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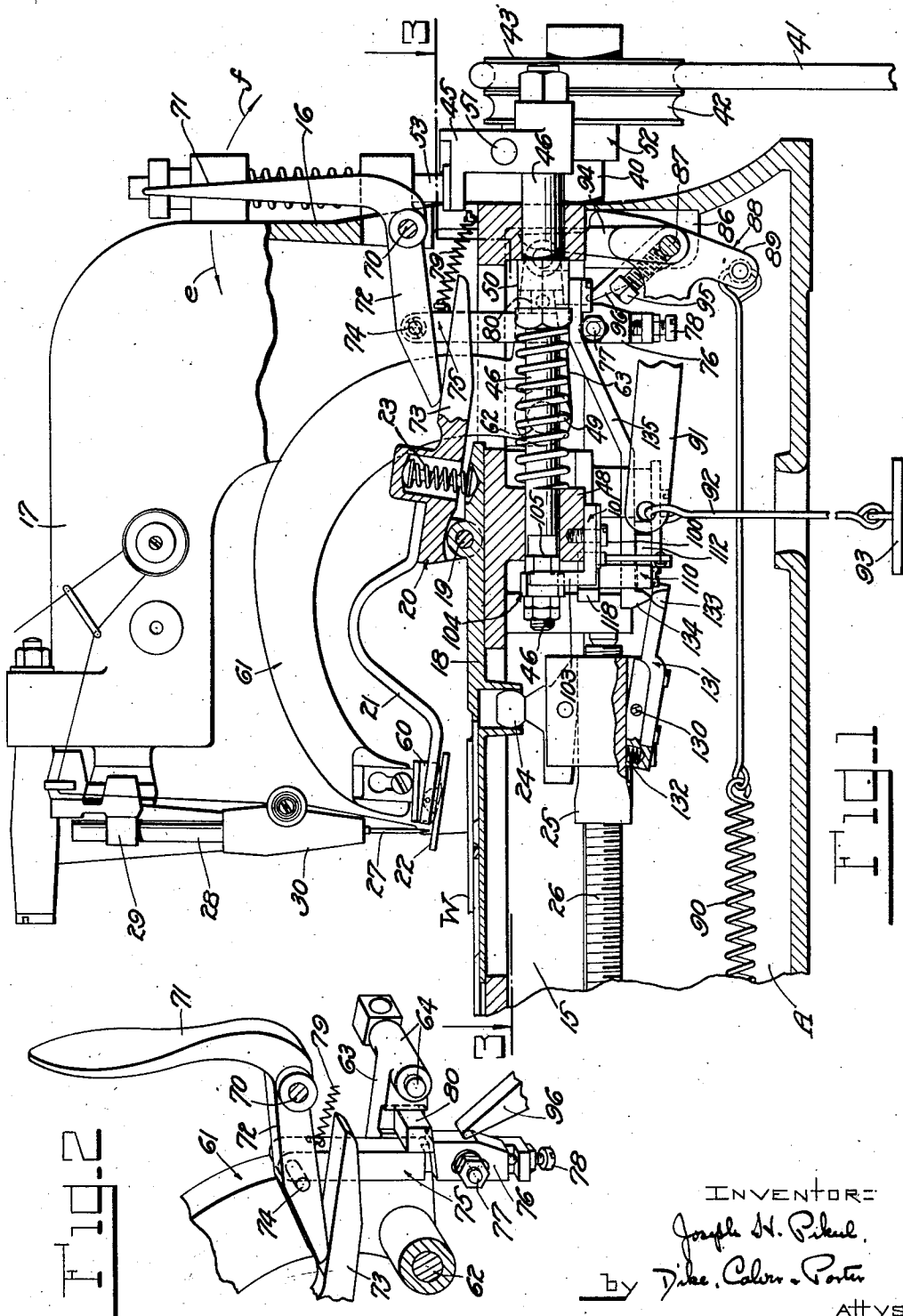
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2,359,330

