

[54] **TWO-STEP BUTTONHOLE MECHANISM SELECTIONS SYSTEM**

[75] **Inventor:** Norbert Thuring, Grotzingen, Germany

[73] **Assignee:** The Singer Co., New York, N.Y.

[22] **Filed:** July 21, 1972

[21] **Appl. No.:** 273,894

- [52] **U.S. Cl.**..... 112/158 B
- [51] **Int. Cl.**..... D05b 3/02
- [58] **Field of Search**..... 112/158 R, 158 A, 112/158 B, 158 C, 158 F

[56] **References Cited**

UNITED STATES PATENTS

2,983,240	5/1961	Engel	112/158 B
3,068,817	12/1962	Hamlett	112/158 A
3,148,645	9/1964	Aiki et al.	112/158 B
3,585,876	6/1971	Marsh	112/158 B
3,670,676	6/1972	Sawada	112/158 B

FOREIGN PATENTS OR APPLICATIONS

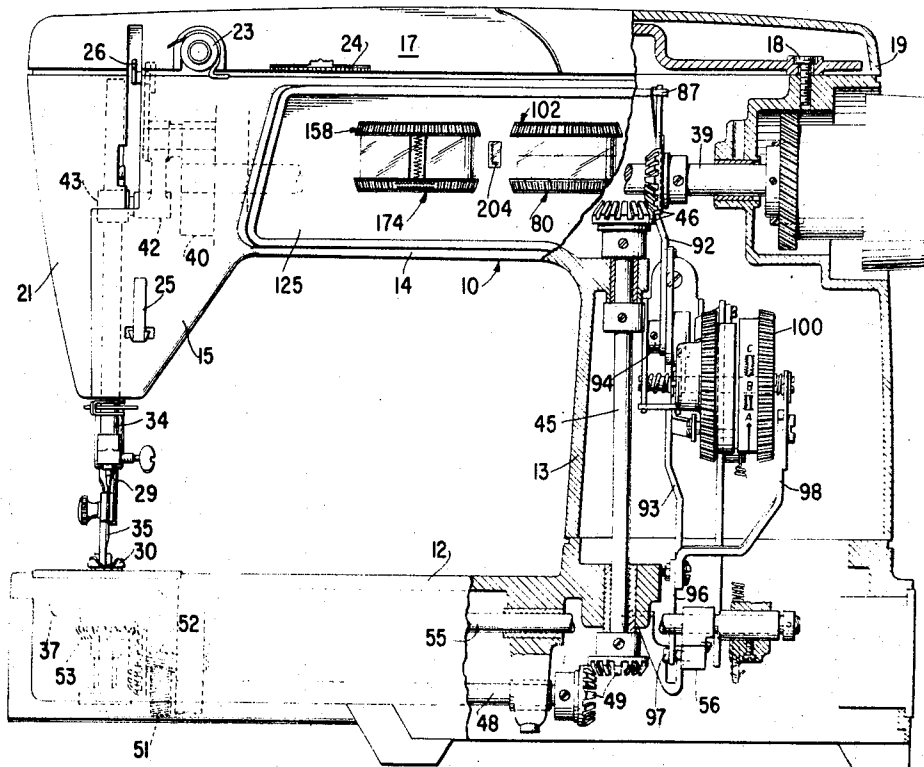
1,038,887	9/1958	Germany.....	112/158 B
-----------	--------	--------------	-----------

Primary Examiner—Werner H. Schroeder
Attorney—Marshall J. Breen et al.

[57] **ABSTRACT**

A selection system for a two-step buttonholing mechanism in which the selection is made by depressing a knob into one of two selectable positions. An intricate track defining a closed loop is affixed to the knob, and, a cam follower on the end of a resilient member substantially rigid in the direction of knob movement but flexible transversely thereof is deflected by the intricate track. The two selectable positions of the knob are defined by detent positions in the closed loop intricate track, the knob being held in a selected position by the resilient member in one of the detent positions. An indication flag, having two indicia thereon spaced from each other, the indicia being representative of the steps of the buttonhole, is connected with the knob so as to present that indicia to view corresponding to the step of the buttonhole selected.

