

July 10, 1962

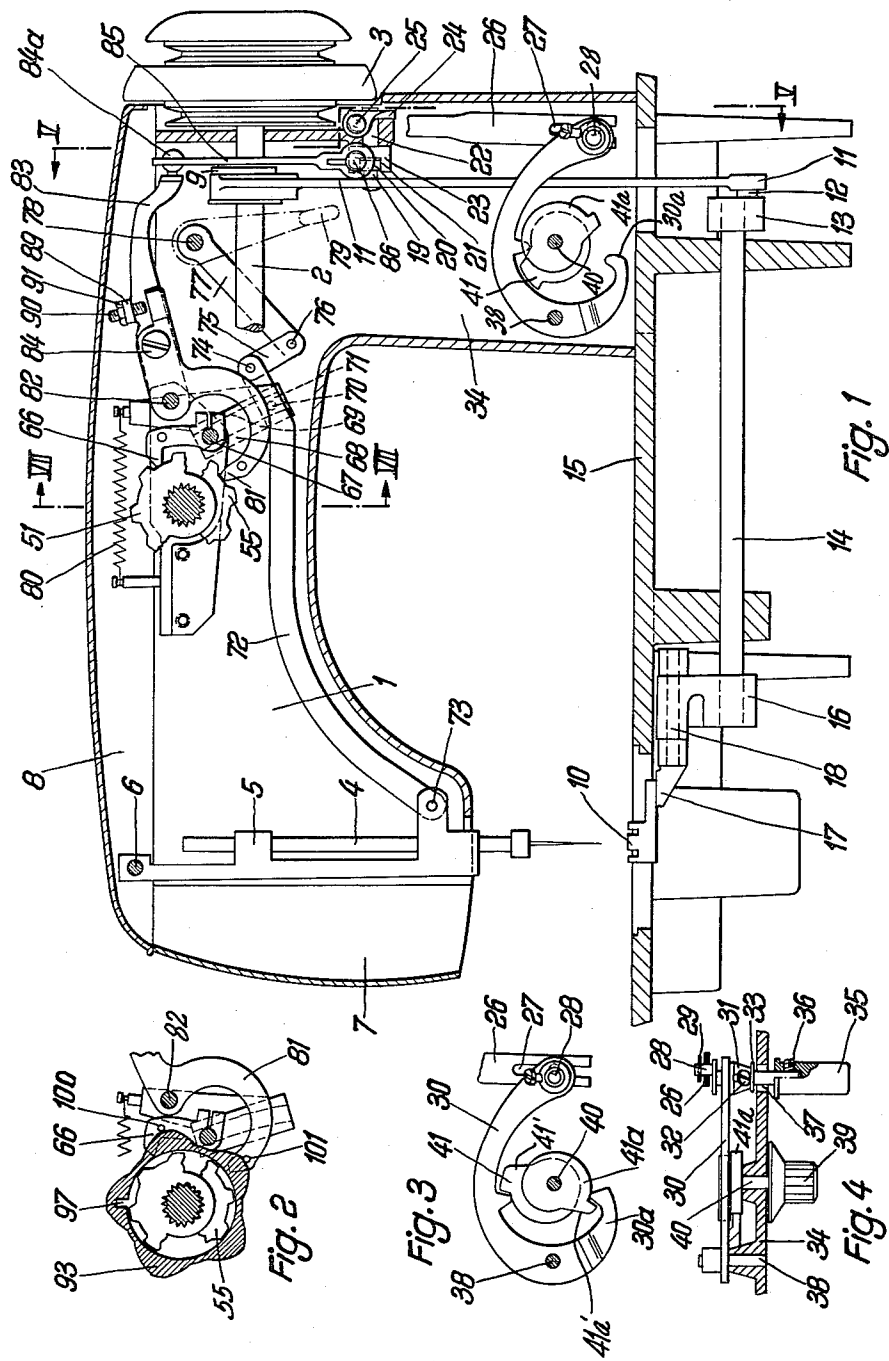
W. ENGEL

3,043,252

ZIGZAG SEWING MACHINE WITH FANCY-STITCH SELECTOR

Filed Feb. 10, 1960

4 Sheets-Sheet 1



July 10, 1962

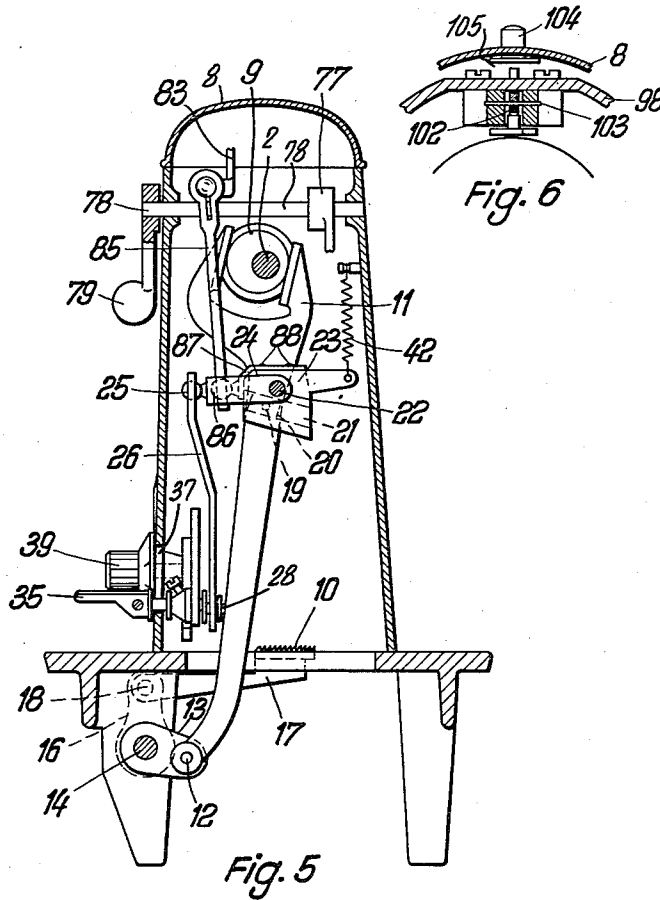
W. ENGEL

3,043,252

ZIGZAG SEWING MACHINE WITH FANCY-STITCH SELECTOR

Filed Feb. 10, 1960

4 Sheets-Sheet 2



July 10, 1962