BUTTONHOLE SEWING MACHINE

Filed July 25, 1941

3 Sheets-Sheet 1



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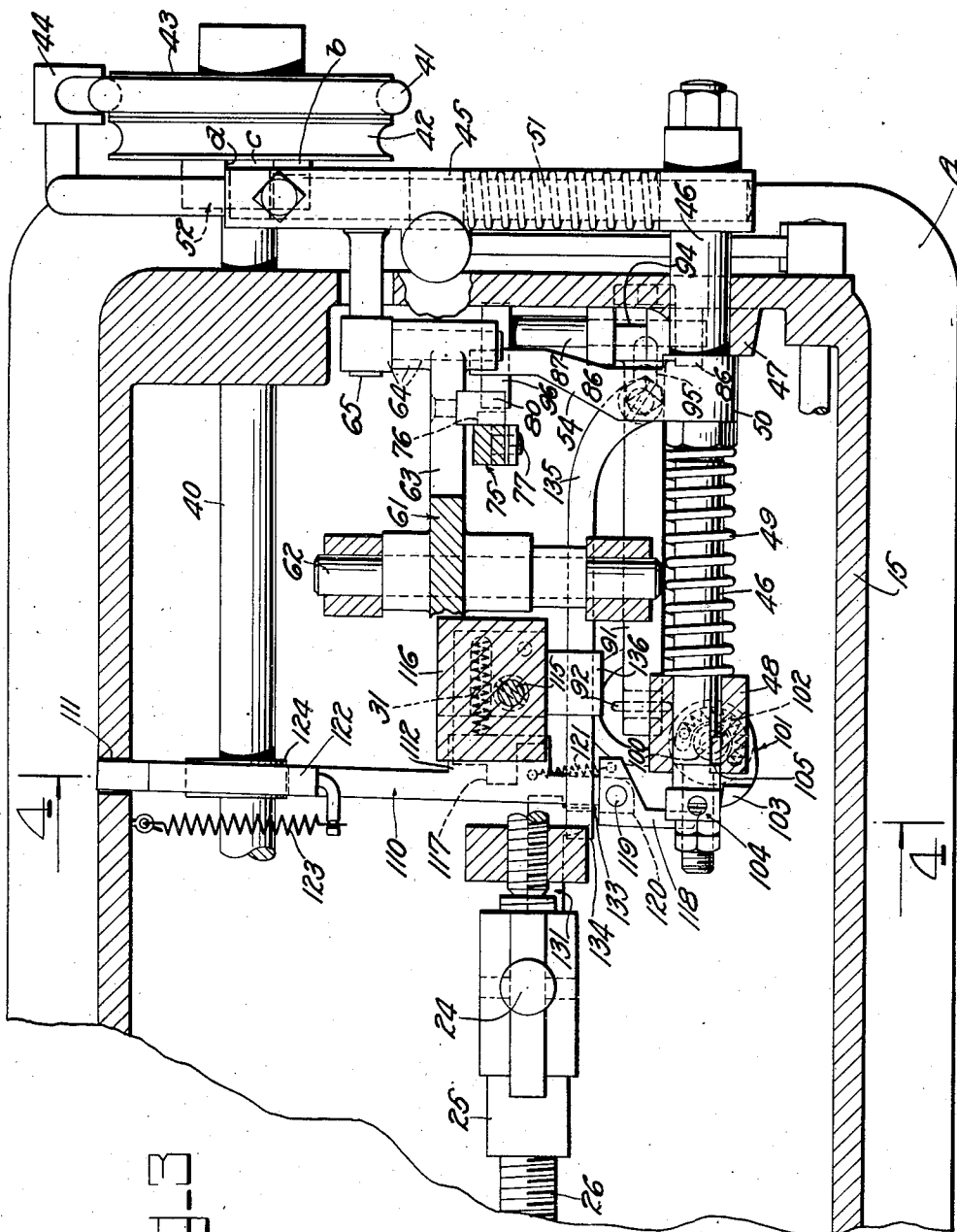


