller shaft 174 is immediately returned by its spring 186 to initial position determined by the fixed stop 194 and stop pin 192. The means for thus disengaging the actuating pawl comprises a pin 212, arranged to underlie the pawl and carried by an arm 214, projecting from the lever 196. The lever is provided with a projecting handle 216 by which it may be conveniently manipulated by the operator.

The mechanism for preventing the operation of the spacing mechanism and thus stopping the machine at the end of the buttonhole cycle in which the thread breaks comprises mechanism for shifting the trip arm 164 into inactive position which is controlled by the thread. As shown the lever 168 is provided with a laterally projecting arm 218 connected by a flexible cord 220 with one arm of a three-arm lever 222, Figs. 1, 2, 3 and 7. The lever is forced in a direction to shift the trip into inactive position by a spring plunger 224 and is locked in inactive position against the pressure of the spring by the lower end of a latch lever 226. The upper end of the latch lever forms an armature arranged to be acted upon by an electro-magnet 228. The magnet circuit is normally open and is adapted to be closed by the engagement of two contact points 230 and 232 included in the circuit. The contact point 230 is carried on a slide 234, which is mounted on guide rods 236 and 238, and is pressed in a direction to bring the contacts into engagement by a light spring 240. The slide is provided with a thread eye 242 through which the needle thread leads from the tension 244 to the fixed thread guides 246 so that the thread during the normal operation of the machine acts to hold the slide in retracted position, as indicated in Fig. 7. Should the thread break it will no longer be held taut, or substantially taut, between the tension and the guide 246, and the slide 234 will be moved to the left by its spring, thus bringing the contact 230 into engagement with the contact 232, energizing the magnet so that it will disengage the latch lever 226 from the three-arm lever

222 and permit the spring plunger 224 to operate the lever and shift the trip arm for the spacing clutch into inactive position. In order that the contacts 232 and 230 may not be engaged when the slide 234 is returned to its normal position in re-setting the mechanism, the contact 232 is carried on a pivoted arm 248, which rests on a pin 250, and overlies the horizontal arm of a bell crank lever 252. The vertical arm of the lever is arranged in the path of a lug 254 on the slide 234. When the slide moves toward the left upon the breaking of the thread the lug 254 rocks the bell crank lever 252 and passes beyond the vertical arm of the lever. When the mechanism is reset the lug rocks the lever and lifts the contact 232 as the contact 230 is passing under it so that the magnet circuit is not closed in re-setting the mechanism.

In order that the controller shaft 174 may not be released and returned to initial position when the operator starts the machine, after the operation of the spacing mechanism has been prevented by the breaking of the thread, the hub of the lever 196 is provided with a rearwardly projecting arm 256, the end of which carries a pivoted pawl 258 held yieldingly in position on the arm by a spring 260. The pawl is arranged to engage the disk 190 on the controller shaft when the arm 196 is moved to start the buttonhole making mechanism, and to thus limit the movement of the lever so that it will not disengage the actuating pawl 180 from the ratchet wheel 178. When the forward movement of the controller shaft has been completed, and the series of buttonholes for which the mechanism is adjusted has therefore been completed, a slot 262 in the disk 190 registers with the pawl 258 so that the arm 196 may be moved sufficiently to disengage the actuating pawl 180 in starting the machine at the beginning of the next series of buttonholes, thus permitting the controller shaft to return to initial position. During this movement of the lever 196 the pawl passes through the slot 262 and during the return movement of the lever 196, after the controller shaft has returned to initial position, the pawl will yield as it passes the disk 190 and then snap into normal position.

The machine may be provided with any suitable or well known form of thread cutter and holder for severing and holding the upper needle thread at the completion of each buttonhole. Such a thread cutter and holder having the construction and mode of operation of the thread cutter and holder shown and described in Patent No. 1,332,683, March 2, 1920 is indicated at 264 in Fig. 1.

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 and best suited to the construction and mode of operation of any machine in which the invention is to be embodied.