3 Claims, 9 Drawing Figures



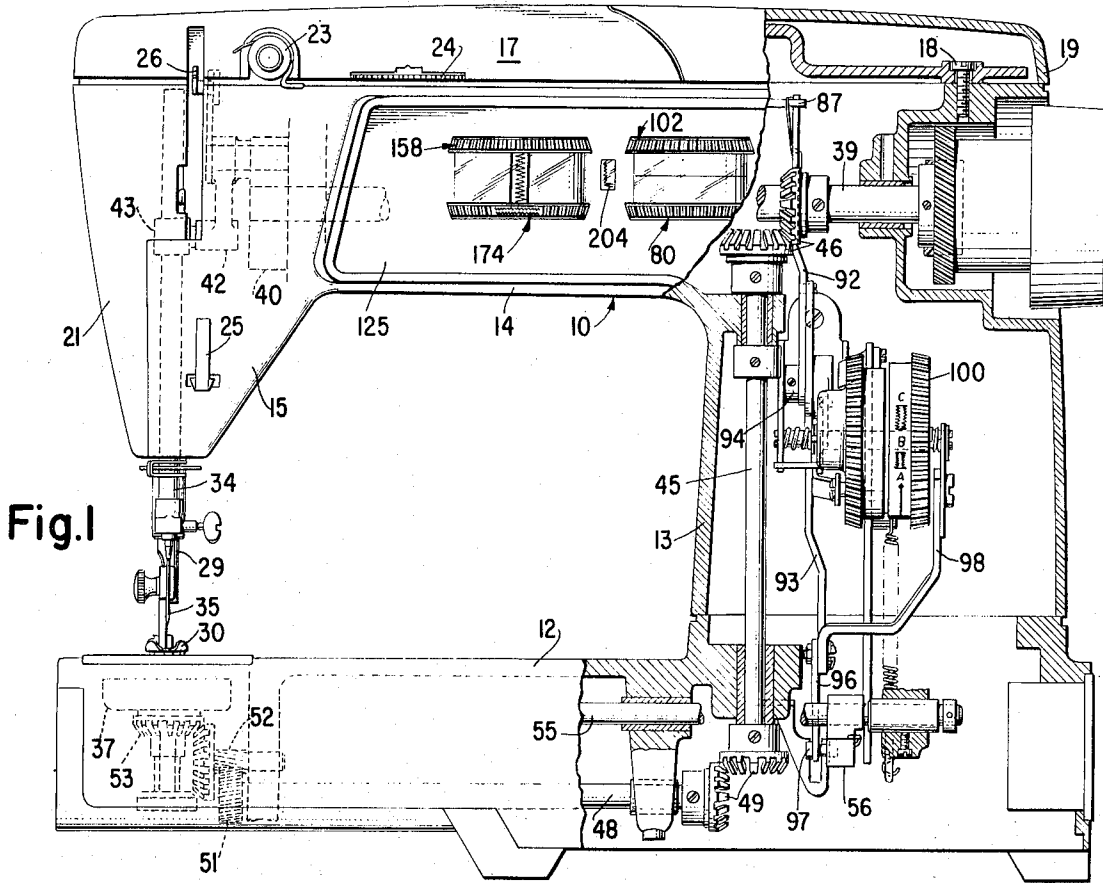


Fig. 1

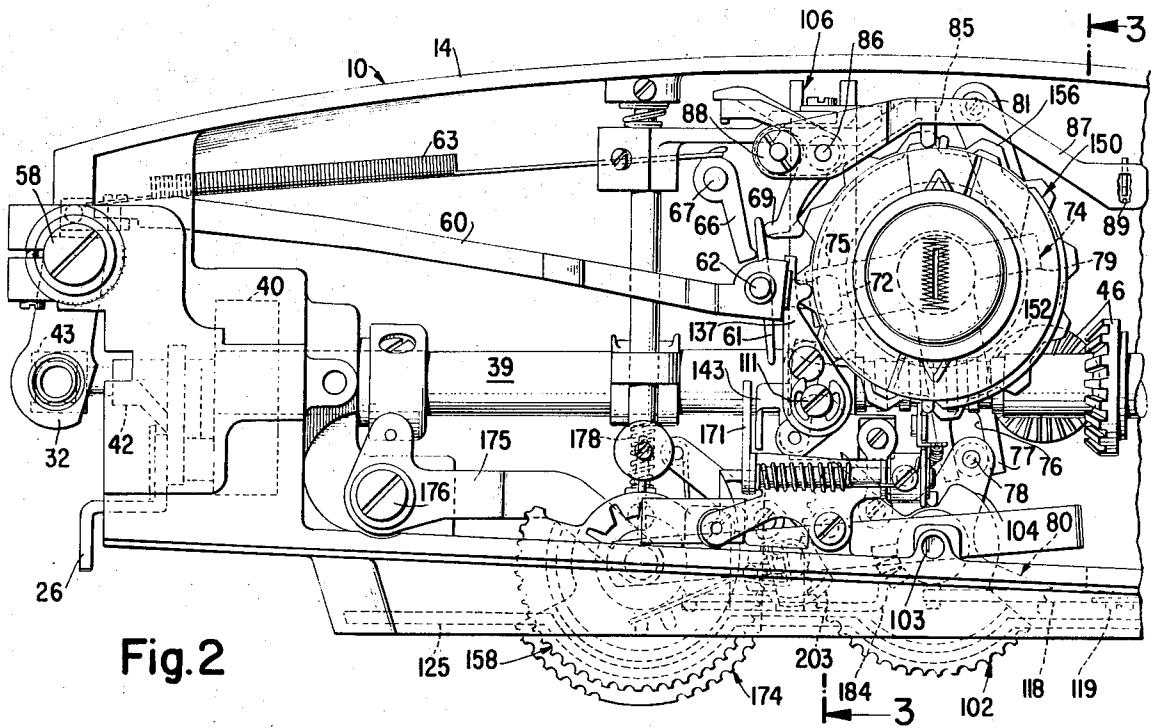


Fig. 2

Fig. 3

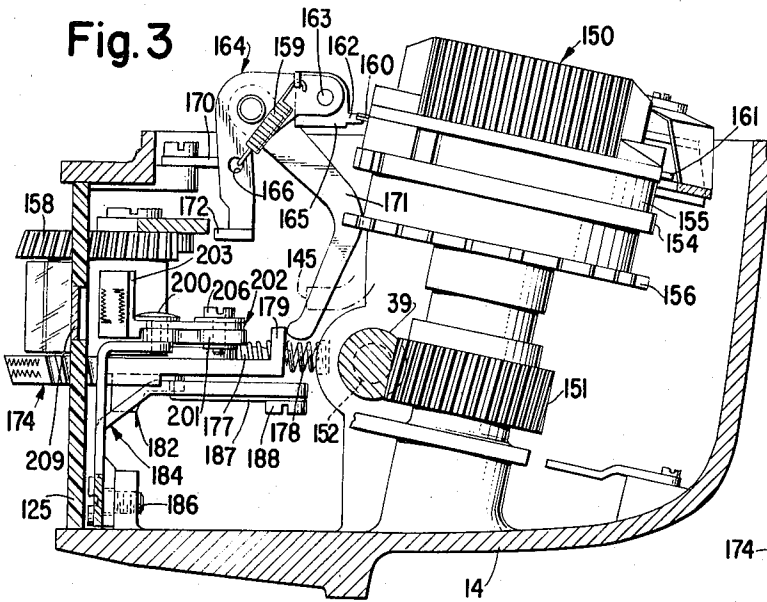


Fig. 6

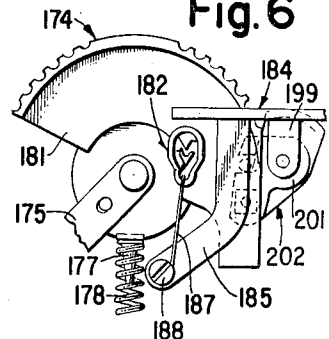