Fig. 3

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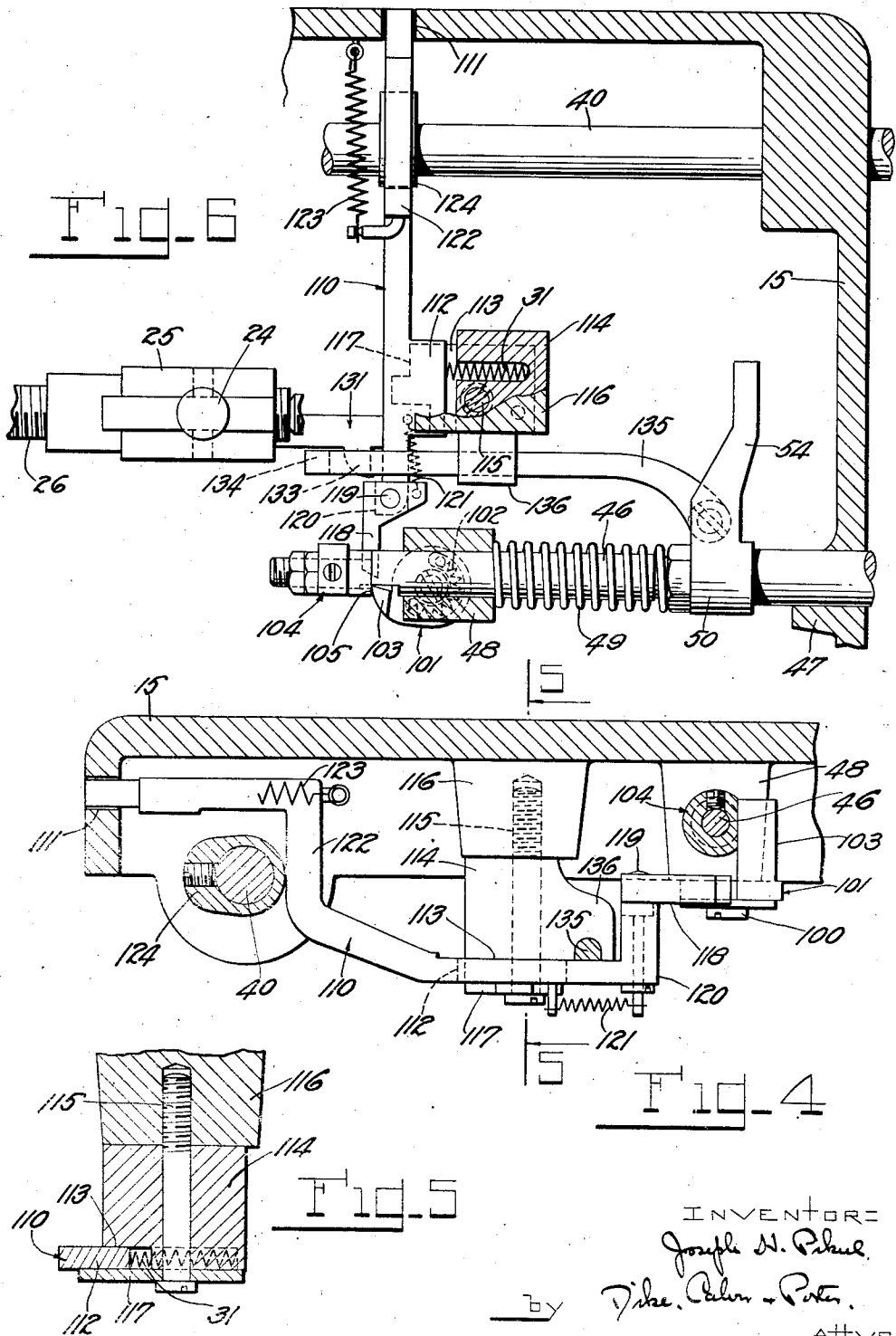
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,359,330

BUTTONHOLE SEWING MACHINE

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13 Claims. (Cl. 112-76)

This invention relates to button hole sewing machines and especially, although not exclusively, to machines of the type known as "straight-hole" machines, described, for example, in Patents No. 714,284, November 25, 1902, and No. 749,776, January 19, 1904.

