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BUTTONHOLE WORKING ATTACHMENT FOR SEWING MACHINES

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4 Sheets-Sheet 1

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By
This invention relates to an improved attachment adapted to be applied to any well-known type of sewing machine and arranged to automatically work buttonholes of various sizes without the necessity of feeding or guiding the material by the operator.

A further object is to provide in a device of this character improved means whereby the feeding movement of the material will be accelerated at the end of the buttonhole is approached, whereby the stitches will be prevented from "piling up" at the ends of the buttonhole, and will be maintained regular and uniform, thereby obviating the formation of thick and unsightly ends, and improved means whereby the same results will be accomplished by sewing once around the buttonhole, that has heretofore necessitated sewing twice around the buttonhole.

A further object is to provide an improved device of this character by means of the use of which the cloth feeder plate will be given a lateral oscillatory movement on each side of the buttonhole, and at the same time a longitudinal movement to advance the material with respect to the needle, and improved means whereby the needle will be caused to take a plurality of stitches after each lateral movement of the cloth feeder plate, on each side of the center of the buttonhole to lock the stitches into the fabric and before the cloth feeder plate is shifted laterally on each side of the center of the buttonhole.

A further object is to provide an improved combined stitch regulator and equalizer, which latter provides an acceleration due to the decrease of travel while approaching the dead center on the ends of the buttonhole, and for a short distance from the ends.

A further object is to provide an improved device of this character in which the parts are reversible to accommodate machines where the needles and presser foot bars are differently located.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention and in which.

Figure 1 is a perspective view of an attachment of this character constructed in accordance with the principles of this invention and showing the same as applied to the presser foot bar of an ordinary sewing machine.

Figure 2 is a diagrammatic view showing the manner in which the stitches are formed.

Figure 3 is a top plan view of the attachment with parts broken away and with parts of the needle bar and presser foot bar in horizontal section.

Figure 4 is a detail top plan view of the stitch regulator and equalizer disc.

Figure 5 is a side elevation of the parts shown in Figure 3.

Figure 6 is a detail perspective view of the cloth feeder plate.

Figure 7 is a vertical sectional view taken on line 7-7, Figure 3.

Figure 8 is a vertical sectional view taken on line 8-8, Figure 7.

Figure 9 is a vertical, transverse sectional view taken on line 9-9, Figure 3.

Figure 10 is a top plan view of the attachment, with parts broken away and showing the parts in a different position from the positions shown in Figure 3.

Figure 11 is a bottom plan view of the attachment with parts omitted.

Figure 12 is a view similar to Figure 11, showing the parts in a different position.

Figures 13 and 14 are top plan views of the forward portion of the cloth feeder plate showing the same in different positions it will assume while feeding the material during the operation of the sewing machine.

Referring more particularly to the drawings the numeral 20 designates a base plate upon which are mounted various parts of the attachment, and projecting above the base plate is an upright 21 having at its upper end a clamp or yoke 22 adapted to embrace the presser foot bar 23 of the sewing machine, after the presser foot has been removed.

Screws 24 are provided and threaded into the yoke 22 to rigidly secure the attachment to the presser foot bar.
Rotatable supported by the lower face of the base plate arc cam members 25—26, one preferably located adjacent the forward end of the base plate and the other adjacent the rear end. The cam 25 rotates within an opening 27 in a plate or member 28 that is provided with a projection 29 preferably of the ball type, journaled in a seat 30 carried by a lever 31. The lever 31 is pivotally connected by one end as at 32 to the base plate 20, and the other end thereof projects beyond the other side of the base plate 20 and is bent over the edge of a projecting portion 33 of the base plate as at 34, and a screw 35 passes through the bent over portion of the lever as at 46, frictionally bind or hold the lever in position after it has been moved about its pivot 32.

The plate or member 28 is provided with a projection 36 which carries a depending pin 37 that projects into and operes within a slot 38 that extends through and longitudinally of a cloth feeder plate 39.

The cam 26 operates within an opening 40 in a plate or member 41, and which plate or member is provided with a projection 42 preferably of the ball type, which is journaled and seated within a seat 43 carried by a lever 44 that is pivotally mounted by one end as at 45 upon the base plate 20 and the other end of the rod projects beyond the edge or portion 46 of the base plate 20 and is bent over the edge of such portion 48 as at 47, and a screw 48 passes through the bent over portion so as to frictionally bind the end of the lever with respect to the projecting portion 43 of the base plate 20 so as to hold the lever in a position to which it may be adjusted about its pivot 45.