What is claimed is:

1. A buttonhole sewing machine, having, in combination, stitch-forming mechanism, mechanism for relatively feeding and moving the work to sew a series of buttonholes, and means rendered active upon the breaking of the thread to stop the machine with the parts in predetermined relative position.
2. A buttonhole sewing machine, having, in combination, stitch-forming mechanism, mechanism for relatively feeding and moving the work to sew a series of buttonholes, and means rendered active upon the breaking of the thread for stopping the machine at the end of the buttonhole sewing cycle in which the break occurs.
3. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, mechanism for automatically spacing the work to sew a pre-determined series of buttonholes, and means rendered active upon the breaking of the thread for rendering the spacing mechanism inactive.
4. A buttonhole sewing machine, having, in combination, stitch-forming mechanism, a work clamp, a buttonhole cutter, mechanism for actuating these parts to cut and sew a buttonhole, mechanism for spacing the work, mechanism for controlling the buttonhole making and spacing mechanisms to automatically cut and sew a pre-determined number of buttonholes, and means rendered active upon the breaking of the thread for rendering the spacing mechanism inactive.
5. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, mechanism for spacing the work at the end of the buttonhole making cycle, and means rendered active upon the breaking of the thread for rendering the spacing mechanism inactive.
6. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, mechanism for spacing the work at the end of each buttonhole making cycle, and means for omitting the spacing at the end of a buttonhole making cycle in which the thread breaks.
7. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, work spacing mechanism thrown into action by the buttonhole making mechanism at the end of its cycle and acting to again start the buttonhole making mechanism, and means for omitting the spacing at the end of a buttonhole making cycle in which the thread breaks.
8. A buttonhole sewing machine, having,

- in combination, buttonhole making mechanism, work spacing mechanism thrown into action by the buttonhole making mechanism at the end of its cycle and acting to again start the buttonhole making mechanism, and means rendered active upon the breaking of the thread for preventing the throwing in of the spacing mechanism at the end of that buttonhole making cycle.
9. A sewing machine, having, in combination, sewing mechanism for effecting a sewing operation including a plurality of stitch-forming cycles, mechanism for spacing the work at the end of each sewing operation, and means rendered active upon the breaking of the thread for rendering the spacing mechanism inactive.
10. A sewing machine, having, in combination, sewing mechanism for effecting a sewing operation including a plurality of stitch-forming cycles, mechanism for spacing the work at the end of each sewing operation, and means for omitting the spacing at the end of a sewing operation in which the thread breaks.
11. A sewing machine, having, in combination, sewing mechanism for effecting a sewing operation, including a plurality of stitch-forming cycles, work spacing mechanism thrown into action by the sewing mechanism at the end of the sewing operation and acting to again start the sewing mechanism, and means rendered active upon the breaking of the thread for preventing the throwing in of the spacing mechanism at the end of that sewing operation.
12. A sewing machine, having, in combination, sewing mechanism for effecting a sewing operation, including a plurality of stitch-forming cycles, mechanism for spacing the work, mechanism for stopping the machine after a pre-determined number of spacings, and means for stopping the machine and omitting a spacing upon the breaking of the thread.
13. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, mechanism for spacing the work at the end of each buttonhole making cycle, mechanism for stopping the machine after a pre-determined number of spacings, and means for stopping the machine and omitting a spacing upon the breaking of the thread.
14. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, a work carrier, spacing mechanism for moving the carrier to space the buttonholes, comprising an oscillating segment, a one-way clutch through which motion is transmitted from the segment to the carrier, and means for varying the throw of the segment.
15. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, a work carrier, spacing mechanism for moving the carrier to space the buttonholes, comprising an oscillating segment, a one-way clutch through which motion is transmitted from the segment to the carrier, a one-revolution clutch thrown into operation by the buttonhole making mechanism at the end of the buttonhole making cycle, a crank driven by the clutch, and a link connecting the crank and segment.
16. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, a work carrier, spacing mechanism for moving the carrier to space the buttonholes, comprising an oscillating segment, a one-way clutch through which motion is transmitted from the segment to the carrier, a one-revolution clutch thrown into operation by the buttonhole making mechanism at the end of the buttonhole making cycle, a crank driven by the clutch, a link connecting the crank and segment, and means for adjusting the connection between the link and segment to vary the throw of the segment.
17. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism rendered active at the end of each buttonhole making cycle, a counting mechanism operated from the spacing mechanism for stopping the machine after a pre-determined number of buttonholes have been sewed, and means for returning the counting mechanism to initial position in starting the buttonhole making mechanism for the initial buttonhole of the succeeding series.
18. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, a work carrier, a one-revolution work spacing clutch thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, an oscillating segment operated by the clutch, a one-way clutch through which motion is transmitted from the segment to the work carrier to space the work, and counting mechanism operated by the segment for preventing the throwing in of the spacing clutch at the completion of a pre-determined number of buttonholes.
19. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, a counting mechanism advancing a step to start the buttonhole making mechanism at each operation of the spacing mechanism and provided with means for preventing the throwing in of the spacing mechanism at the completion of its advance movement, and means

for preventing the throwing in of the spacing mechanism upon the breaking of the thread.

20. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, a counting mechanism advanced a step to start the buttonhole making mechanism at each operation of the spacing mechanism, means operated by the final movement of the counting mechanism for preventing the throwing in of the spacing mechanism, and means for returning the counting mechanism to initial position upon the initial starting of the buttonhole making mechanism.

21. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, a counting ratchet, a spring tending to hold the ratchet in initial position, an actuating pawl operated by the spacing mechanism, and means operated by the final movement of the ratchet for preventing the throwing in of the spacing mechanism.

22. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, a counting ratchet, a spring tending to hold the ratchet in initial position, an actuating pawl operated by the spacing mechanism, a lever riding against the teeth of the ratchet, and means for starting the buttonhole making mechanism operated by the lever.

23. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, a counting ratchet, a spring tending to hold the ratchet in initial position, an actuating pawl operated by the spacing mechanism, a stop pawl lever riding against the teeth of the ratchet, and means for starting the buttonhole making mechanism operated by the lever.

24. A buttonhole sewing machine, having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism thrown into operation by the buttonhole making mechanism at the end of each buttonhole making cycle, a counting ratchet, a spring tending to hold the ratchet in initial position, an actuating pawl operated by the spacing mechanism, a stop pawl lever riding against the teeth

of the ratchet, and means for disengaging the actuating pawl by an abnormal movement of the stop pawl lever.

25. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for relatively feeding and spacing the work to sew a pre-determined series of buttonholes, mechanism for automatically stopping the machine at the completion of the series, and means for stopping the machine upon the breaking of the thread.

26. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for relatively feeding and moving the work to sew a series of buttonholes, and means controlled by the thread for stopping the machine with the parts in pre-determined relative position.

27. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for relatively feeding and moving the work to sew a series of buttonholes, and means controlled by the thread for stopping the machine at the end of a buttonhole sewing cycle.

28. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for relatively moving the work and stitch-forming mechanism to sew a buttonhole, and means controlled by the thread for stopping the machine at the end of a buttonhole cycle.

29. A buttonhole sewing machine having, in combination, stitch-forming mechanism, mechanism for spacing the work at the end of the buttonhole making cycle, and means controlled by the thread for rendering the spacing mechanism inactive.

30. A sewing machine having, in combination, stitch-forming mechanism, work spacing mechanism, and means controlled by the thread for rendering the spacing mechanism inactive.

31. A buttonhole sewing machine having, in combination, buttonhole making mechanism, work spacing mechanism thrown into action by the buttonhole making mechanism at the end of its cycle and acting to again start the buttonhole making mechanism, and counting mechanism acting after a predetermined number of spacings to render the spacing mechanism inactive at the completion of the next buttonhole making cycle.

32. A buttonhole sewing machine having, in combination, buttonhole making mechanism, work spacing mechanism, means operated by the buttonhole making mechanism for starting the spacing mechanism, means operated by the spacing mechanism for starting the buttonhole making mechanism, and counting mechanism adjustable for different numbers of buttonholes for rendering the starting means for the spacing mechanism inactive.

33. A buttonhole sewing machine having, in combination, buttonhole making mechanism, work spacing mechanism, means operated by the buttonhole making mechanism 5 for starting the spacing mechanism at the completion of a buttonhole, means operated by the spacing mechanism for starting the buttonhole making mechanism at the completion of a spacing operation, and mechanism 10 for rendering the starting means for the spacing mechanism inactive at the completion of a predetermined number of buttonholes.

34. A buttonhole sewing machine having, 15 in combination, buttonhole making mechanism including a rotary feed cam, a work carrier, and actuating mechanism for the carrier thrown into operation by a cam on the feed cam at the completion of a buttonhole making cycle. 20

35. A buttonhole sewing machine having, in combination, buttonhole making mechanism, work spacing mechanism, a trip for

controlling the spacing mechanism operated by the buttonhole making mechanism, 25 and mechanism for rendering the trip inactive after a predetermined number of spacing operations.

36. A buttonhole sewing machine having, in combination, buttonhole making mechanism, stop mechanism therefor, work spacing mechanism rendered active at the end of a buttonhole making cycle and adapted to re-start the buttonhole making mechanism, a counting mechanism for rendering the 35 spacing mechanism inactive after a predetermined number of buttonholes have been sewed, means for manually starting the buttonhole making mechanism and for returning the counting mechanism to initial position, and means for preventing the return 40 of the counting mechanism in starting the buttonhole making mechanism until the predetermined number of buttonholes have been sewed.

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