Buttonhole machines of this and some other types include stitch-forming mechanism, a work clamp adapted to be closed or opened to clamp or release the work, means for imparting feeding movements to the work clamp in order to position the stitches around the buttonhole, and starting and stopping mechanism for the machine, adapted to be manually operated, as by a treadle or hand lever, to initiate the sewing operation and to be automatically operated to stop the machine upon the completion of the buttonhole sewing cycle. In many such machines, for example those described in the patents above referred to, means are provided for automatically closing the work clamp as an incident to the starting of the machine and for automatically opening the work clamp as an incident to stopping of the machine. In such arrangements the work clamp cannot be closed without starting the machine, and the machine cannot be stopped without opening the work clamp. It is advantageous to be able to close the work clamps without starting the machine in order to "spot" the work, that is to say, to check its proper positioning and permit its rearrangement, if necessary, before the stitching commences. It is also advantageous to be able to stop the machine without opening the clamp (and thereby releasing the work) in order to permit inspection of the stitching and, in the event of defective stitching, to repeat the buttonhole sewing cycle while the work remains clamped. In any event, it is advantageous to permit the clamps to close or remain closed while the machine is at rest in order to facilitate the threading of the needle. In some machines these results have been accomplished by the provision of entirely separate and independent means for opening and closing the work clamp and for starting and stopping the machine, but this requires a duplication of parts, and, when this expedient is used, the advantages of the automatic interrelation of the closing and opening of the work clamps with the starting and stopping of the machine, which it is desirable to retain during the large majority of buttonhole sewing operations, are lost, special attention on the part of the operator is required to see that the clamp is closed before the machine is started, and additional operations are imposed upon him.

The present invention has for an object to provide mechanism operable by a single treadle or equivalent device to close the work clamps either with or without starting the machine, and adapted also to cause the work clamps either to be automatically opened or to remain closed when the machine is stopped.

The more particular objects of the invention, together with means whereby the latter may be carried into effect, will best be understood from the following description of a preferred embodiment thereof shown in the accompanying drawings, this, however, having been chosen for purposes of exemplification merely, since the invention, as defined by the claims hereunto appended, may be otherwise embodied without departure from the spirit and scope thereof.

In said drawings:

Fig. 1 is a side elevation, partly in vertical section and partly broken away, of a machine embodying the invention, certain parts not essential to the understanding of the invention being omitted for simplicity of illustration.

Fig. 2 is a fragmentary perspective view of certain parts of the mechanism to be referred to.

Fig. 3 is a horizontal section taken substantially on the line 3-3 of Fig. 1.

Fig. 4 is a transverse vertical section taken substantially on the line 4-4 of Fig. 3.

Fig. 5 is a detail section taken substantially on the line 5-5, Fig. 4.

Fig. 6 is a view similar to Fig. 3, showing certain parts of the latter figure in different positions.

In the drawings, particularly Figs. 1 and 3, is shown a portion of a "straight-hole" button hole sewing machine of the general type described in the patents above referred to. Said machine comprises a hollow base A having at its top a bed 15 from which rises a standard 16 carrying an overhanging arm 17 spaced above the bed. Guided on the bed for longitudinal movement thereon is a work clamp comprising a clamp plate 18 to which is pivoted at 19 a lever 20 carrying clamp arms 21 to the extremities of which are pivoted clamping feet 22. The clamping arms 21, except when restrained as hereinafter described and as shown in Fig. 1, are normally depressed, to close the clamp and cause the feet 22 to clamp the work W upon the plate 18, by a spring 23 interposed between the lever 20 and the plate 18. The clamp plate 18 is connected by a ball and socket connection, generally indicated at 24, with a nut 25 threaded on a feed screw 26 which is intermittently rotated by mechanism not shown,

first in one direction and then in the other, to cause the nut 25, and consequently the work clamp as a whole, to be moved, from a starting position shown in Figs. 1 and 3, first toward the left, as viewed in said figures, to position the stitches along one side of the buttonhole, and then toward the right back to the starting position to position the stitches along the opposite side of the buttonhole.

The stitch forming or sewing instrumentalities comprise an eye-pointed needle 27 above the bed and cooperating under-thread handling mechanism, not shown, below the bed. The needle 27 is carried by a needle bar 28, which is longitudinally or vertically reciprocated, by means generally indicated at 29, in a needle bar guide 30, means, not shown, being provided for oscillating said guide alternately in opposite directions transversely to the direction of feed of the work clamp between successive strokes of the needle to position the depth stitches.

