

Sept. 20, 1949.

N. T. ALMQUIST

2,482,607

BUTTONHOLE ATTACHMENT FOR SEWING MACHINES

Filed April 12, 1946

2 Sheets-Sheet 1

Fig. 1.

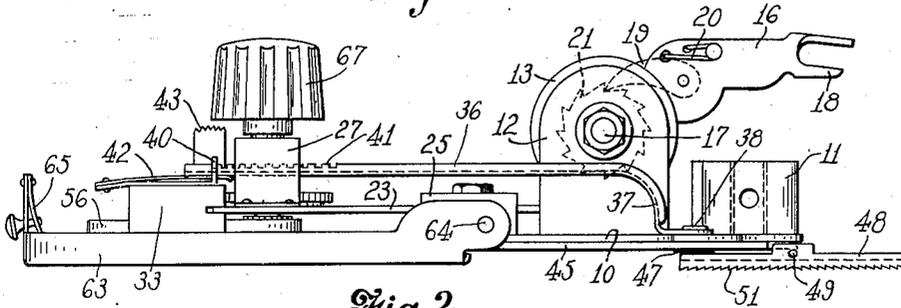


Fig. 2.

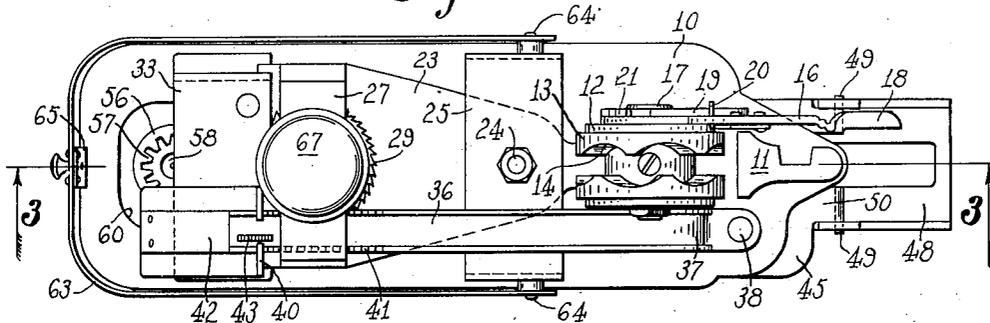


Fig. 3.

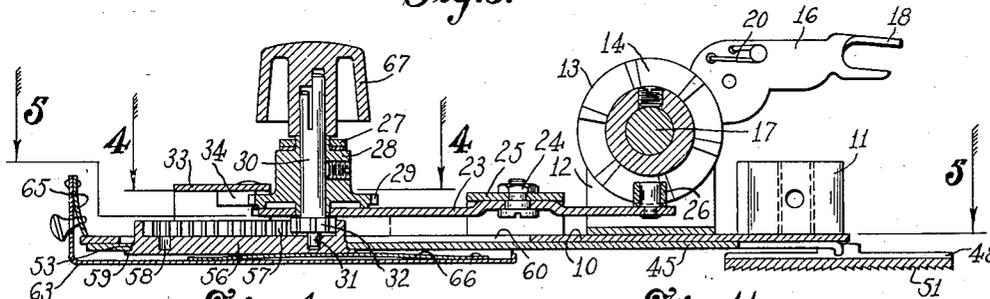


Fig. 4.

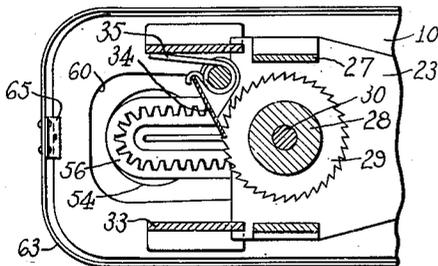
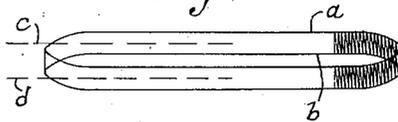


Fig. 11.