The plate 41 is also provided with a projection 49 carrying a depending pin 50 which projects into and also operates within the slot 38 in the cloth feeder plate 39 so that the cloth feeder plate 39 will be adapted for a longitudinal feeding movement and the pins 37 and 50 will cooperate with the sides of the slot 38 in the cloth feeder plate, in a manner to be later set forth and thereby impart a lateral oscillatory movement to the cloth feeder plate during the advancing movement of the cloth feeder plate, as well as a turning of the plate so as to shift the active end thereof from one side to the other side of the center of the buttonhole.

The cam 25 is secured to the shaft 51 of a rotatable ratchet wheel 52 and the shaft 51 (see particularly Figures 7 and 8) is shunted to form a bearing 53 for which an oscillatory cam member 54 is mounted and which rests upon the base plate 20. This cam member 54 is provided with teeth 55 with which teeth 56 on a segment member 57 mesh, the segment member being pivotally mounted as at 58 upon an upright 59 secured to the base plate 20, the cam member 54 being adapt-
will be to recede to permit the clutch member 71 to move with respect to the hub but when the clutch member is moved in the opposite direction the balls 78 will frictionally grip the hub 69 and will turn the latter and with it the cam 26 and the accelerator cam 70, for a purpose to be set forth.

The clutch member 71 is operated by means of an arm 77 secured thereto and this arm projects over the base plate 20 and in close proximity thereto. A stop 73 having a shoulder 79 is pivotally mounted upon the bed plate 20, and the shoulder 79 is so arranged that it may be positioned by moving the stop 73 about the pivot 80, so that the lever or arm 77 will engage the stop after any desired angle or extent of movement of the arm 77, thereby controlling or regulating the extent to which the accelerator cam 70 will be moved upon each operative movement of the arm or lever 77. The stop member 78 is moved about its pivot in any desired or suitable manner, preferably by means of the screw 81 threaded through a portion 82 of the stop and the screw is provided with a knob or head 83 preferably having a knurled periphery, so that the screw may be adjusted with respect to the portion 82 of the stop. A spring 84 may be provided to serve as a tension or friction device for holding the screw in its adjusting position.

The end of the screw 81 (see particularly Figures 7 and 10) is adapted to engage the periphery of the accelerator cam 70 so that the position of the shoulder 79 on the stop 78 will be controlled by the accelerator cam 70. This cam 70 (see particularly Figures 3 and 5) is preferably elliptical in cross section, that is with the portion 55 of a smaller diameter than the portion 56 of the cam, so that as the cam 70 is rotated, the position of the shoulder 79 will be varied by the extent of movement of the stop 78 about the pivot 80, and this varying movement will be accomplished by the different portions of the periphery of the cam 70 moving into engagement with the end of the screw 81. A suitable spring 87 is provided which tends normally to move the arm 77 against the shoulder 79 of the stop.

The arm 77 and with it the clutch member 71 are adapted to be moved against the stress of the spring 87 and away from the stop 79 by means of the cam 54 which engages the end of the arm 77, the latter being located in close proximity thereto to move the arm away from such shoulder and against the stress of the spring 87, gradually as the high portion of the cam 54 moves into contact with the arm 77. As the low portion of the cam approaches the arm 77, the spring 87 tends to move the arm 77 against the shoulder 79 of the stop 78.

Thus it will be manifest that the rotation of the accelerator cam 70 and hub 69 depend upon the oscillatory movement of the clutch member 71 and the arm 77 and this in turn is controlled by the actuation of the cam 54. The cam 54 is oscillated by means of the reciprocation of the needle bar 68, through the medium of the arm 62, segment member 57, and teeth 56 meshing with the teeth 55 on the cam 54.