A main shaft 40 journalled in bearings in the bed 15 has power applied thereto by a belt 41 alternatively engageable with fast and loose pulleys 42 and 43 on said shaft under the control of a belt shifter 44. The belt shifter 44 constitutes an extension of a stop member 45 carried by an oscillating and longitudinally movable rock shaft 46 mounted for oscillation and a limited longitudinal movement in bearing lugs 47 and 48 depending from the bed. The shaft 46 is normally urged toward the right, as viewed in Figs. 1 and 3, to engage the belt 41 with the loose pulley 43, by a spring 49 surrounding said shaft and interposed between the bearing lug 48 and a collar 50 secured to the shaft, engagement of said collar with the bearing lug 47 limiting the movements of said shaft under the influence of said spring. The collar 50 is provided with a laterally extending arm 54 by which the shaft 46 may be moved to the left against the tension of the spring 49 by means hereinafter described.

Slidably mounted in the stop arm 45 is a spring pressed stop bolt 51, the end of which, when the shaft 46 is in the longitudinal position shown in Figs. 1 and 3 (i. e., the position to engage the belt 41 with the loose pulley 43), is in the path of a cam 52 fast on the shaft 40, said cam having a rising portion *b*, a notch *c* and a stop shoulder *d*. The bolt 51, when in the path of movement of the cam 52, is held in engagement with the periphery of the latter by a spring pressed plunger 53 carried by the upright 16 and engaging the stop arm 45, said plunger tending to force said stop arm downwardly and press the end of the bolt 51 against the periphery of the cam 52.

A buttonhole cutter 60 is carried by a lever 61 journalled on a short stud shaft 62 supported in the bed, said lever having an arm 63 connected by a universal joint, generally indicated at 64 (Fig. 3) with a stud 65 extending inwardly from the stop arm 45. The arrangement is such that when the end of the stop bolt 51 rides upon the rising portion *b* of the cam 52, the buttonhole cutter 61 is depressed to cut the buttonhole slit, after which, when the end of the bolt enters the notch *c* the spring pressed plunger 53 causes the buttonhole cutter to rise to its original position, and when the end of the bolt 45 is engaged by the stop shoulder *d* the machine is positively stopped, the stopping impact being cushioned by the yielding of said bolt.

Except as hereafter pointed out, the construction, arrangement and mode of operation of the

parts above referred to are, or may be, substantially as more fully described in the above mentioned patents, particularly Patent No. 714,284.

Pivoted at 70 in the wall of the upright 16 is a lever having one arm 71 extending to the exterior of the upright and formed to constitute a finger piece or hand lever and another arm 72 extending into the upright into a position to engage an extended portion 73 of the lever 20 which carries the clamp arms 21. By moving the finger piece 71 inwardly or in the direction of the arrow *e* (Fig. 1), the clamping feet 22 may be raised to open the clamp and release the work against the tension of the spring 23. Conversely, when the clamp closes under the influence of the spring 23, the arm 72 is moved upwardly and the finger piece 71 moved outwardly in the direction of the arrow *f*, or said lever may be moved in the latter direction a sufficient distance to disengage the arm 72 from the arm 73, even when the clamp is closed, for a purpose hereinafter explained. Pivoted at 74 to the arm 72 is a depending link 75 (see particularly Fig. 2) carrying a catch or block 76. The block 76 is preferably adjustably connected with the link 75 by a screw 77 passing through a slot therein, its adjusted position being fixed by a set screw 78. The link 75 is normally urged by a spring 79 in the direction to cause the catch or block 76 to engage a lug 80 carried by the arm 63 of the buttonhole cutter lever 61. Consequently, when the buttonhole cutter 60 rises, the arm 72 is drawn downwardly to open the work clamp, but if the catch 76 be disengaged from the lug 80, the movement or position of the buttonhole cutter lever will have no effect upon the work clamp which will close or remain closed under the influence of its spring 23.

Journalled in ears 86 in the case A is a rock shaft 87 having secured thereto, as by a set screw 95, a three-armed lever indicated as a whole at 88. One arm 89 of the lever 88 has connected therewith a spring 90 tending normally to turn the shaft 87 in a clockwise direction as viewed in Fig. 1. A second arm 91 of the lever 88 is connected by a link 92 with a foot treadle 93, whereby depression of the treadle will turn the shaft 87 in a counter-clockwise direction against the tension of the spring 90. The third arm 94 of the lever 88 is extended into a position to engage the arm 54 when the shaft 87 is turned in the counterclockwise direction, thereby sliding the shaft 46 toward the left in Figs. 1 and 3 to start the machine as above explained. Also fast on the shaft 87 is a trip finger 96 adapted, when the shaft 87 is turned in a counter-clockwise direction, to engage the catch or block 76 and disengage the latter from the lug 80. The arrangement is such that when the treadle 93 is depressed to turn the shaft 87 in a counter-clockwise direction from its normal position as shown in Fig. 1, in which it is held by the spring 90, the trip finger 96 will engage the catch 76 to disengage the latter from the block 80 before the arm 94 engages the arm 54, or at least before such engagement has moved the shaft 46 far enough to start the machine.