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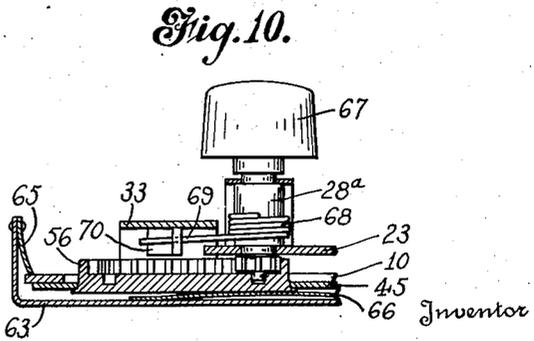
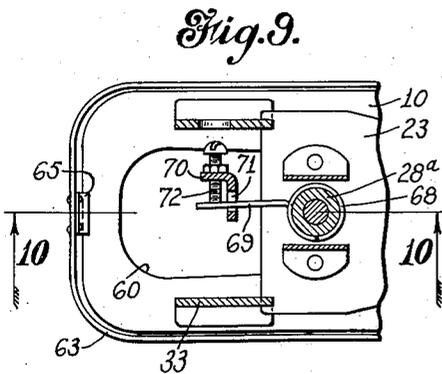
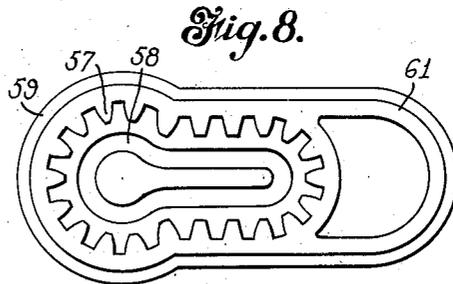
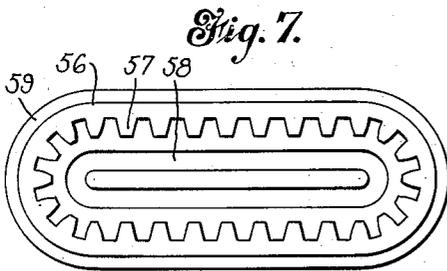
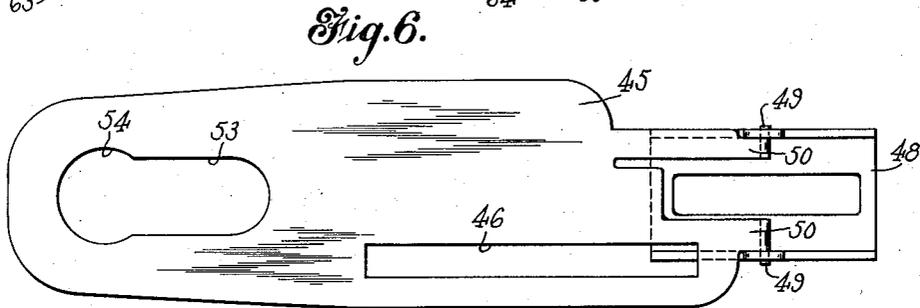
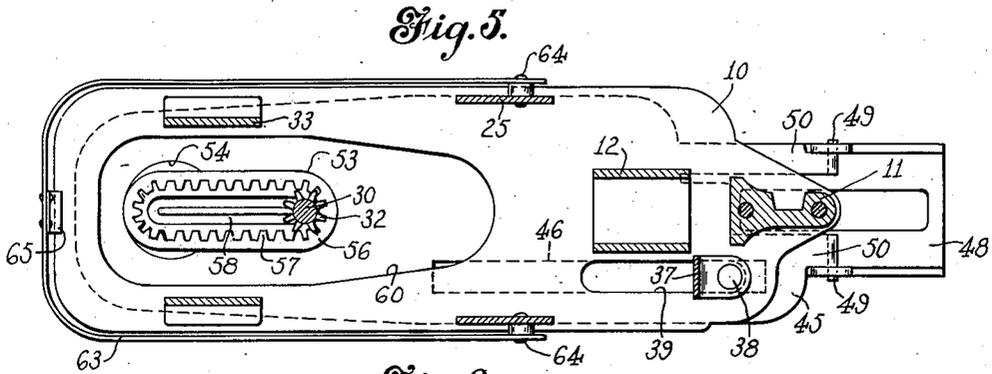
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BUTTONHOLE ATTACHMENT FOR SEWING MACHINES

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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BUTTONHOLE ATTACHMENT FOR SEWING MACHINES

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18 Claims. (Cl. 112-77)

1

This invention relates to sewing machine attachments, and more particularly to a buttonhole attachment for sewing machines. The invention also relates particularly to the provision of an attachment of this character for use with ordinary household sewing machines, and in the operation of the present device in stitching a buttonhole the work is reciprocated laterally for the formation of the buttonhole stitches and also fed lengthwise of the buttonhole to stitch along one side thereof. When the line of stitching reaches the end of the buttonhole or the end of the feed, the feed will be reversed and the material shifted laterally or transversely of the line of stitches, so that the opposite side of the buttonhole will be stitched. All of the above operations are performed automatically, so that a continuous line of stitches entirely surrounding the buttonhole will result without the necessity for any intervention of the operator.