Fig. 7

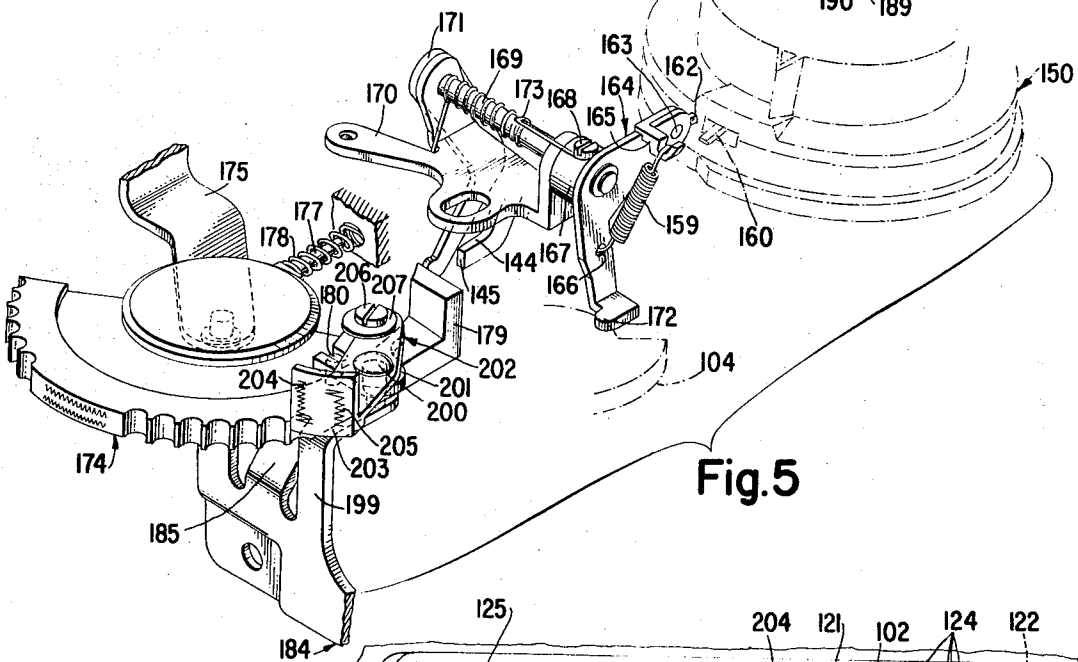
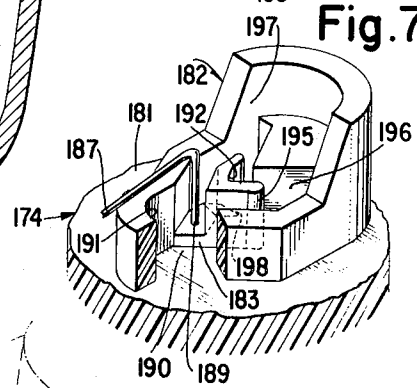
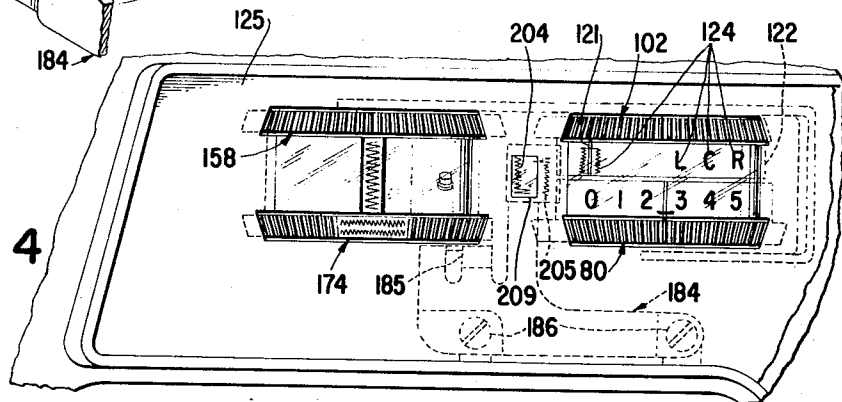
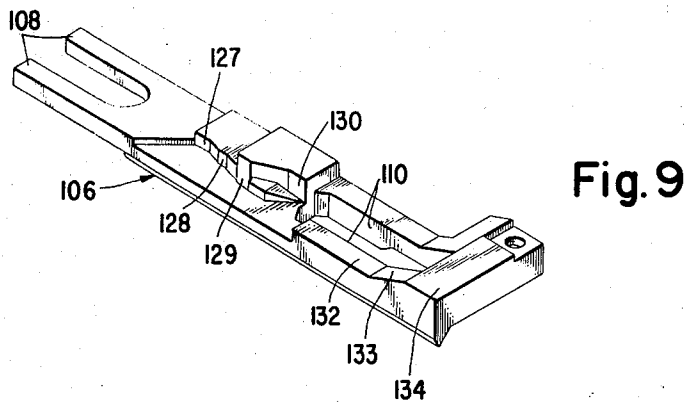
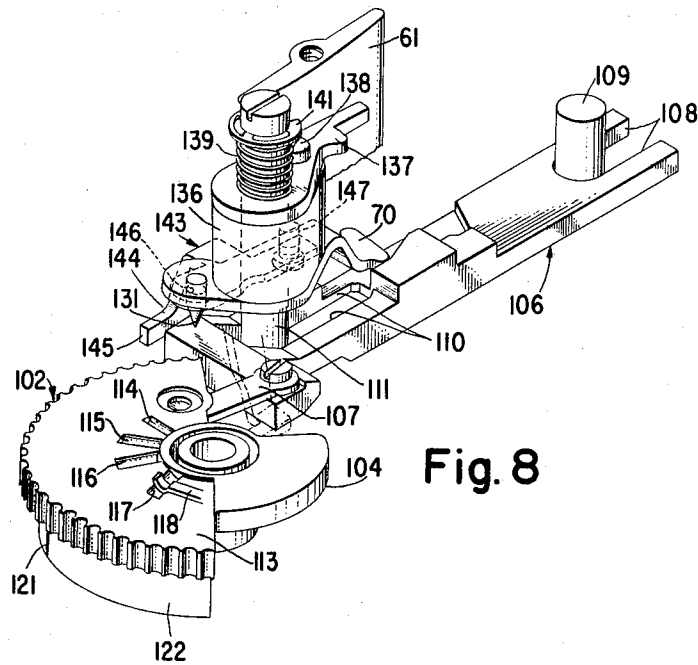