Mounted, as by a screw 100, on the bearing lug 48 is a rotary latch 101 normally urged in a clockwise direction (as viewed in Figs. 3 and 6) by a spring 102. The latch 101 has an upstanding finger 103 (see also Fig. 1) which cooperates with a collar 104 on the shaft 46. The arrangement is such that when the shaft 46 is moved toward the left from the position shown in Figs.

1 and 3 into that shown in Fig. 6 to start the machine, the finger 103 is caused by the spring 102 to snap back of the shoulder 105 provided by the collar 104 to hold the shaft 46 in running position.

A floating angular bar 110 (Figs. 3, 4 and 6) has one end received in an opening 111 in the wall of the bed 15 in such a manner as to permit both the longitudinal and angular movement of said bar in a horizontal direction. The bar 110 is formed with a laterally extending flange or ear 112 which is guided in a horizontal groove 113 in the lower face of a block 114 (see also Fig. 5) secured, as by a bolt 115, to a boss 116 depending from the bed 15, said flange or ear 112 being retained in said groove by a plate 117 likewise secured to the block 114 by the bolt 115, whereby the bar 110 is guided for lateral horizontal angular or swinging movement about its connection at 111 with the bed 15. The bar 110 is normally urged toward the left, as viewed in Figs. 3 and 6, by a spring 31 seated in an extension of the groove 113, the normal position of said bar under the influence of said spring being shown in Fig. 3. When in this position, the end of a latch 118 pivoted at 119 to an upturned end 120 (Fig. 4) of the bar, and normally held in the position shown with respect thereto by a spring 121, is laterally offset from the finger 103, as shown in Fig. 3. When the bar 110 is swung to the right against the tension of the spring 31, into the position shown in Fig. 6, the end of the latch is brought opposite the finger 103. The bar 110 is formed with an angular portion 122 (see particularly Fig. 4) which is held by a spring 123 in engagement with the periphery of a cam 124 on the main shaft 40, whereby at each rotation of said shaft, that is to say, during each stitch forming cycle of the machine, said bar is given a longitudinal movement, said movement being guided by the opening 111 and slot 113. When said bar is in the lateral position shown in Fig. 3, this movement is an idle one, but when said bar occupies the lateral position shown in Fig. 6, such longitudinal movement will cause the latch 118 to engage the finger 103 and release the latter from the shoulder 105.

Pivoted at 130 (Fig. 1) to the underside of the feed nut 25 is a dog 131 normally held by a spring 132 with its right hand end (as viewed in Figs. 1 and 6) elevated or in such position that, when the nut 25 is moved to the right into its initial or starting position upon the completion of the buttonhole, said end will engage the bar 110 and swing the latter from the position shown in Fig. 3 into that shown in Fig. 6. The dog 131 is formed with a laterally offset cam projection 133 adapted to be engaged by a cooperating cam projection 134 on an arm 135 carried by the collar 50 and guided in an ear or lateral projection 136 on the block 114. The arrangement is such that when the shaft 46 moves toward the right (as viewed in Figs. 1, 3 and 6) to stop the machine (the nut 25 being in the position shown in said figures) the cam projection 134 engages the cam projection 133, thereby depressing the free end of the dog 131 into the position shown in Fig. 1, causing the same to disengage the bar 110, and permitting the latter to swing into its normal position shown in Fig. 3 under the influence of the spring 31.