The stitching upon each side of the buttonhole is somewhat in the nature of a zig-zag stitch, and it is advantageous that the lateral oscillatory movements of the feed blade which produce this stitch be capable of adjustment in order to adjust the width of these stitches or the "bite," as this is usually called. It is also desirable that the spacing of the two lines of stitching be adjustable so as to vary the distance between the median line of stitching on one side of the buttonhole and the median line of stitching on the other side thereof to make wide or narrow buttonholes. A third adjustment is also necessary, which is the adjustment of the length of the line of stitching in order to make buttonholes of different lengths. In order words, with such an attachment it is necessary that a buttonhole of any size, within limits, be possible and that the "bite" or the width of the stitch at each side of the buttonhole also be varied.

One object of the present invention is to provide a new and improved buttonhole attachment for sewing machines which will be efficient in operation and which will be of relatively simple construction.

A further object of the invention is to provide a buttonhole attachment for sewing machines which will possess all of the necessary adjustments for the making of buttonholes of different sizes, which adjustments may be made in a relatively simple manner so that they may be made by any user of the machine.

A still further object of the invention is to provide a buttonhole attachment for sewing ma-

2

chines which will be comprised of relatively few parts and be relatively simple in construction, and which will, at the same time, have all of the necessary adjustments required in a device of this kind.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a side elevational view of a buttonhole attachment for sewing machines embodying my invention;

Fig. 2 is a top plan view of the same;

Fig. 3 is a sectional view on line 3-3 of Fig. 2;

Fig. 4 is a fragmentary sectional view on line 4-4 of Fig. 3;

Fig. 5 is a sectional view on line 5-5 of Fig. 3;

Fig. 6 is a top plan view of the feed blade apart from the remaining structure;

Fig. 7 is a top plan view of one of the rack units or templets detachably secured to the feed blade;

Fig. 8 is a similar view of a rack unit or templet of different shape;

Fig. 9 is a view similar to Fig. 4 showing a slight modification of my device;

Fig. 10 is a sectional view on line 10-10 of Fig. 9; and

Fig. 11 is a diagrammatic view of the type of stitch effected by the attachment.

To illustrate one embodiment of my invention, I have shown a buttonhole attachment for sewing machines comprising a supporting frame comprising a base plate 10 having attaching means 11 thereon by which it may be secured to the presser bar of the sewing machine.

Upstanding from this base plate are a pair of spaced standards 12 in which are rotatably mounted a cam roll 13 having a cam groove 14 therein of zig-zag shape intended to impart oscillatory movement to a cam follower received therein, as will be hereinafter explained, this oscillatory movement being in a direction laterally or transversely of the longitudinally dimension of the attachment.

The cam roll or wheel 13 is designed to be operated in a step-by-step movement, and for this purpose an actuating lever 16 is pivoted on the shaft 17 of the wheel, this lever being provided with a forked end 18 to be attached to the needle bar in the usual manner. The lever 16 carries a pawl 19 urged by a spring 20 into engagement with a ratchet wheel 21 made rigid with the cam 13 so that operation of the ratchet wheel in a step-by-step movement by reciprocation or oscil-

lation of the lever 16 will effect step-by-step movement of the cam.

A lever 23 is pivoted at 24 to a bracket 25 carried by the base plate 10, this lever having on its forward end a follower 26 disposed in the cam track or groove 14, so that as the cam 13 rotates the lever 23 will be oscillated about its pivot 24.

It will be noted that the lever 23 is relatively wide at its rear end and is in the form of a flat plate. Upon the rear end of this lever is mounted a bearing bracket 27, and the hub 28 of a ratchet wheel 29 is rotatably mounted in this bracket and in the lever 23. Secured to this hub is a shaft 30 which extends through the lever 23 and terminates in a downwardly projecting pin 31. Formed integrally with, or rigidly secured to this shaft, is a pinion 32 disposed below the lever 23.

A bridge member 33 is secured to the supporting plate 10, this bridge member being disposed in a position spaced above the plate and overlying the ratchet 29. Pivotaly mounted at the lower surface of the bridge member 33 is a pawl 34 urged by a spring 35 into engagement with the ratchet wheel 29.