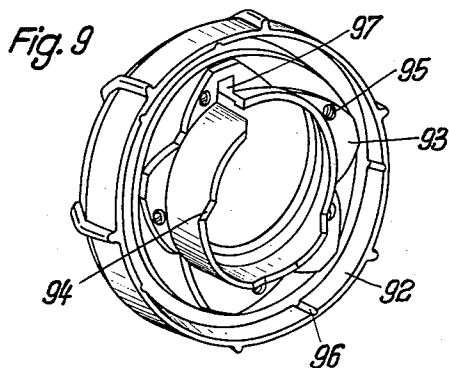
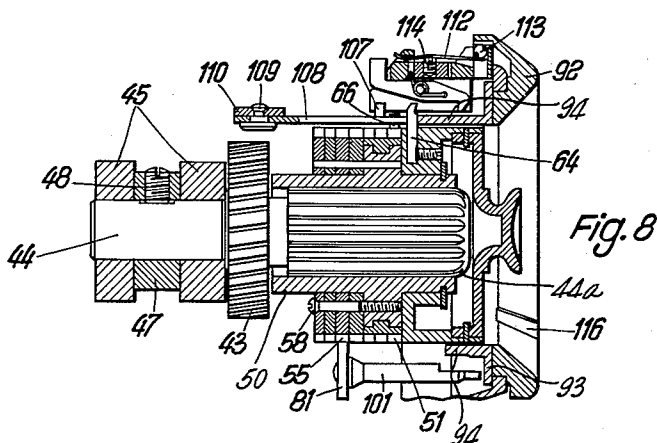
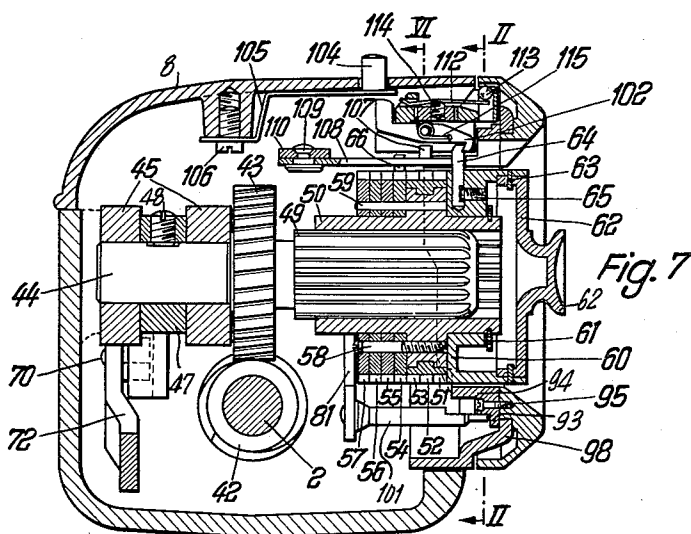
W. ENGEL

3,043,252

ZIGZAG SEWING MACHINE WITH FANCY-STITCH SELECTOR

Filed Feb. 10, 1960

4 Sheets-Sheet 3



July 10, 1962

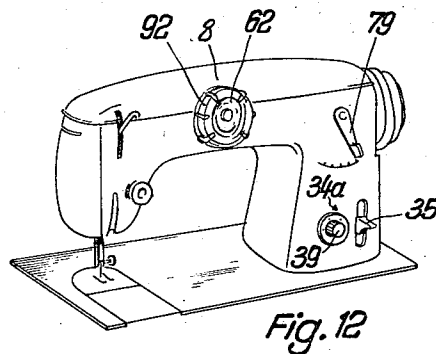
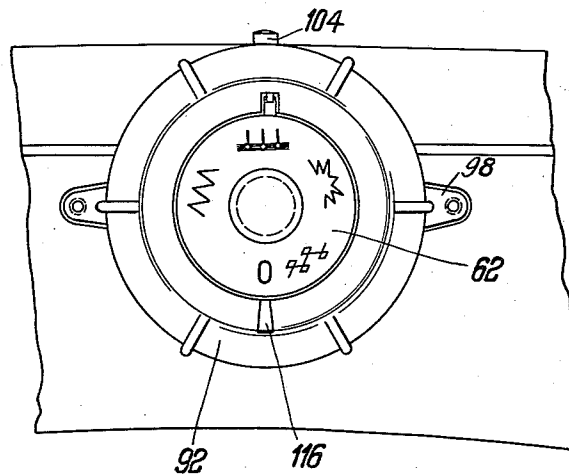
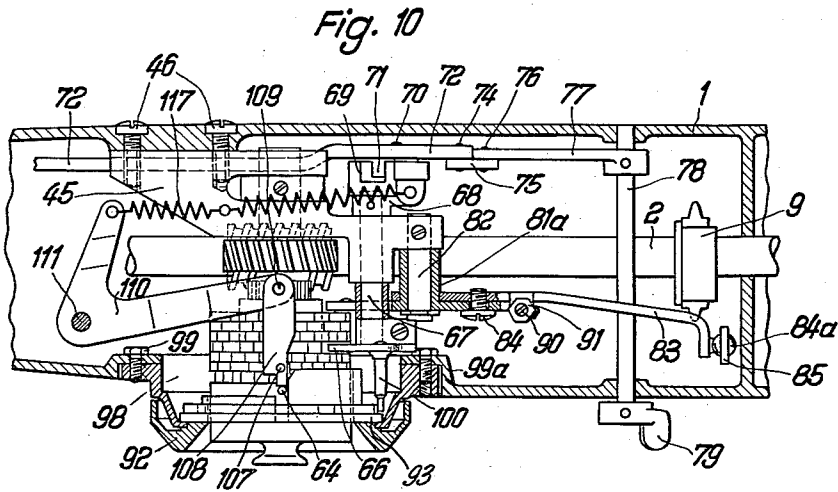
W. ENGEL