The machine being at rest and the parts in the positions shown in Figs. 1 and 3, the partial depression of the treadle 93 will cause the trip finger 96 to engage the latch 76 and disengage 75

the latter from the lug 80, thereby permitting the work clamp to close under the influence of its spring 23. This result can be accomplished by a movement of the treadle insufficient to cause the arm 94 to engage the arm 54 and move the shaft 46 into starting position, so that the machine will remain at rest with the clamp closed, permitting the position of the work to be checked, and, if necessary, corrected by re-opening of the clamp by manipulation of the hand lever 71. Thereafter the treadle 93 may be fully depressed, causing the arm 94 to move the shaft 46 toward the left into starting or running position, in which position it is retained by engagement of the finger 103 with the stop shoulder 105 under the influence of the spring 102, as shown in Fig. 6. As above stated, and as more fully explained in the patents above referred to, during the buttonhole sewing cycle the feed nut 25 is moved by the screw 26, first toward the left and then toward the right back to its initial or starting position shown in Figs. 1, 3 and 6. Movement of the shaft 46 into running position has caused a corresponding movement of the cam lug 134 to the left from the position shown in Figs. 1 and 3 into that shown in Fig. 6. Consequently, when the feed nut 25, in its movement toward the right, approaches its initial position, as shown in Fig. 6, the cam lug 133 will pass out of engagement with the cam lug 134, permitting the free end of the dog 131 to rise into its normal position under the influence of the spring 132, so that said dog 131 will engage the bar 110 and swing it into the position shown in Fig. 6, whereupon longitudinal movement of said bar by the cam 124 will cause the dog 118 to engage the finger 103 and disengage the latter from the stop shoulder 105, thereby permitting the spring 49 to move the shaft 46 into the stopping position. Such movement causes re-engagement of the cam lug 134 with the cam lug 133, releases the dog 131 from the bar 110, and permits the latter under the influence of the spring 31 to be swung back from the position shown in Fig. 6, to that shown in Fig. 3, thereby restoring all of the parts to their original positions for restarting the machine.

The automatic stopping of the machine upon the completion of the buttonhole sewing cycle, as above described, of course, requires that the treadle 93 be released after the starting of the machine. If desired, said treadle may be only partly released, that is to say, allowed to move upwardly only to a sufficient extent to permit the automatic stopping of the machine while causing the trip finger 96 to re-engage the catch 76 and prevent the latter from re-engaging the lug 80, in which event the machine may be automatically stopped without opening the work clamp when the buttonhole cutter 60 rises after its cutting operation, thereby holding the work clamp closed and permitting the work to be inspected and, if necessary, the sewing cycle repeated, by again fully depressing the treadle, without releasing the work. Alternatively, however, if it is desired to have the work clamp remain closed after the stopping of the machine, the hand lever 71 is moved in the direction of the arrow *f*, Fig. 1, a sufficient distance to lift the link 75 into such an elevated position that the lug 80 will not engage and depress the latch block 76 when the buttonhole cutter lever is operated. Thereafter the clamp can be manually opened and the parts restored to their normal positions by movement of the hand lever 71 in

the direction of the arrow *e* into the position shown in Fig. 1.

It is obvious that, in place of the treadle 93, a hand or knee operated lever might be employed, and the term "manually operated member" as hereinafter used, is intended to include all such equivalent foot, leg, hand, etc. operated devices.

I claim:

1. In a buttonhole sewing machine, starting and stopping mechanism, a work clamp, means tending normally to close said clamp, means, including a member automatically actuated incidentally to the movement of said mechanism into stopping position and a connection between said member and work clamp to open the latter when said member is actuated and hold the same open when the machine is at rest, and controlling means including a manually operated member movable from its normal position into an extreme position to cause said mechanism to start the machine and into an intermediate position to interrupt said connection.

2. In a buttonhole sewing machine, starting and stopping mechanism, a work clamp, means tending normally to close said clamp, means, including a member automatically actuated incidentally to the movement of said mechanism into stopping position and a connection between said member and work clamp to open the latter when said member is actuated and hold the same open when the machine is at rest, and controlling means including a manually operated member movable from its normal position into an extreme position to cause said mechanism to start the machine and into an intermediate position to interrupt said connection, said controlling means, when said manually operated member is in its intermediate position, permitting said mechanism to stop the machine upon the completion of the buttonhole sewing cycle while holding said connection interrupted.

3. In a buttonhole sewing machine, starting and stopping mechanism, means tending normally to move said mechanism into stopping position and hold the same therein, controlling means including a manually operated member movable into one position to move said mechanism into starting or running position, means for holding said mechanism in running position and for automatically releasing the same substantially upon the completion of the buttonhole sewing cycle, a work clamp, means for automatically opening said work clamp upon the completion of the buttonhole sewing cycle and for holding it open while the machine is at rest, and means operated by movement of said manually operated member into another position for rendering said clamp opening and holding means inoperative while leaving said starting and stopping mechanism in stopping position or free to move thereinto.