It will be remembered that the plate or lever 23 rotatably carrying the pinion 32 is oscillated laterally of the longitudinal dimension of the attachment by rotation of the cam wheel 13, this oscillation taking place in an up-and-down direction as viewed in Fig. 4. From this figure, it will be apparent that, as the pawl 34 is mounted on a fixed part of the frame of the device, the oscillation of the lever 23 and the ratchet wheel 29 carried thereby will effect step-by-step rotation of this wheel and of the pinion 32. Movement of the ratchet wheel toward the bottom of the sheet, as viewed in Fig. 4, or away from the pawl will result in the latter riding idly over the teeth of the wheel, while movement of the lever 23 and the wheel in the opposite direction, or toward the top of the sheet of the drawing, will result in the engagement of the pawl with the teeth of the wheel and the rotation of the latter and, therefore, the rotation of the pinion 32. Therefore, each movement of the lever 23 in one direction effects a partial rotation of the pinion 32.

An adjusting lever 36 is slidably mounted with respect to the supporting plate 10, the forward end of this lever being bent downwardly, as shown at 37, and carrying a pivot pin 38 slidably mounted in a slot 39 in the plate, so that the lever can be adjusted with respect to the plate. At its rear end, this lever passes through a stirrup 40 secured to the bridge 33 and is provided at its upper surface with a plurality of notches or teeth 41 adapted to be forced into engagement with the upper portion of the stirrup by a leaf spring 42. A fingerpiece 43 is mounted upon the lever so that it may be depressed by pressure of the finger thereon and the teeth 41 released from the stirrup to permit adjustment of the lever in the slot 39. Thus, while the lever 36 may be adjusted longitudinally of the plate 10, it will be held in any given position by engagement of the teeth 41 with the stirrup 40.

A feed blade 45, shown in detail in Fig. 6 of the drawings, is mounted below the plate 10 for both sliding movement in a longitudinal direction and oscillatory movement in a direction transverse to the longitudinal dimension of the attachment. This feed blade is provided with a slot 46 which slidably receives the pivot pin 38 upon the lower end of the adjusting lever 36, the head 47 of the pivot pin (Fig. 1) securing the blade against detachment from the pin. Thus this blade may swing or oscillate about the pivot pin 38 and also

slide longitudinally relatively to this pin as permitted by the slot 46.

Adjacent its front end a presser foot or feeding foot 48 is pivoted at 49 to forwardly extending legs 50 of the blade 45. The presser foot 48 may be roughened upon its lower surface 51, as is usual, so as to engage the goods and properly feed the goods both longitudinally and laterally of the device during its operation. It will be understood that the attachment is employed in connection with a cover plate (not shown) which covers up the usual feeding mechanism of the sewing machine, so that the entire feed of the goods is obtained through the foot 48 and feed blade 45 to which the foot is pivoted.

Adjacent its rear end the feed blade 45 is provided with an opening 53, this opening being preferably of keyhole shape in that it is enlarged at its rear end, as shown at 54. Within this opening is snugly, but freely, received the frame 55 of a rack member or unit, which member is provided adjacent its outer wall with an endless series of rack teeth 57. This member is also provided with an oblong or oval groove or track 58 within the series of teeth 57, the series of teeth also being of oval or oblong shape in this form of my invention. Adjacent its outer edge the frame 55 is provided with a laterally extending flange 59 adapted to abut against the lower surface of the blade 45 about the edges of the opening 53, as shown, for example, in Fig. 3.

As will be apparent from Figs. 3 and 5, when the rack unit 56 is in place it will project forwardly through an opening 60 in the supporting plate 10, this opening being relatively large so as to provide for the sliding and lateral movements of the feed blade 45 and the rack unit which is carried thereby. Also, the pilot pin 31 on the lower end of the shaft 30 is received in the groove or track 58 of the rack unit, and the pinion 32 is also received in this unit and its teeth engaged with those of the rack 57.

From the above description it will be apparent that, as the pinion is rotated, the rack member 56 and rear end of the feed blade will be caused to travel in a more or less generally oval path as determined by the engagement of the pilot pin 31 in the groove 58. It may also be noted that this pilot pin serves to connect the oscillating lever 23 with the feed blade 45 so that, as the lever is oscillated by the cam 13, the rear end of the feed blade will likewise be oscillated, thus effecting an oscillatory movement of the presser foot 48 and of the material engaged by the presser foot, so as to effect the zig-zag line of stitching at each side of the buttonhole.