The base plate 20 is suitably recessed so as to receive the cams 26 and 27 as well as the members 26—41. The cloth feeder plate 39 is arranged below the base plate 20 and is provided with an elongated opening 88 through its body portion which extends for a considerable distance lengthwise of the plate and is held in position with respect to the base plate 20 by means of a cap plate 59, having secured to the inner face thereof and intermediate its ends, a leaf spring 90. The ends of the spring 90 are yieldingly spaced from the face of the cap plate 59 and are of a width to project into the opening 88 in the cloth feeder plate 39, and to rest against the bottom faces of the cams 26—28 and of the plates or members 26—41. This plate is held in position by means of suitable screws 51—52. The screw 51 passes through the plate 59 and is provided with a head engaging the outer surface of the plate while the screw itself passes through the spring 90 and is threaded into the hub or portion 51 of the ratchet wheel 52. The screw 52 also passes through the plate 59 as well as through an opening in the spring 90 and is provided with a head which engages the outer surface of the plate 59 and is threaded into the hub 69 in the accelerator cam 70. The spring 90 serves as a friction device or brake to prevent overthrow of the parts.

The extremity 93 of the cloth feeder plate is preferably reduced in width with respect to the width of the feeder plate 39 and projects beyond the forward edge of the base plate 20 having an elongated slot 94 therethrough. The lower face of the reduced portion 93 of the feeder plate is provided with teeth 95 which also extend about the outer periphery as well as the inner periphery of the portion 93 to engage the cloth to advance the same. This opening 94 is of considerable width with respect to the diameter of the needle and is of a width to permit of an oscillatory movement being imparted to the end 93 of the cloth feeder plate on each side of the center of the buttonhole, as will be hereinafter more fully described, and the needle passes through this opening 94.

Projecting above the rear end of the cloth feeder plate 39 is an upright 96 which is provided with a forwardly projecting portion 97 to which portion is pivoted as at 98 a link 99. This link may be of any desired length and is connected to a slide 100 by means of a suitable connecting device, such as a thumb screw 101. The lower face of the slide 100
is preferably recessed as at 102 and undercut. A guide or rib 103 is secured to the upper face of the accelerator cam 70 and is shaped to fit within the recess 102, the rib being secured to the accelerator cam in any suitable manner, as by means of suitable screws 104. The screw 101 is preferably a thumb screw and passes through a head 105 with which a shoulder 106 on the thumb screw co-operates, so that by adjusting the thumb screw to loosen the same the slide 100 may be adjusted lengthwise of the rib or guide 103, in directions toward and away from the axis of rotation of the accelerator cam 70 and by such adjustment, the length of longitudinal movement of the cloth feeder plate may be varied.

In the operation of the device the cam 25 during its rotation, will impart a lateral oscillatory movement to the cloth feeder plate and the rapidity of such oscillatory movement will be controlled by the rapidity of the operation of the needle of the sewing machine.

As the needle rises and falls the cam 25 will be rotated and the cam is so shaped that the desired extent of oscillatory movement will be imparted to the cloth feeder plate. As the cam 25 rotates, the plate or member 27 will be rocked about its pivot (see Figure 11) and through the medium of the pin 27 and slot 38 in the cloth feeder plate 30, oscillatory movement will be imparted to the plate and during this oscillatory movement the cam 25 will be rotated through the medium of the clutch member 71. As the cam 51 is oscillated, the pawl 60 co-operating with the ratchet wheel 52 will rotate the cam 25 and by the oscillation of the cam 34, the arm 77 of the clutch member 71 will be moved against the stress of the spring 87, and through the medium of the balls 73 acting upon the periphery of the hub 69 of the accelerator cam 70, the latter will be rotated.

The extent of rotation of the accelerator cam will be controlled by the position of the screw 81 which controls the position of the shoulder 79 of the stop 78.

As the accelerator cam 70 rotates the link 99 will cause the cloth feeder plate to be advanced longitudinally. As the accelerator cam 70 rotates the cam 26 will also rotate and this cam is so shaped that it will co-operate with the sides or walls of the opening 40 in the member 41 to shift the cloth feeder plate from one side to the other side of the center of the buttonhole, and this shifting movement occurs as the cloth feeder plate moves the cloth with respect to the needle at the end of the buttonhole so as to cause a stitching around the ends of the buttonhole.

The cam 25 is so shaped that a lateral oscillatory movement will be given to the cloth feeder plate on each side of the buttonhole and the cam 25 is also so shaped that an interval of rest in the lateral oscillation will be given to the cloth feeder plate during every other stitch of the needle. That is, the cam 25 will hold the cloth feeder plate in such a manner that the needle will be caused to make a plurality of stitches at the end of each successive lateral movement as shown diagrammatically in Figure 2, so that the thread will lock into the cloth, and with the further result that perfect stitches will be formed at the ends of the buttonhole and the stitches will not pile up while the needle is rounding the ends of the buttonhole.