Fig. 5

Fig. 4





TWO-STEP BUTTONHOLE MECHANISM SELECTIONS SYSTEM

BACKGROUND OF THE INVENTION

The Marsh et al. U.S. Pat. No. 3,585,876 dated June 22, 1971 discloses a zigzag sewing machine which contains a two-step buttonhole mechanism of the type utilized with the present invention. In that patent, relating to zigzag sewing machines in which the control of the lateral jogging movements of the needle and of the direction and magnitude of work feed are accomplished by pattern cam means, is disclosed an exchangeable pattern cam unit suitable for the production of closed stitch groups. The most common closed stitch group and that used in the disclosure in the above cited patent is the buttonhole.

The exchangeable pattern cam unit for buttonholing produces a buttonhole in two steps, each step including a bar tack end and one side of the buttonhole. The side of the buttonhole is produced after the bar tack and while it is being produced the rotation of the exchangeable pattern cam unit is temporarily halted. Thereby the length of the buttonhole may be varied at will to suit the particular button selected for use.

The exchangeable pattern cam unit is halted by placing a rock arm of a clutch control mechanism in the path of travel of one of two radial bell crank arms, projecting from the side of the pattern cam unit at different levels and 180° apart. The radial bell crank arms are part of two bell cranks carried by the exchangeable pattern cam unit which through suitable linkage and an internal clutch mechanism are able to declutch the pattern cams of the unit and arrest their rotation. Since the buttonhole is performed in two steps, two radial bell crank arms are required which must be located at different levels in order to enable selection of the steps of the buttonhole to be performed by proper location of the rock arm of the clutch control mechanism.

The production of a buttonhole requires, in addition to installation of the exchangeable pattern cam unit, the placement of several dials of the sewing machine in certain specified positions for the formation of the first half of the buttonhole; and, repositioning of the dial regulating the position of the rock arm of the clutch control mechanism to complete the last half of the buttonhole. To preclude wear on the pattern cam unit when not in use, the rock arm of the clutch control mechanism must also be capable of placement in a position which allows continuous rotation of the pattern cam unit when not in use. Thus the dial regulating the position of the rock arm of the clutch control mechanism has the additional function of placing the rock arm out of cooperative engagement with the radial bell crank arms of the pattern cam unit. This requirement led to the possibility for making an error in the placement of the dial resulting in the formation of undesired stitching and possible permanent marring of the material.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a mechanism for selecting the step of the buttonhole desired that will obviate the possibility of error in the production of buttonholes.

It is a further object of this invention to provide such a mechanism which will be simple to operate and to understand, and which will not be susceptible of inadvertent

operation when the sewing machine is set for other than buttonhole stitching.

These objects are achieved by removing the function of positioning the buttonholing clutch control rock arm for regular pattern or straight stitching from the buttonholer control dial, and placing this function under the control of another dial having a specific position for the buttonhole mode of operation. Since the buttonhole control dial is required to function only during buttonhole operation, it is possible to simplify, and clarify the process of buttonhole production, as well as to interlock this dial to prevent its inadvertent operation during other than buttonhole sewing.