As has been stated above, the rack member 56 is freely, though snugly, received in the opening 53, so that it may be replaceable by a different unit having the same outside dimensions but having a series of rack teeth and groove 58 of different length or shape, so as to make buttonholes of different length, shape, or width. For example, as shown in Fig. 8, a rack unit 61 is shown which may be inserted into opening 53 of the blade 45 interchangeably with the rack unit 56, the unit 61 being adapted to make a buttonhole of keyhole shape.

In order to hold these rack units in place, a lower cover 63 is provided, which cover is hinged to the base plate 10 at 64 (Figs. 1 and 2) and is provided at its free end with a spring latch 65 engaging the upper surface of the base plate 10 to hold it in place. Upon the upper surface of

5

this cover is a flat spring 66 which bears against the rack unit 56 and holds it in place.

Upon the upper end of the shaft 30 is secured a knob 67 by which this shaft may be turned so as to advance the rack unit and the feed blade manually, if desired, in order to begin stitching at any desired place around the periphery of the buttonhole.

In Figs. 9 and 10 of the drawings, I have shown a modified form of my invention in that a different construction is employed to impart an intermittent feed or rotation of the pinion 32. In this form of my invention the hub 28^a is somewhat smaller than the hub 28 shown in Fig. 3. About this hub a spring 68 is coiled, the lower end of which spring is secured at 69 to a lug 70 on the lower surface of the bridge member 33. It will be noted that, as shown in Fig. 9, the spring passes through an elongated opening 71 in the lug 70, and an adjusting screw 72 serves to hold the end of the spring against movement so that the feed may be adjusted by turning this screw. It will be obvious that with this arrangement, when the lever 23 is moved in one direction, the spring will be tightened about the hub 28^a and cause this hub to rotate, thus rotating the shaft 30 and pinion 32, while, when the lever 23 is moved in the other direction, the spring will be relieved of its grip upon the hub and the pinion 32 will remain at rest.

The operation of my device is briefly as follows: When the lever 16 is oscillated by the reciprocation of the needle bar, the cam roll or wheel 13 will be given a step-by-step movement through the pawl 19 and ratchet wheel 21. By the engagement of the pin 31 and pinion 32 with the rack unit 56 which is held snugly in place in the feed blade 45, the oscillation of the lever 23 by the movement of the cam wheel 13 will be imparted to the feed blade. This effects lateral oscillation of the forward end of the feed blade and, therefore, of the presser foot 48 and the goods carried thereby so as to move the material back and forth and effect the zig-zag stitching, shown in Fig. 11, this movement moving the needle from points in the line *a*, for example, to points in the line *b*, and vice versa.

At the same time, the pinion 32 will be caused to rotate, and by its engagement with the teeth of the endless rack of the rack unit 56 the feed blade will be caused to move slidably and in a longitudinal direction relatively to the frame of the attachment. Due to the engagement of the pin 31 in the groove or track 58 this will cause the rear end of the feed blade to travel in an oblong path and thus produce the closed line of stitching shown in Fig. 11. During this movement the feed blade moves about the pivot pin 38 and also slides longitudinally with respect to this pin as permitted by the slot 46.

If it is desired to change the "bite" or the width of the stitching between the line *a* and the line *b*, this may be done by moving the lever 36 which moves the pivot point 38 and, therefore, changes the movement of the front end of the feed blade with respect to the movement of the rear end by changing the application of the pivot point.

The length and the general shape of the button hole is determined by the shape of the guide groove 58 and the rack teeth of the rack unit 56 so that, if a shorter buttonhole is desired or one of keyhole shape, a different rack unit is employed which, as already described, may be readily inserted in place.

If it is desired to vary the spacing of the stitch-

6

ing which is the distance between the median line of the stitching at one side of the buttonhole and that at the other side, or the distance between the lines *c* and *d* in Fig. 11, this may be done also by movement of the lever 36 as movement of the pivot pin 38 not only changes the lateral throw of the feed blade in making the stitches, but also changes to a degree the lateral throw of the feed blade at the end of the buttonhole when the pilot pin is passing over the oblong ends of the endless track, so that two adjustments are effected by the lever 36. It is understood that the spacing is also partly determined by the distance between the opposite runs of the track 58, but the determination in this respect is modified by the position of the pivot pin 38.