3,043,252

ZIGZAG SEWING MACHINE WITH FANCY-STITCH SELECTOR

Filed Feb. 10, 1960

4 Sheets-Sheet 4



1

3,043,252

ZIGZAG SEWING MACHINE WITH FANCY-STITCH SELECTOR

Wolfgang Engel, Bielefeld, Germany, assignor to Anker-Phoenix Nähmaschinen AG, Bielefeld, Germany, a corporation of Germany

Filed Feb. 10, 1960, Ser. No. 7,938

Claims priority, application Germany June 13, 1959
16 Claims. (Cl. 112-158)

My invention relates to automatic zigzag sewing machines with fancy-stitch selector.

In a known sewing machine of this type, the stitch selector comprises a built-in set of control cams cooperating with a cam follower that, for the purpose of cam selection, is manually displaceable in the axial direction after being manually lifted off the cams.

In another known zigzag sewing machine with a built-in set of control cams, the lateral deflections of the needle bar are controlled by a cam follower, and the movements of the material feeder in the base plate of the machine are conjointly controlled by another follower co-acting with a second set of cams. For changing the stitch selection, the two followers are first moved by a manual member out of engagement with the respective two cam sets, and are thereafter shifted to a new position by actuation of a second manual member. A pointer connected with the second member indicates the selected stitch pattern on a stationarily mounted scale of indicia.

Also known is a zigzag sewing machine with an exchangeable set of cams as well as a built-in cam set. This machine has a manual adjusting member in synchronous driving connection with a drum equipped with feeler pins as well as an indicator scale representing the selectable stitch patterns. When changing the selection, the manual control member must first be displaced in axial direction and, while being thus kept displaced, must be turned about its axis.

In another known zigzag sewing machine, comprising built-in as well as exchangeable cams, the manual adjusting member for selecting a cam is journaled on a swing member and participates in the needle-bar oscillations during sewing operation in synchronism with the selected cam disc. The visible sides of the exchangeable set of cams carry symbols and numbers. When the exchangeable set of cams is inserted in the machine, only the symbols or numbers on the side facing the seamstress can be read. However, since some of these indicia are in a slanting position and others are turned 180°, and also since the markings on the rear side of the cam set are not visible at all, the proper selection is inconvenient and may involve errors. For that reason, when selecting the rear cam disc, it is sometimes necessary to first make a sewing test in order to ascertain which particular sewing pattern is produced by the particular cam disc.

It is an object of my invention to devise a zigzag sewing machine whose stitch-pattern selector devices, in contrast to those heretofore known, are considerably simplified with respect to the attention to be given by the operating person when changing the machine from one type or pattern of stitch to another, so as to make the use of the machine as easy and foolproof as possible without thereby limiting the number or variety of stitch selections.

To this end, and in accordance with a feature of my invention, I provide the stitch selector devices, in a zigzag sewing machine having a plurality of stitch and/or feed control cams for selective cooperation with a cam follower, with a single exteriorly accessible manual control member which, for normal operation, is movable

2

along only one given path of motion and has a number of predetermined rest or catch positions corresponding to respectively different stitch selections; and I further provide this member with a lifter cam and a selector cam of mutually correlated cam contours which, as the manual member is being moved from one to the next position, first disengage the follower from the cams, then axially displace the follower relative to the cams or vice versa, and thereafter reestablish the cam-follower engagement.

According to another feature of my invention, I provide the set of stitch-control cams with a group of cams for controlling the lateral deflections of the needle bar and with another group of cams for controlling the motion of the material feeder, the two cam groups of the single set being correlated to respective two cam followers so that any selection of a lateral-deflection control cam is accompanied by a correlated selection of one of the respective feed control cams; and I cooperatively connect the above-mentioned lifter cam with the cam followers of both cam groups for simultaneously disengaging them from these groups during a given interval of displacing motion performed by the manual control member when being shifted from one to the next position of rest.

According to still another feature of the invention, the single path along which the manual control member is movable for stitch selection is a rotational movement about the axis of the manual member, and the set of stitch-control cams, the lifter cam and the selector cam are all mounted in coaxial relation to the rotatable manual member.

According to a further feature of my invention, the set of control cams including, as the case may be, a group of deflector-control cams as well as a correlated group of feeder control cams, is exchangeable as a single unit and is removably coupled with the manual control member which, in turn, is mounted on the machine frame structure and, when being shifted or turned between its predetermined rest positions, is coupled with the exchangeable set of cams.

By virtue of the exchangeability of the cam set in accordance with the just-mentioned features, each of the available, different sets of cams can be provided with corresponding indicating symbols so that in each case only those symbols are visible to, and need be observed by, the seamstress whose correlated cams are inserted into and active in the machine, thus securing a reliable and virtually foolproof operation of the stitch-selector machinery.

The above-mentioned and more specific objects, advantages and features of the invention, said features being set forth with particularity in the claims annexed hereto, will be apparent from, and will be mentioned in, the following with reference to the embodiment of a zigzag sewing machine according to the invention illustrated by way of example on the accompanying drawings, in which:

FIG. 1 is a vertical longitudinal section through the machine.

FIG. 2 illustrates separately a lifter cam in section along the line II-II in FIG. 7.

FIGS. 3 and 4 are a lateral view and a part-sectional top view of details relating to manual means for setting the stitching length and stitching direction.