DESCRIPTION OF THE DRAWINGS

With the above and additional objects and advantages in view as will hereinafter appear this invention comprises the devices, combinations and arrangement of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 is a front elevational view of a sewing machine, partly in vertical section having this invention applied thereto,

FIG. 2 is a partial top plan view of the sewing machine in FIG. 1 with the top and end cover plates removed,

FIG. 3 is a cross-sectional view taken transversely through the bracket arm substantially along line 3—3 of FIG. 2,

FIG. 4 is a fragment of the sewing machine escutcheon plate in front elevation including the control dials for the needle jogging controls,

FIG. 5 is a detached perspective view of the buttonhole cam unit clutch control arrangement of this invention,

FIG. 6 is a bottom view of the buttonholer control knob and the bracket supporting the resilient track follower,

FIG. 7 is a detached perspective view of the intricate track detent arrangement of the buttonholer control knob shown in FIG. 6 partially in section,

FIG. 8 is a detached perspective view of the control arrangement for the neutral position of needle vibration of the zigzag mechanism and of the cam follower vertical positioning arrangement to track the needle positioning cam of the pattern cam unit, and

FIG. 9 is a detached perspective view of the slider which forms a part of the neutral needle positioning and the vertical positioning control arrangement illustrated in FIG. 8.

Referring to FIG. 1, the invention illustrated is embodied in the sewing machine 10 having a work supporting bed 12 from one end of which a hollow standard 13 rises supporting a bracket arm 14 overhanging the bed and terminating in the sewing head 15. The top of the bracket arm 14 is covered by a top cover 17 attached to the bracket arm by a screw 18 and having a hinged lid 19 which supports a spool pin support post (not shown) and provides access to an internal pattern cam unit explained herein. A hinged end cover plate 21 closes the sewing head 15.

The top cover 17 carries a needle thread tension device 23 and a tension adjusting dial 24. The front face of the sewing head 15 carries a pivot thread guide 25 for receiving upper thread after the thread tension device 23 and before a needle thread take-up lever 26.

Mounted in the sewing head 15 is a presser bar 29 having a presser foot 30 attached to the bottom thereof to hold the work material in engagement with the feed dog (not shown) of a feed system (not shown) for feeding the work material. Also mounted in the sewing head 15 is a needle bar gate 32, more clearly seen in FIG. 2 which supports a needle bar 34 for endwise reciprocation. A sewing needle 35 affixed to the end of the needle bar 34 cooperates with a rotating hook 37 located in the bed 12 below the sewing head 15 in the formation of lock stitches.

A horizontal arm shaft 39 rotatably supported in the bracket arm 14 is driven by a sewing machine motor (not shown) and rotates a crank 40 fixed to one end of the arm shaft. A connecting link 42 connects the crank 40 to a needle bar stud 43 affixed to the needle bar and thereby produces the endwise reciprocation of the needle bar 34.

Visible in bed 12 is a feed regulating shaft 55 and a feed regulating control lever 56 to control the feed of the sewing machine.

A vertical arm shaft 45, driven by miter gears 46 on the horizontal arm shaft 39 and the vertical arm shaft, drives a bed shaft 48 through a second set of miter gears 49. A helical gear 51 on the opposite end of bed shaft 48 is in mesh with a combination helical gear and miter gear 52 in a 2 to 1 speed relationship and drives the hook 37 by means of miter gear 53 at the rate of two revolutions for each reciprocation of the needle bar 34.

Referring to FIG. 2, the needle bar gate 32, pivoted at 58 in the sewing head 15, is urged to oscillate by pivot control link 60. On the opposite end of the pivot control link 60 is mounted a wobble plate 61 pivoted on the pivot control link at 62. A biasing spring 63 is attached at one end to the needle bar gate 32 and has its other end attached to one arm of a two-armed bias lever 66 which pivots about post 67 mounted in the bracket arm 14. The second arm of bias lever 66 presses against the wobble plate 61 and urges in into contact with a first cam follower 69 and a second cam follower 70 visible in FIG. 8.

A spherical stud 72 is formed as part of the pivot control link 60 below the wobble plate 61. This spherical stud 72 seats into a receptacle in the first arm 75 of a T-shaped lever 74. A slot 77 in the second arm of the T-shaped lever 74 accommodates a stud 78 which is affixed to an extension of a bight control dial 80 (see also FIG. 4). A stop adjustably attached to the bracket arm 14 of the sewing machine impinges against the third arm 79 of the T-shaped lever 74 to limit movement of this lever. A similar stop (not shown) impinges against the first arm 75 of the lever 74 to limit movement in the opposite direction.

In zigzag sewing the first cam follower 69 is actuated by a zigzag cam while the second cam follower 70 determines the neutral position of needle vibration as will be explained below. When the wobble plate pivot 62 is located by rotation of the bight control dial 80 opposite the first cam follower 69 the maximum excursion of the pivot control link 60 and consequently the needle bar gate 32 is obtained. If the wobble plate pivot 62 is located by rotation of the bight control dial 80 opposite the second cam follower 70 as shown in FIG. 2 there will be no excursion of the pivot control link 60 or the needle bar gate 32 since the first cam follower 69 will only cause the wobble plate 61 to rotate about its pivot

62 without moving the pivot control link 60. For all positions of the dial between these extremes the magnitude of zigzag oscillations will be correspondingly reduced from the maximum obtainable.