By the adjustment of the end of the link 99 with respect to the accelerator cam 70, toward or away from the axis of rotation of the cam the length of the advancing movement of the cloth feeder plate may be controlled or varied and by the adjustment of the screw 81 co-operating with the periphery of the accelerator cam 70, the length of the stitches or space between the stitches may be varied. Also by the adjustment of the screw 81, the degree of acceleration of the advancing movement of the cloth feeder plate may be varied.

In Figure 13, the cloth feeder plate is shown in dotted lines in the position which it will assume during the formation of the stitches or the lateral oscillation of the cloth feeder plate on one side of the buttonhole, and in full lines the position which the cloth feeder plate will assume as it moves across one end of the buttonhole to the other side of the center of the buttonhole.

Likewise in Figure 14, the same steps of operation are indicated, showing in dotted line the position which the cloth feeder plate will assume while forming the stitches on the other side of the buttonhole, and in full lines the manner in which the cloth feeder plate moves to the other side of the buttonhole as the stitches are made around the end of the buttonhole.

In order to provide a means for adjusting or fitting the mechanism to different machines, the upright 21 instead of being formed as a part of the base plate (see particularly Figure 1) it is formed separately therefrom and the upright 21 is secured to a base 107 which is provided with slots 108. This plate 107 is adapted to rest upon the base plate 20 and to be secured thereto by means of fastening screws 109 which pass through the slots 105 and into the base plate 20. By loosening these screws 109 it will be manifest that the whole structure which is supported by the upright 20 may be adjusted with relation to the base 107 and thereby vary the position of the mechanism with respect to the presser foot bar 23.

In applying this apparatus to a machine, it is first necessary to remove the presser foot and then to cover up the feed plate on ordinary machines. To that end a plate 110
is provided, which has an opening 111 there-
through and through which opening 111 the
needle 67 passes. This plate 110 is placed
in position over the feed device in the sew-
ing machine and is secured in position by
means of suitable fastening screws 112 pass-
ing through a slot 118 in the bed of the sewing
machine.

In Figure 2 there is diagrammatically
illustrated the manner in which the two
stitches are made between each successive
step of oscillation of the cloth feeder plate,
two of the stitches 114 being formed by the
needle at the end of each lateral movement
of the cloth feeder plate.

By adjusting the levers 31 and 41 about
their respective pivots 32 and 45, it will be
manifest that the degree of oscillatory move-
ment of the plates or members 28—41 may
be varied and through this means the extent of
oscillatory movement and of advancing move-
ment of the cloth feeder plate may be varied.

The cam 25 is provided with an active face
25° which co-operates with the plate or mem-
ber 28 for causing the oscillatory movement
of the plate about the pivot 20. This sur-
facer 25' is of a sufficient length that the at-
tachment will be adapted to be applied to
machines in which the needle bars of the
machine have different lengths of strokes,
and regardless of the length of stroke of the
needle bar, the cam surface 25° will always
maintain the oscillation of the plate or mem-
ber 28 in timed relation with the stroke of the
particular length stroke of the needle
bar. This will obviate the necessity of the
adjustment of the parts when the attach-
ment is applied to machines in which the
needle bars vary in the length of their stroke.

While the preferred form of the inven-
tion has been herein shown and described, it
is to be understood that various changes may
be made in the details of construction and in
the combination and arrangement of the sev-
eral parts, within the scope of the claims,
without departing from the spirit of this in-
vention.

What is claimed as new is:—

1. In a buttonhole working attachment for
sewing machines, a cloth feeder plate, means
for advancing the plate, and means for im-
parting a lateral oscillatory movement to the
plate on each side of the center of the but-
onhole, the last recited means embodying me-
chanism for causing the needle to make a
plu-
rality of stitches between successive lateral
movements, and means for varying at will
the extent of such lateral oscillatory move-
ments.

2. In a buttonhole working attachment for
sewing machines, a cloth feeder plate, means
for advancing the plate, means for impart-
ing a lateral oscillatory movement to the
plate on each side of the center of the button-
hole, the last recited means embodying me-
chanism for causing the needle to make a plu-
rality of stitches between successive lateral
movements, and means for varying at will
the extent of the advancing movement of the
cloth feeder plate.