FIG. 5 is a vertical cross section of the sewing machine along line V-V in FIG. 1, seen from the side of the machine drive.

FIG. 6 illustrates in cross section a detail relating to a cam ejector latch, the section being along the line VI-VI in FIG. 7.

FIG. 7 is a cross-sectional view of the fancy-stitch con-

3

trol assembly, the section being taken along the line VII—VII in FIG. 1.

FIG. 8 shows part of the same assembly as FIG. 7 in a different operating position of the appertaining set of control cams.

FIG. 9 is a perspective view of the rotatable manual control member for fancy-stitch selection including a lifter cam and a selector cam, seen from the interior of the sewing machine.

FIG. 10 shows the same fancy-stitch control assembly as FIGS. 7 and 8 in a part-sectional view seen from above.

FIG. 11 is a front view of the rotational manual control member in the position required for exchanging the set of control cams.

FIG. 12 is a perspective view of the sewing machine showing the various manual controls accessible and operable from the outside.

Journalled inside and longitudinally of the hollow arm structure 1 of the sewing machine head is a main drive shaft 2 (FIGS. 1, 5, 7, 10) with a driving wheel 3 (FIG. 1) which is also operable manually. The main shaft 2, acting through a crank and a connecting rod (not illustrated) causes the needle bar 4 of the machine to reciprocate vertically in glide bearings of a swing arm 5 which is oscillatable about a pivot pin 6 mounted in the arm structure 1. The arm structure 1 is open at the front and at the top and is normally closed at both places by a front cover 7 and a top cover 8 (FIGS. 1, 12).

Firmly mounted on the main shaft 2 is an eccentric 9 (FIGS. 1, 5, 10) for driving a material feeder 10 (FIGS. 1, 5) which is transversely displaceable in a slot of the machine base plate 15. The eccentric 9 is straddled by a fork lever 11 which is linked by a pin 12 with a crank 13 (FIGS. 1, 5) on a feed-control shaft 14 journalled in the base plate 15. Mounted on the left-hand end (FIG. 1) of shaft 13 is another crank 16 which extends substantially vertically upward and whose upper end is straddled by a bifurcated feed bar 17. Bar 17 carries the serrated feeder 10 and is linked with crank 16 by a pin 18.

Riveted into the forked lever 11 is a pivot pin 19 (FIGS. 1, 5) which carries a slider block 20 movable in the guideway 22 of a slide member 23. The slide member 23 has a pivot pin 22 journalled in the machine housing. A lever 24 is fastened to the end of pin 22 and carries a spherical pin 25 (FIGS. 5, 1) straddled by a pusher rod 26. The lower end of rod 26 has a longitudinal slot 27 (FIGS. 1, 3) and is biased by a pull spring 42 (FIG. 5) so that the top of slot 27 abuts against a pin 28 (FIGS. 1, 3, 4, 5). The pin 28 has an eccentric portion rotatable in the hub 31 of a feeler lever 30 (FIGS. 3, 4). One end of the pin 28 protrudes out of the upright standard portion 34 of the machine housing, passing through a slot 37 (FIGS. 4, 5, 12). The eccentric position of the pin 28 can be set and fixed by means of a set screw 32 (FIG. 4). The end of pin 28, protruding out of the machine housing, carries on the outside a stitch-direction control knob 35 fastened by a set screw 36. The pin 28 and the pusher rod 26 are axially secured in position by means of spring rings 29, 33 (FIG. 4).

The feeler lever 30 is pivotally mounted on a stationary pin 38 fastened to the housing structure 34 of the machine (FIGS. 1, 3, 4). The tip 30a of lever 30 is designed as a feeler or follower for coaction with a cam 41a, and another portion of lever 30 has a projection to co-operate, as a feeler or follower, with a cam 41, both cams (FIGS. 3, 1) serving for adjusting the stitching length. The two cams 41 and 41a are fastened beside each other on a short shaft 40 which is rotatably mounted in the standard portion 34 of the machine housing and which carries a stitch-length adjusting knob 39 on its outwardly protruding end (FIGS. 4, 5, 12). The cam contours

4

of the two cams 41 and 41a are similar and are angularly displaced from each other the same amount as the feeler projections of lever 30 relative to the cam center axis of shaft 40. In the rotational position of cams 41 and 41a shown in FIG. 3 the feeler lever 30/31a is in its mid-position and the two feeler projections are in contact with the respective cam lobes so that the feeler lever 30/31a cannot be turned about the pivot pin 38 by means of the stitch-direction control knob 35. The stitch-length control knob 39 on shaft 40 can now be turned to the position in which the mark "0" is located opposite the mark 34a (FIG. 12) on the standard 34. The contour of cams 41 and 41a ascends radially outward at 41' and 41'a (FIG. 3) in a gradual manner to gradually merge with a lobe portion of greater steepness. By virtue of such cam configuration, small stitching lengths can be very accurately adjusted as is desirable when sewing forward and reverse for producing the side-bar portions of buttonholes.

A worm 42 (FIGS. 7, 8) fastened on main shaft 2 meshes with a worm gear 43 on a control shaft 44 which extends horizontally within the arm structure of the machine. The control shaft 44 is journalled in a bearing block 45 (FIGS. 7, 8, 10) and is prevented from axial displacement by a shoulder ring 47 (FIGS. 7, 8) fastened to shaft 44 by means of a bolt 48. The bearing block 45 is attached to the wall of the machine arm 1 by means of screw bolts 46 (FIG. 10). The right-hand free end of the control shaft 44 (relative to FIG. 7) is provided with a peripheral group of longitudinal teeth 49 whose number is equal to the transmission ratio between worm 42 and worm gear 43. Slidingly mounted on the toothed portion 49 of control shaft 44 is a sleeve 50 with corresponding longitudinal teeth meshing with the teeth 49 to prevent the sleeve 50 from rotating relative to the control shaft 44 while permitting axial sleeve displacements.