While I have shown and described some preferred embodiments of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What I claim is:

1. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, and cooperating interengaging means mounted upon said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever.

2. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, and cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever.

3. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, and a rack on said blade with which said pinion is engaged.

4. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, and means for effecting rotation of said pinion by the oscillatory movement of the lever.

5. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, coop-

erating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, means for effecting rotation of said pinion by the oscillatory movement of the lever, and an endless rack on said blade with which said pinion is engaged.

6. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, and a rack on said blade with which said pinion is engaged, said rack being rigidly secured to the blade whereby said blade is moved in one direction upon rotation of the pinion and in a transverse direction by oscillation of said lever.

7. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a pinion engaged with the teeth of said rack member, means carried by the frame for supporting said pinion for rotating movement and for oscillating movement about a point remote from its axis, and means for simultaneously rotating said pinion and oscillating it about said point.

8. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a lever pivoted to the frame and oscillated by the movement of the needle bar, a pinion rotatably carried by the lever and engaged with said rack member, and means for effecting intermittent rotation of the pinion upon oscillation of the lever.

9. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, means for effecting rotation of said pinion by the oscillatory movement of the lever, and means for rotating said pinion independently of the movement of the lever.

10. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a pinion engaged with the teeth of said rack, means supporting said pinion on the frame for rotation about its axis and for oscillation about a point remote from its axis, and means for simultaneously rotating said pinion and oscillating it about said point, said rack member being removably secured to the blade whereby it may be replaced by another.

11. In a buttonhole attachment for sewing ma-

chines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a pinion engaged with the teeth of said rack member, means carried by the frame for supporting said pinion for rotating movement and for oscillating movement about a point remote from its axis, and means for simultaneously rotating said pinion and oscillating it about said point, said blade having an opening therein, and said rack member being snugly and removably received in said opening.

12. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, said feed blade being provided with an opening for selectively receiving one of a plurality of rack members, a rack member removably disposed in said opening, a pinion engaged with the teeth of said rack member, means carried by the frame for supporting said pinion for rotating movement and for oscillating movement about a point remote from its axis, and means for simultaneously rotating said pinion on its axis and oscillating it about said point.

13. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a pinion engaged with the teeth of said rack member, means carried by the frame for supporting said pinion for rotating movement and for oscillating movement about a point remote from its axis, means for simultaneously rotating said pinion and oscillating it about said point, said rack member having an endless series of teeth thereupon to move said feed blade in an oblong path to stitch around a buttonhole, and means for adjusting the bite of the stitch.

14. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a pinion engaged with the teeth of said rack member, means carried by the frame for supporting said pinion for rotating movement and for oscillating movement about a point remote from its axis, means for simultaneously rotating said pinion and oscillating it about said point, said rack member having an endless series of teeth thereupon to move said feed blade in an oblong path to stitch around a buttonhole, and means for adjusting the spacing of the stitching on one side of the buttonhole from that on the other side.

15. In a buttonhole attachment for sewing machines having a needle bar, a supporting frame, a feed blade carried by the frame for pivotal and sliding movements relatively thereto, a rack member fixedly secured to said blade, a pinion engaged with the teeth of said rack member, means carried by the frame for supporting said pinion for rotating movement and for oscillating movement about a point remote from its axis, means for simultaneously rotating said pinion and oscillating it about said point, said rack member having an endless series of teeth thereupon to move said feed blade in an oblong path to stitch around a buttonhole, and means for adjusting the position of the pivotal connection of the feed blade with the frame to adjust both the bite and spacing of the stitching.

9

16. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said means including a rack member, said feed blade having an opening therein, and said rack member being snugly received in said opening, and means to removably hold said rack member in place.

17. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, means for effecting rotation of said pinion by the oscillatory movement of the lever, said means com-

10

prising a ratchet wheel on said pinion shaft, and a cooperating pawl mounted on the plate.

18. A buttonhole attachment for sewing machines, comprising a supporting plate, a lever pivotally mounted thereon, means for oscillating said lever in a substantially horizontal plane, a feed blade, means connecting said blade to the plate for oscillatory and sliding movement, cooperating means carried by said lever and feed blade for actuating the latter in both oscillatory and sliding movements by the oscillatory movement of the lever, said last-named means comprising a pinion carried by said lever, and means for effecting rotation of said pinion by the oscillatory movement of the lever, said means comprising a spring coiled about the shaft of said pinion and having one end fixed with respect to the plate.

NILS T. ALMQUIST.

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