3. In a buttonhole working attachment for
sewing machines, a cloth feeder plate, means
for advancing the plate, means for impart-
ing a lateral oscillatory movement to the
plate on each side of the center of the button-
hole, the last recited means embodying me-
chanism for causing the needle to make a plu-
rality of stitches between successive lateral
movements, and means for varying at will
the extent of the advancing movement of the
cloth feeder plate.

4. In a buttonhole making attachment for
sewing machines, a base plate, a lever piv-
ottally mounted by one end upon said plate,
means adjustably securing the other end of
the lever to the base plate, an oscillatory
plate, means pivotally connecting said oscil-
latory plate to said lever, said oscillatory
plate having an opening therein, a cam fit-
ing in said opening, a cloth feeder plate,
means for longitudinally moving said cloth
feeder plate with respect to the base plate,
said cloth feeder plate having a slot there-
through and extending longitudinally there-
of, and a pin on said oscillatory plate project-
ing into said slot for imparting oscillatory
movement to the cloth feeder plate, said pin
and slot operating to permit longitudinal
movement to the cloth feeder plate.

5. In a buttonhole making attachment for
sewing machines, a base plate, a lever piv-
ottally mounted by one end upon said plate,
the other end of the lever extending around
the edge of the base plate, a fastening screw
passing through the wall of the bent portion
of the lever and operating to clamp the end
of the lever to the base plate against adjust-
ment, an oscillatory plate, means pivotally
connecting said oscillatory plate to said le-
ver, said oscillatory plate having an opening
therein, a cam fitting in said opening, a cloth
feeder plate, means for longitudinally mov-
ing said cloth feeder plate with respect to the
base plate, said cloth feeder plate having a
slot there-through and extending longitudi-
nally thereof, and a pin on said oscillatory
plate projecting into said slot for imparting
oscillatory movement to the cloth feeder plate,
said pin and slot operating to permit longi-
tudinal movement to the cloth feeder plate.

6. In a buttonhole making attachment for
sewing machines, a base plate, two levers piv-
ottally connected by one end to the base plate,
two oscillatory plates each pivotally con-
ected to one of the levers intermediate the
ends of the latter, means adjustably securing
the other ends of the levers to the base plate,
said plates having central openings therein,
a rotary oscillating movement producing
a cam fitting in one of said openings, a switch
cam in the other opening, a cloth feeder
plate mounted to travel beneath the cam actuated plates, said cloth feeder plate having a longitudinal slot therein, projections on said oscillatory plates extending into said slot, means for actuating said cams, and means for advancing the cloth feeder plate.

7. In a buttonhole making attachment for sewing machines, a base plate, two levers pivotally connected with the plate, two oscillatory plates pivotally connected with the respective levers, means adjustably securing the free ends of the levers to the base plate whereby the extent of oscillatory movement of said plates about their points of pivotal connection with the levers may be varied, said plates having openings therethrough, a rotary oscillating movement producing cam fitting in one of said plates, a switch cam fitting in the opening in the other plate, a cloth feeder plate mounted to travel beneath the cam actuated plates, said cloth feeder plate having a longitudinal slot therein, projections on the oscillating plates extending into said slot, means for actuating the cams, and means responsive to the rotation of one of the cams to advance the cloth feeder plate.

8. In a buttonhole making attachment for sewing machines, a base plate, two levers pivotally connected with the plate, two oscillatory plates pivotally connected with the respective levers, means adjustably securing the free ends of the levers to the base plate whereby the extent of oscillatory movement of said plates about their points of pivotal connection with the levers may be varied, said plates having openings therethrough, a rotary oscillating movement producing cam fitting in one of said plates, a switch cam fitting in the opening in the other plate, a cloth feeder plate mounted to travel beneath the cam actuated plates, said cloth feeder plate having a longitudinal slot therein, projections on the oscillating plates extending into said slot, means for actuating the cams, means responsive to the rotation of one of the cams to advance the cloth feeder plate, means responsive to the rotation of one of the cams to advance the cloth feed plate, means whereby the extent of advancing movement of the cloth feed plate may be varied, and means operatively related to the cloth feed plate advancing means for accelerating the movement of said feed plate.

In testimony whereof I have signed my name to this specification, on this 26th day of November, A.D. 1931.

FRANKLIN SPAULDING.