Mounted on sleeve 50 are a number of coaxial stitch-pattern control cams 51 to 57. The cams 51, 52 and 53 serve to automatically control the lateral needle-bar oscillations imparted to the swing arm 5 (FIG. 1). The cam 54 likewise produces lateral oscillations of the needle-bar swing arm 5. The cam discs 55, 56 and 57, however, control the operation of the material feeder device. The cams 51 to 57 on sleeve 50 preferably consist of synthetic plastic. All these cams are rigidly fastened to the sleeve 50 by means of screw bolts 58.

Also coaxially mounted on sleeve 50 but rotatable relative thereto is a ring member 60 (FIG. 7) which is prevented by a spring ring 61 from axial displacement. The ring member 60 has a peripheral portion which extends to the right (FIG. 7) axially beyond the sleeve 50 and carries on its outward end a symbol indicator disc 62 (FIGS. 7, 8, 11, 12). Disc 62 is fastened to ring member 60 by pins 63. Another pin 64 protrudes radially out of the ring member 60 to which it is fastened by a screw 65. The pin 64 prevents the indicator disc 62 from rotating during rotation of sleeve 50 and control cams 51 to 57.

As mentioned, the cams 51 to 54 impart lateral oscillatory deflections to the needle-bar swing arm 5 (FIG. 1). These lateral motions are transmitted to the swing arm 5 by a cam follower 66 (FIGS. 1, 10) fastened on a pivot pin 67 which is rotatably mounted in the bearing block 45. The follower 66 abuts against a selected one of the cams 51 to 54 under the biasing force of a spring 80 (FIG. 1). Fastened to the free end of the pivot pin 67 is a slide member 68 (FIGS. 10, 1) which possesses a curved glideway 69 in which a slider block 71 is displaceable. The slider 71 is journalled on a pivot pin 70 riveted to a pull rod 72 which is linked by a pin 73 (FIG. 1) with the needle-bar swing arm 5. The pin 70 can be placed in coaxial registry with the pivot pin 67 (FIGS. 1, 10). With such an adjustment, the cam 51 (FIG. 1) does not impart any lateral deflections to the swing arm

5

5, and the sewing machine produces straight stitches. However, the pin 70 can be displaced downwardly (FIG. 1) along the glideway 69 of slide member 68 with the result that the swing arm 5 is caused to oscillate and to impart a lateral movement to the needle bar up to the available maximum deflection. The just-mentioned displacement of pin 70 is effected by means of a handle 79 (FIGS. 5, 10, 12) which is mounted outside of the machine-arm structure 1 on a shaft 78. The shaft 78 (FIGS. 1, 5, 10) is journaled in the structure 1 and carries an arm 77 linked to a pull rod 72 by pivot pins 74, 76 and a linking member 75.

The cam 55 (FIGS. 8, 1, 2), or any other selected cam 56, 57, controls the motion of the feeder 10 by means of a cam follower 81 designed as a lever which is rotatably mounted on a pivot pin 82 fastened to the bearing block 45. A lever arm 83 (FIGS. 10, 1, 5) is rotatable on the hub 81a (FIG. 10) of the follower lever 81. The arm 83 carries a set screw 84 passing through a slit of the follower 81. The set screw 84 serves for adjusting the angular position of arm 83 with respect to follower 81, both forming together an angular composite lever structure. The end of lever arm 83 carries a spherical pin 84a straddled by the upper portion of a pull rod 85 (FIGS. 1, 10). The lower end of rod 85 straddles a spherical pin 86 fastened to an angle piece 87 which is connected by screws 88 (FIG. 5) with the glide-way members 25. The feed-control follower 81 is forced against the contour of cam 55 (56 or 57) by the biasing action of the spring 42 (FIG. 5).

By the action of the above-described cam mechanisms, the sewing machine can automatically produce controlled fancy stitches. For such automatic operation, the cams 41 and 41a on shaft 40 (FIGS. 1, 3, 4) must be turned manually by means of knob 39 (FIGS. 5, 4) to such an extent that the top end of slit 27 (FIG. 3) in pusher rod 26 (FIGS. 3, 4, 1, 5) does not come into contact with the eccentric pin 28 (FIGS. 3, 4), such a position of cams 40 and 41a being illustrated in FIG. 1. In order to have the stitching area, that is the position of the forward and reverse stitches during automatic control of the feed motion, symmetrically located with respect to the zero position, the angular position of the follower lever 81 with lever arm 83 can be varied during sewing operation. For this purpose, the lever arm 83 (FIGS. 1, 10) has a lateral lug 89 which carries a set screw 90 normally locked by a counter nut 91. The set screw 90 abuts against the follower lever 81. After loosening the set screw 90 and the nut 91, the automatically controlled forward and reverse stitches can be adjusted by turning the set screw 90. This can also be done while the machine is in operation. After completing the adjustment, the set screw 90 is to be locked by means of the counter nut 91.

The follower 66 (FIG. 10) for lateral needle-bar deflection is spaced from the follower 81 (FIGS. 10, 1) for feed control a distance equal to four cam widths of the cam set 51 to 57 (FIG. 7). By axially displacing the sleeve 50 with the cam set 51 to 57 on control shaft 44, a double selection is simultaneously made, namely a selection of a cam for lateral deflection control of the needle bar and also a selection of a correlated cam for controlling the operation of the material feeder 10. The arrangement of the cams in set 51 to 57 is such that three cams 51, 52, 53 for lateral needle-bar deflection are correlated to three respective cams 55, 56, 57 for feed control (FIG. 8), whereas the fourth zigzag stitch-producing cam 54, when selected for controlling the lateral deflections of the needle-bar swing arm 5, does not coact with any feed control cam. When the cam set is displaced axially to such an extent that the zigzag control cam 54 cooperates with the follower 66 for lateral needle-bar deflection (FIG. 7), the top end of slit 27 in pusher rod 26 places itself, under the force of spring 42, against the pin 28 (FIG. 4) because the follower lever 81 for feed control is not now confronted with any cam disc (FIG. 7).