Also apparent in FIG. 2 is a feed control cam follower 85 pivoted on pivot post 86 supported by the bracket arm 14. A transmission lever 87, also pivoted on the pivot post 86, is attached to the feed control cam follower 85 by screw 88. Trapped in a slot 89 at one end of the transmission lever 87 is the upper half of a vertical compound lever 92 visible in FIG. 1. The lower half of this vertical compound lever 93 is keyed to the upper half of the compound lever 92 and both halves pivot about shaft 94. A connecting link 96 is attached to the bottom of the vertical compound lever 93, and carried by a carrier link 98. A stud 97 on the forward end of the connecting link 96 impinges on feed regulating control lever 56 to rotate the feed regulating shaft 55 and thereby controlling the feed of the material under the influence of a feed controlling cam. A feed controller and carrier link control dial 100 regulates the operation of the carrier link 98 and controls manual feed.

A needle position control and buttonhole selection dial 102 depicted in FIGS. 4 and 8 controls the neutral position of the needle vibration or places the machine in the buttonhole mode of operation. This dial pivots on a shaft 103 mounted in the bracket arm 14 of the sewing machine (see FIG. 2). The dial itself contains a cam portion 104 whose purpose will be explained below. Rotation of the dial positions a slide block 106 by means of a link 107 connecting the block and the dial. The slide block 106 has bifurcations 108 on one end thereof which embrace a vertical post 109 supported by the bracket arm 14. A slot 110 in the forward position of the slide block encircles a second post 111 also supported by the bracket arm. On the top face of the dial 113 are located radial notches 114, 115, 116, and 117. A spring detent 118 visible in FIGS. 2 and 8 has one end formed to cooperate with these radial notches. The spring detent is retained in the bracket arm 14 by screw 119 (see FIG. 2). An indicator line 121 scribed in the peripheral portion 122 of the dial 102 is alignable with indicia 124 molded into an escutcheon plate 125 (see FIG. 4) supported in the front portion of the bracket arm 14 and standard 13. When the radial notch 114 is engaged with the spring detent 118, the indicator line 121 would be aligned with that indicium 124 in the escutcheon plate 89 indicating right needle position. The radial notch 115 corresponds to center needle position; and radial notch 116 corresponds to left needle position. Radial notch 117 as shown in FIG. 8 and in FIG. 4 would align the indicator line 121 of dial 102 with the buttonhole symbol of the indicia 124.

Referring to FIG. 9 the cam step 127 would be engaged with the cam follower 70 for neutral right needle position. Similarly cam steps 128 and 129 would be engaged for neutral center and neutral left needle positions respectively. When the machine is placed in the buttonhole mode of operation the slide block 106 is moved to the extreme position as is shown in FIG. 8 and cam follower 70 is opposite step 130 on the slide block. A vertical follower pin 131 mounted on cam follower lever 70 opposite its pivot post 111 tracks the surface 132 of the slide block 106 when the slide block is being used to determine neutral needle position. When the sewing machine is placed into buttonhole

mode of operation and the dial 102 is rotated until the indicator line 121 on the dial is aligned with the buttonhole symbol of the indicia 124 on the escutcheon plate 125, the follower pin 131 moves along the ramp 133 and comes to rest on surface 134 of the slide block 106. This action causes the cam follower 70 which is attached to a block 136 to rise to a new level. An upper follower lever 137 also attached to the block 136 by screw 138 is carried with the block to this new level. When the sewing machine is returned from the buttonhole mode back to the normal sewing mode, a spring 139 encircling the post 111 and held in place by snapping 141 causes the upper follower lever 137, block 136 and front cam follower 70 to again descend to the lower level as the vertical follower pin 131 progresses down the ramp 133. A bracket 143 having a downturned and forward extending ear 144 and presenting an abutment face 145 (see FIG. 8 and FIG. 5) is attached beneath the second cam follower 70 by means of a hole 146 encircling the vertical follower pin 131 and a screw 147 passing through the cam follower 70 and received in the block 136. The purpose of this bracket 143 and abutment face 145 will be explained below.

In FIG. 3 is shown a pattern cam unit 150 driven by a worm gear 151 mounted on a shaft (not shown) affixed in the bracket arm 14. The worm gear 151 is in mesh with a worm 152 cut on the horizontal arm shaft 39. The pattern cam unit 150 is composed of a needle position cam 154 and a cam 155 for buttonhole feed control. A zigzag cam 156 is also shown. The upper follower lever 137 will track the needle position cam 154 of the pattern cam unit when elevated by the rotation of the needle position and buttonhole-selector dial 102 to the buttonhole mode of operation as explained above. The cam 155 for buttonhole feed control will be tracked by the feed control cam follower 85 when the dial 100 is manipulated to engage the various levers and links to the feed regulating control lever 56 also as explained above. Eliminated for the sake of simplicity are the other cams normally in the cam stack. In FIG. 4 is shown a selector dial 158 which would normally select among the various cams in the cam stack, however again for the sake of simplicity the mechanics of the selector system are not shown.