4. In a buttonhole sewing machine, a work clamp, means tending normally to close said clamp, a manually operable clamp opening member, and means, including a connection from said member, for automatically opening said clamp upon the completion of the buttonhole sewing cycle, said member being movable into a position to render said connection inoperative.

5. In a buttonhole sewing machine, starting and stopping mechanism movable into starting and stopping positions, a work clamp, means tending normally to close said clamp, a member

moved under the control of said starting and stopping mechanism when the latter is in stopping position and immediately prior to the stopping of the machine, means, including a releasable latch, connecting said member and work clamp for opening the latter and holding the same open when the machine is at rest, a rock shaft, a manually operated member for rocking said shaft, an arm on said rock shaft for moving said starting and stopping mechanism into starting position, and a finger on said rock shaft for releasing said latch, said arm and finger being so arranged on said shaft as to cause said finger to release said latch by a less movement of said manually operated member than that required to cause said arm to move said starting and stopping mechanism into starting position.

6. In a sewing machine, starting and stopping mechanism operable to start the machine and also acting automatically, when permitted, to stop the machine upon the completion of a predetermined sewing cycle, work clamping mechanism, and common controlling means for said mechanisms including a single manually operated member movable selectively into one position to permit said first named mechanism to stop the machine without causing said last named mechanism to unclamp the work or into another position to permit said first named mechanism to stop the machine and the last named mechanism to unclamp the work.

7. In a sewing machine, starting and stopping mechanism operable to start the machine and also acting automatically, when permitted, to stop the machine upon the completion of a predetermined sewing cycle, work clamping mechanism, and common controlling means for said mechanisms including a single manually operated member movable selectively into positions to cause said last named mechanism to clamp the work either with or without causing said first named mechanism to start the machine, and to permit said first named mechanism to stop the machine either with or without causing said last named mechanism to unclamp the work.

8. In a sewing machine, a work clamp, mechanism automatically operable to stop the machine on completion of a predetermined sewing cycle of the machine, means operated in timed relation with the operation of said mechanism to open said clamp, and manually operable means to render said clamp opening means inoperative.

9. In a sewing machine, a work clamp, mechanism movable into positions to start and stop the machine, a device causing automatic movement of said mechanism into stopping position on completion of a sewing cycle of the machine, means operated in timed relation with the movement of said mechanism into stopping position to open said clamp, and manually operable means to render said clamp opening means inoperative.

10. In a sewing machine, a work clamp, mechanism movable into positions to start and stop the machine, a device causing automatic movement of said mechanism into stopping position on completion of a sewing cycle of the machine, means operated in timed relation with the movement of said mechanism into stopping position to open said clamp, and means operable to move said mechanism into starting position and further operable to render said clamp opening means inoperative.

11. In a sewing machine, a work clamp, mechanism movable into positions to start and stop the machine, a device causing automatic move-

ment of said mechanism into stopping position on completion of a sewing cycle of the machine, means operated in timed relation with the movement of said mechanism into stopping position to open said clamp, and means operable to cause said clamp to close and move said mechanism into starting position and further operable to render said clamp opening means inoperative.

12. In a sewing machine, a work clamp, mechanism movable into positions to start and stop the machine, a device causing automatic movement of said mechanism into stopping position on completion of a sewing cycle of the machine, means operated in timed relation with the movement of said mechanism into stopping position to open said clamp, and means manually movable into positions to cause said clamp to close and to move said mechanism into starting position, respectively, and further manually movable into a position to render said clamp opening means inoperative.

tion, respectively, and further manually movable into a position to render said clamp opening means inoperative.

13. In a sewing machine, a work clamp, mechanism movable into positions to start and stop the machine, a device causing automatic movement of said mechanism into stopping position on completion of a sewing cycle of the machine, means operated in timed relation with the movement of said mechanism into stopping position to open said clamp, and means manually movable in one direction into successive positions to cause said clamp to close and to move said mechanism into starting position, respectively, and further manually movable into a position to render said clamp opening means inoperative.

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