6

With this cam adjustment, the stitching length and the feed can be adjusted by hand.

As is apparent from FIGS. 7, 8 and 10, the entire set of cams 51 to 57, inclusive of the symbol indicator disc 62, can be exchanged for another set. If desired, of course, more or fewer than three control cams may be provided for lateral stitch control and also for feed control.

The changes in adjustment of the sewing machine between different zigzag stitches, embroidery stitches, button-hole sewing, straight stitches, as well as the adjustment required for removing or inserting a set of control cams, are all effected by means of a single manual member 92 consisting, in the illustrated embodiment, of a ring-shaped knob 92. The rotary knob 92 is mounted in a flange bearing 98 (FIG. 10) which is fastened by screws 99 and 99a on the arm structure of the machine. The ring-shaped member 92 carries two cams 93 and 94 (FIG. 9) which are formed as a single integral piece of metal coaxially fastened to the manual member 92 by screws 95 (FIGS. 7, 9). The double cam 93, 94 is fastened to the member 92 after the member is inserted into the flange bearing 98. The cam 93, hereinafter called "lifter cam," cooperates with a lifter pin 101 (FIGS. 7, 8) which is rigidly secured to the feed control follower 81, and also cooperates with a second lifter pin 100 (FIG. 10) which is rigidly fastened to the follower 66 for control of the lateral needle-bar deflections. The respective contours of cams 93 and 94 are so interrelated and the spacing between the two lifter pins 100 and 101 peripherally along these cams is so chosen that both followers 66 and 81 are simultaneously lifted by the lifter cam 93 away from the control cams 51 to 57, or are simultaneously returned into engagement with these cams due to manual rotation of the knob member 92.

The cam 94 (FIGS. 9, 7, 8), hereinafter called "selector cam" for distinction, is engaged by the above-mentioned pin 64 (FIGS. 7, 8). By turning the manual member 92, the stepped contour of selector cam 94 (FIG. 9) causes the sleeve 50 with the entire set of control cams 51 to 57 to be axially displaced step by step, each step corresponding to the thickness of a single cam. Such displacement takes place as soon as the lifter cam 93 has lifted the two followers 66 and 81 off the set of cams. The rotary motion of the manual member 92 from one step to the other is defined by catch positions. For this purpose, several stop grooves 96 (FIG. 9) are distributed over the inner periphery of the ring-shaped member 92, and are engaged by steel balls 113 (FIGS. 7, 8) under the biasing action of a leaf spring 112. The strength of the arresting force active in each of the available stop positions can be adjusted by means of a set screw 114 which controls the biasing force of the spring 112.

For exchanging the set of cams, the rotary member 92 is to be manually turned to a position in which the marker line 116 (FIG. 11) on member 92 registers with the zero symbol "0" on the symbol indicator disc 62 of the cam set. In this position of manual member 92, the lifter curve 93 has removed the two followers 66 and 81 from the control cams (FIG. 2). Under the action of a spring 117 (FIG. 10), an angular lever 110 pivoted on a pin 111 in arm structure 1, is turned to a position in which a linking member 108, joined by a pin 109 with the lever 110 and guided by a pin 107 in a slot 97 (FIG. 9) of the cam structure 94, places the pin 64 into engagement with a latch pawl 102 (FIGS. 6, 7). The latch pawl 102 is mounted on the flange bearing 98 by means of a pivot pin 103 (FIG. 6). A helical spring 115 (FIG. 7) seated on pin 103 always forces the latch nose of the pawl 102 downwardly and thus locks the cam set from being displaced axially. Fastened by a screw 106 on the inner wall of the top cover 8 is a leaf spring 105 (FIGS. 7, 6) whose free end carries a push button 104 protruding out of the top cover 8. When the cam set is placed into the exchange position described above by turning the manual member 62 to the zero position illustrated in FIG. 11, the

actuation of the push button 104 causes the pawl 102 to turn against the action of spring 115 out of the range of latch pin 64. This releases the axial locking of the cam set, and the cam set, acted upon by a spring 117 (FIG. 10) through the bell-crank lever 110 and the link 108, is axially displaced on control shaft 44 so that it will jump partially out of the ring-shaped knob member 92 to a position from which it can be conveniently removed. During this operation, the tongue of the link 108 passes through the slit 97 (FIG. 9) in selector cam 94. This prevents the manual member 92 from being turned when no set of cams is inserted.

To facilitate inserting a cam set, the outer end of the control shaft 94 is rounded (44a in FIG. 8) and the front ends of the coupling teeth are bevelled. As a result, a sleeve 50 with a set of control cams can readily be shoved onto the shaft 44. The set of cams may simply be held at the ring 60 or at the handle 62a joined with the indicator disc 62, and when the sleeve is being inserted it need only be observed that the pin 64 points upwardly and passes into the groove or slit 97. By pushing the set of cams against the force of spring 117, the pin 64 catches behind the latch nose of pawl 102 and thus locks the set in proper position. When thereafter the manual member 92 is turned to a desired zigzag or embroidery-stitch position, the latch pin 64, acting also as a follower with respect to the selector cam 94, is displaced by cam 94 in the axial direction and in opposition to the spring 117.

It will be understood from the foregoing that simply by turning the single manual member 92 from one rest position to the other, the following operations are simultaneously controlled.

(1) The followers 66 and 81 for automatic needle-bar and feed control are lifted off the control cams.

(2) The set of control cams is axially displaced so that the cams corresponding to the selected stitch pattern are in registry with the respective two followers.

(3) The two cam followers for automatic needle-bar and feed control are lowered onto the active contours of the control cams.