The pattern cam unit is similar to that shown in U.S. Pat. No. 3,585,876 of June 22, 1971 of Marsh et al. to which reference may be had for details on construction of this unit. From the pattern cam unit protrude two radial bell crank arms 160 and 161 spaced 180° apart and separated from each other vertically. These radial bell crank arms are connected with clutch means within the pattern cam unit. Impeding the rotation of a radial bell crank arm will cause the needle position cam 154 and the feed cam 155 to halt their rotation. To impede the rotation of the radial arms 160 and 161, a clutch control stop 162 is provided. The clutch control stop is pivoted at 163 at the extremity of a first arm of a clutch control bell crank 164. The stop 162 is capable of selective positioning to interfere with either radial arm 160 or radial arm 161 as will be explained below. The stop is constructed with an arm 165 overhanging the clutch control bell crank 164. One leg of a spring 159 is attached to the first arm of the clutch control crank 164. The second leg of the spring 159 is attached to a hole 166 in the second arm of the clutch control bell crank 164. Mounting of the clutch control stop 162 in

this fashion serves to prevent machine jamming. The clutch control bell crank 164 is fast to a hub 157 which is firmly held by a screw 168 onto an axle rod 169 carried in a clutch control bracket 170 attached to the bracket arm 14 of the sewing machine. The opposite end of the axle 169 carries a clutch control lever 171. A torsion spring 172 biased against the clutch control bracket 170 and attached under the screw 168 biases the clutch control bell crank 164 and the clutch control lever 171 in a clockwise direction as viewed in FIG. 5. The second arm of the clutch control bell crank 164 is fashioned with a cam follower 172 at its extremity. The cam follower 172 impinges on the cam portion 104 of the needle position controller and buttonhole selection dial 102.

In FIG. 4 is visible an abutment control knob 174 shaped like a dial which is affixed to and supported by a support bracket 175 partially visible in FIG. 5 and in FIG. 2. The bracket 175 is pivoted on the sewing machine frame by shoulder screw 176. The knob 174 contains a projection 177 visible in FIG. 5 over which a coil spring 178 is fitted. The projection 177 projects into a hole in the bracket arm 14 while the spring is biased against the bracket arm to urge the knob to protrude from the escutcheon plate 125 (see FIG. 5). The knob is further formed with an abutment member 179 which cooperates with the extremity of the clutch control lever 171. Behind the abutment member 179 a pin 180 protrudes vertically from the top surface of the knob 174. On the bottom surface 181 of knob 174 (see FIG. 6) an intricate track 182 forming a closed loop is molded into the knob. This track 182 contains an abrupt change in depth at 183 visible in FIG. 7.

A support 184 having a first cantilevered arm 185 extending under the knob is fixed to the sewing machine frame by screws 186, adjacent the knob 174. At its extremity the arm 185 supports a resilient member 187 affixed thereto by a screw 188 (see FIGS. 6 and 7).

The resilient member 187 contains a cam follower portion 189 at its free end which projects into the intricate track 182 of the knob 174 (see FIG. 7). The resilient member 187 is continually biased by the intricate track 182 towards the right as viewed in FIG. 6. The resilient member 187 is also biased in a vertical direction by the bottom surface 190 of the intricate track 182. The abrupt change in depth 183 creates a barrier to the travel of the cam follower portion 189 of the resilient member 187 which forces the cam follower portion 189 to proceed about the closed loop intricate track 182 in a counterclockwise fashion as viewed in FIG. 6. It will be observed in FIG. 6 that there are two detent positions 191 and 192. In these two positions, the position of the knob 174 is stable under the urging of the coil spring 178 and the restraint of the resilient member 187. When the knob 174 is depressed from detent position 191, the spring 178 is compressed and the cam follower portion 189 of the resilient member 187 will proceed in a counterclockwise direction, as viewed in FIG. 6 about the moving intricate track 182 due to the barrier created by the abrupt change in depth 183. As the cam follower portion 189 passes beyond the reentrant corner 195 in the intricate track 182 it will move inwards against the reentrant outer face of the track at 196 with an audible snap due to the horizontal bias on the resilient member 187. Releasing the knob at this point will cause the cam follower portion 189 to be seated in the detent position 192. If the knob 174 is de-

pressed again from detent position 192, the cam follower portion 189 of the resilient member will proceed about the moving intricate track 182 in a counterclockwise direction as viewed in FIG. 6 because of the horizontal bias remaining on the resilient member 187 and strike the outer wall of the intricate track at 197 with an audible snap. Releasing the knob 174 will reseal the cam follower portion 189 of the resilient member 187 in the detent position 191 after passing up a ramp 198 increasing the vertical bias on the resilient member and over the abrupt change in depth 183.

The support 184 has a second cantilevered arm 199 extending adjacent the knob 174 above the top surface thereof. Pivoted to this arm at its free end by a shouldered rivet 200 is a clevis 201 and member 202 having an upstanding radiused lug 203 at its forward extremity forming an indication flag. On the face of the indication flag 203 are indicia 204 and 205. The member 202 is adjustably attached to the clevis 201 by screw 206 and washer 207. The clevis 201 contains a slot 208 which embraces the pin 180 extending from the knob 174. When the knob 174 is depressed into one of the two stable positions defined by the detents 191 and 192, the pin 180 extending from the knob will cause the clevis 201 to rotate about the rivet 200, carrying the member 202 with its indication flag 203 with it to a new angular position. The indicium 204 or 205 on the indication flag 203 corresponding to the step of the buttonhole selected by actuation of the knob 174 is presented for viewing through the window 209 in the escutcheon plate 125. The indicia indicate the bar tack end and the side of the buttonhole being executed by the sewing machine.