(4) The selected stitch pattern is indicated on the symbol disc.

(5) Simultaneous switching from automatic needle-bar and feed control to manual control of needle-bar and feed motion.

After turning the manual member 92 to the zero position for exchange of a cam set, the set previously contained in the machine is released by push-button actuation and is automatically ejected to a removing position; thereafter, when inserting a desired other set of cams, this set is constrainedly and automatically latched in the proper position.

If desired, the selector cam 54, normally designed for producing zigzag stitches that are variable under control by the manual lever 79, can also be employed as fancy-stitch control cam. This has the particular advantage that fancy or embroidery stitches can be additionally varied under the effect of the manually adjustable operation of the material feeder 10.

The illustrated fancy-stitch selector devices of the machine also afford the sewing of buttonholes. By corresponding design of the control cams 51 to 53 relating to the lateral needle motion, and the control cams 55 to 57 for controlling the feeder 10, the individual side bars and transverse stitches that make up the buttonhole pattern can be automatically controlled and the cam disc 54 is then available for controlling the sewing-over operation, if desired in conjunction with an additional cam disc. The manual control member 92 is then turned from position to position in order to place the various groups of control cams into operation.

While in the embodiment described above, the single manual control member 92 for jointly selecting a type of stitch is rotatable on a single given path defining a single plane, it should be understood that the above-explained

principles of such simultaneous control, involving the lifting of cam followers, the selection of a cam, and the lowering of cam followers, while the manual member is being moved from one to another predetermined position of rest, can also be embodied with a linear or other predetermined path of the single manual control member.

Furthermore, while the invention in its preferred and most favorable form involves the simultaneous and correlated control of fancy-stitch selection and feed control motion, the invention is also applicable by having the manual control member act upon one or more cam followers serving either for control of needle-bar deflection alone or for material feed control alone; and it will also be understood that instead of axially displacing the control cams to be selected by the manual member, the cam selection may also be effected by displacing a single cam follower common to a group of cams or by selecting one of a group of cam followers so that only one of them is active at a time in cooperation with one of the respective cams.

Such and other modifications will be obvious to those skilled in the art, upon a study of this disclosure, so that my invention can be given embodiments other than particularly illustrated and described herein, without departing from the essential features of the invention and within the scope of the claims annexed hereto.

I claim.

1. A zigzag sewing machine, comprising a needle bar, a stitch-pattern control mechanism having a set of co-axially rotatable control cams for automatic control of fancy-stitch patterns and a cam follower operatively connected with said needle bar and movable into an active position in engagement with a selected one of said cams and into an inactive position out of engagement therewith, said set and said follower being axially displaceable relative to each other for cam selection, a manually actuatable control member movable in a single path of planar motion and having given positions of rest spaced from each other along said path, stitch-pattern indicator means with which said manual member coacts to indicate different stitch patterns in said respective positions, a lifter cam and a selector cam having a given cam-contour relation to each other and being both connected with said member to move together therewith, said lifter cam being operatively connected with said follower for lifting the latter off said cam set only when said member is being moved between one and the next one of said positions, and means cooperatively associated with said selector cam to impart one step of relative displacement between said cam set and said follower when said follower is thus lifted.

2. A zigzag sewing machine, comprising a stitch-pattern control mechanism having an exchangeable set of co-axially rotatable control cams corresponding to a desired fancy-stitch sewing operation and a cam follower operatively connected with said needle bar and movable into an active position in engagement with a selected one of said cams and into an inactive position out of engagement therewith, said set and said follower being axially displaceable relative to each other for cam selection, a manually actuatable control member axially fixed and rotatable about its axis to given positions of rotation, stitch indicator means with which said member coacts to indicate different stitch types in said respective positions, a lifter cam and a selector cam having a given cam-contour relation to each other and being both connected with said member in coaxial relation thereto to rotate together with said member about said axis, said lifter cam being connected with said follower for lifting the latter off said cam set when said member is being moved from position to position, and means operatively associated with said selector cam to impart relative axial displacement between said set and said follower when said follower is thus lifted.

3. A zigzag sewing machine, comprising a stitch-pat-

tern control mechanism having a set of coaxially rotatable control cams and a cam follower normally in engagement with a selected one of said cams, said set and said follower being axially displaceable relative to each other for cam selection, a manually actuable control member mounted in coaxial relation to said cam set and rotatable about the cam axis to given positions of rest, stitch-pattern indicator means with which said manual member coacts to indicate different stitch patterns in said respective positions, a lifter cam and a selector cam both having generally annular shape and extending in coaxial relation to said member, said lifter cam and said selector cam being rigidly joined with said member to be rotationally displaced together therewith, means engaging said lifter cam and connected with said follower for lifting it off said cam set when said member is being moved between one and the next one of said positions, and means engaging said selector cam for imparting relative axial displacement to one of said set and follower respectively when said follower is lifted.

4. A zigzag sewing machine, comprising a needlebar deflecting mechanism with a plurality of different deflector control cams and a cam follower connected with said deflecting mechanism and normally in engagement with one of said respective deflector control cams, a material feed mechanism with a plurality of different feed control cams and a cam follower connected with said feed mechanism and normally in engagement with one of said respective feed control cams, a handle member accessible exteriorly of the machine and manually displaceable on a given planar path, said handle member having given positions of rest spaced from each other along said path, stitch indicator means with which said member coacts to indicate different stitch types in said respective positions, a lifter cam and a selector cam having a given cam-contour relation to each other and being both joined with said member to be moved together therewith, means connecting said lifter cam with said two cam followers for temporarily lifting both of them off said deflector control cams and said feed control cams when said manual member passes from one to another one of said given positions, and means coacting with said selector cam for shifting said control cams relative to said two cam followers when said followers are thus lifted, whereby said lifter cam and said selector cam place said two followers into engagement with a different one of said deflector control cams and a correlated different one of said feed control cams.