As illustrated in FIG. 8 when the needle position control and buttonhole selection dial 102 is located so that the spring detent 118 is positioned in the radial notch 117 the indicator line 121 on the dial 102 is aligned with the buttonhole symbol on the escutcheon plate 125 (see FIG. 4). The abutment face 145 of the bracket 143 will be elevated to a position where it will not interfere with the abutment member 179 on the knob 174. Therefore, when the machine is placed in the buttonhole mode of operation the knob 174 may be depressed to contact the extremity of the clutch control lever 171 and reposition the clutch control stop 162 out of contact with the radial arm 160 of the pattern cam unit 150. The pattern cam unit will then make one-half revolution whereupon the radial arm 161 will strike the clutch control stop 162 to halt the rotation of the pattern cam unit 150. During this one-half revolution of the pattern cam unit 150, a bar tack end of a buttonhole is formed. While the pattern cam unit 150 is maintained in a stationary position by the clutch control stop 162 one side of the buttonhole is being formed. When the knob 174 is again depressed and released, the stop 162 will be repositioned to allow the radial arm 161 and the pattern cam unit 150 to resume rotation upon which the second bar tack in the buttonhole will be formed. When the radial arm 160 is again impeded by the clutch control stop 162 rotation of pattern cam unit 150 will cease and the second side of the buttonhole will be formed, closing the buttonhole. When the buttonhole is closed the sewing machine may cease operation and the dial 102 may be rotated until the indicator line 121 of the dial is opposite the indicium 124 in the escutcheon plate 125 for the desired needle position. When the dial 102 is rotated the cam follower 172

on the second arm of the clutch control bell crank 164 will be urged by the cam portion 104 of the dial 102 to rotate the bell crank 164 and the clutch control stop 162 attached thereto out of operative engagement with both radial arms 160 and 161. Thereby when the buttonhole is completed and the machine is placed in normal sewing mode of operation rotation of the pattern cam unit 150 may proceed unimpeded to preclude wear of the internal mechanisms.

As the knob 174 is depressed to either one of the two stable positions defined by the detents 191 and 192 in the closed loop intricate track 182 the pin 180 on the knob 174 acting on the clevis 201 and thereby on the upstanding lug 203 will present to view through the window 209 in the escutcheon plate 125 that indicium 204 or 205 indicating the portion of the buttonhole being produced.

While the embodiments disclosed indicate a closed loop intricate track having two detent positions, it is possible to obtain many more detent positions capable of sequential selection both with or without a closed loop simply by proper arrangement of a biased resilient member and abrupt changes in depth of the track utilized.

Having thus set forth the nature of this invention what is claimed herein is:

1. In a zigzag sewing machine having controls for neutral needle position of zigzag motion and for bight, a pattern cam unit driven by the sewing machine for the production of buttonholes in incremental steps, and operator influenced clutch means for sequentially initiating incremental rotation of said pattern cam unit for producing buttonholes in incremental steps, a device for selecting and indicating the particular increment of the pattern cam unit selected, said device including;
 - a. a knob shiftably mounted on the sewing machine and having an abutment member,
 - b. means to maintain the knob in a selected one of a plurality of positions,
 - c. clutch control means mounted in said sewing machine cooperatively connecting said abutment member on said knob with said operator influenced clutch means on said pattern cam unit to initiate incremental rotation thereof,
 - d. a bracket support in said sewing machine adjacent said knob,
 - e. an indication flag rotatably mounted on said bracket said indication flag having a plurality of indicia thereon spaced from each other each indicative of one of said incremental steps performed by said pattern cam unit,
 - f. connecting means between said knob and said indication flag causing rotation of said flag when said knob is moved from one selected position to another selected position for presenting that indicia of the flag to view corresponding to the step of the buttonhole being produced by the pattern cam unit.
2. In a sewing machine as claimed in claim 1 wherein the means for maintaining said knob in a selected one of a plurality of positions includes;
 - a. a first resilient member depending from said bracket substantially rigid in the direction of movement of said knob but flexible transversely thereof,
 - b. a cam follower means adjacent said resilient member and attached to that end of said resilient member opposite the end affixed to the bracket,

c. a second resilient member urging said knob towards one of said two positions,
 d. an intricate track affixed to said knob receiving said cam follower means attached to said first resilient member, said intricate track exerting a bias on said first resilient member in two mutually perpendicular directions one of which is substantially perpendicular to said intricate track, said intricate track having at least two detent positions to retain said knob in a selected one of said positions, said intricate track having means associated with the transverse flexure of said first resilient member to establish a direction of travel of said first resilient member in said track, said means including an abrupt change in the depth of said track decreasing the bias on said first resilient member perpendicular to said intricate track, said abrupt change in

depth guiding said cam follower means of said first resilient member to travel in a preferred path.

3. In a sewing machine as claimed in claim 1 means associated with the control for neutral needle position of zigzag motion for establishing a buttonhole mode of operation, said means including an interlock arrangement preventing motion of said knob shiftably mounted on said sewing machine when said control is used to determine neutral needle position of zigzag motion but allowing motion when establishing a buttonhole mode of operation; said means also rendering said clutch control means inoperative on said pattern cam unit when not establishing a buttonhole mode of operation but operative thereon when establishing a buttonhole mode of operation.

* * * * *

20

25

30

35

40

45

50

55

60

65