5. A zigzag sewing machine, comprising a needlebar deflecting mechanism with a plurality of different deflector control cams and a cam follower connected with said deflecting mechanism and normally in engagement with one of said respective deflector control cams, a material feed mechanism with a plurality of different feed control cams and a cam follower connected with said feed mechanism and normally in engagement with one of said respective feed control cams, a manually actuable control member axially fixed and rotatable about its axis to given positions of rotation, stitch indicator means with which said member coacts to indicate different stitch types in said respective positions, a lifter cam and a selector cam having a given cam-contour relation to each other and being both connected with said member in coaxial relation thereto to rotate together with said member about said axis, said lifter cam being connected with said two cam followers for temporarily lifting both of them off said deflector control cams and said feed control cams when said manual member passes from one to another one of said given positions, and means coacting with said selector cam for shifting said control cams relative to said two cam followers when said followers are lifted, whereby said lifter cam and said selector cam place said two followers into engagement with a different one of said deflector control cams and a correlated different one of said feed control cams.

6. A zigzag sewing machine, comprising a needlebar deflecting mechanism having a shaft rotatable in fixed relation to the sewing operation, an exchangeable set of control cams corresponding to a desired fancy-stitch sewing operation coaxially mounted on said shaft in non-rotatable but axially displaceable connection therewith, a cam follower having a fixed pivot axis and being normally in engagement with a selected one of said cams to derive needle deflecting motion therefrom, a handle member accessible exteriorly of the machine and manually displaceable on a single planar path, said handle member having given positions of rest spaced from each other along said path, stitch indicator means with which said member coacts to indicate different stitch types in said respective positions, a lifter cam and a selector cam having a given cam-contour relation to each other and being both connected with said member to be moved together therewith, means connecting said lifter cam with said follower for lifting it off said cam set when said member is being moved between two adjacent ones of said positions, and means engaging said selector cam and connected with said cam set for axially displacing it on said shaft relative to said follower when said follower is lifted.

7. A zigzag sewing machine, comprising a needlebar deflecting mechanism with a plurality of different deflector control cams and a cam follower connected with said deflecting mechanism and normally in engagement with one of said respective deflector control cams, a material feed mechanism with a plurality of different feed control cams and a cam follower connected with said feed mechanism and normally in engagement with one of said respective feed control cams, a shaft rotatable in fixed relation to the sewing operation, said deflector control cams and said feed control cams being coaxially seated on said shaft to rotate together therewith and forming together a single set axially displaceable on said shaft for cam selection, a ring-shaped handle member rotatable about the axis of said shaft and having a center opening through which said cam set is exchangeably insertable, said member being manually rotatable between given positions of rest, a lifter cam and a selector cam having a given cam-contour relation to each other and being both connected with said member in coaxial relation thereto to rotate together with said member about said axis, means engaging said lifter cam and connected with said two followers for lifting both off said cam set when said member is being moved between one and the next one of said positions, and said cam set having means engaging said selector cam for axially displacing said set on said shaft when said followers are lifted, whereby said lifter cam and said selector cam place said two followers into engagement with a different one of said deflector control cams and a correlated different one of said feed control cams when said handle member is being rotated from one to the next position of rest.

8. A zigzag sewing machine according to claim 7, comprising another deflector control cam selectively engageable with said cam follower of said needle bar deflecting mechanism in a given position of rest of said handle member, said cam follower of said feed mechanism being idle when said handle member is in said given position, and manually operable feed control means connected with said feed mechanism when said handle member is in said given position, whereby the machine is set for manual feed control when said handle member is set to said given position.

9. A zigzag sewing machine according to claim 7, comprising a sleeve axially displaceable on said control shaft in non-rotatable relation thereto, said set of control cams being coaxially fastened to said sleeve, said control shaft having a free end from which said sleeve with said control cams is removable, and an indicator disc coaxially mounted on said sleeve and having stitch-pattern indicia coactive with said ring-shaped handle member to indicate the selected stitch pattern.

11

10. A zigzag sewing machine according to claim 9, comprising spring means active upon said sleeve and having the tendency to move said sleeve outwardly on said free end of said shaft, and manually releasable latch means for retaining said sleeve in opposition to the force of said spring means when said sleeve with said cam set is pushed inwardly to the operative position of said cam set.

11. In a zigzag sewing machine according to claim 10, said indicator disc being rotatable on said sleeve relative to said cam set and having a radially protruding latch pin, a fixed structure having a groove into which said pin can enter when, during insertion of said sleeve onto said shaft, said disc is in a given rotational position, said latch means being engageable with said pin for preventing said disc from rotating relative to said structure when said sleeve and cam set are latched in said operative cam-set position.

12. In a zigzag sewing machine according to claim 11, said manually releasable latch means comprising a spring-biased pawl engageable with said latch pin, and a manual release member coactively connected with said pawl for disengaging it from said latch pin, whereby actuation of said release member causes ejection of said sleeve together with said cam set and said indicator disc when said ring-shaped handle member is placed in said given position.

13. A zigzag sewing machine according to claim 7, comprising a sleeve axially displaceable on said control shaft in non-rotatable relation thereto, said set of control cams being coaxially fastened to said sleeve, said control shaft having a free end from which said sleeve with said control cams is removable, an indicator disc coaxially rotatable on said sleeve in axially fixed relation thereto and having indicia coactive with said ring-shaped handle member to indicate the selected stitch pattern, a pin joined with said disc and engageable with said selector cam so as to constitute said means for axially displacing said cam set on said shaft, a fixed structure having a groove into which said pin can enter during insertion of said sleeve onto said shaft when said disc is in a given rotational position, and manually releasable latch means engageable with said pin for preventing said disc from rotating relative to said structure and latching said sleeve and cam set in operative position when said sleeve is fully inserted.

14. A zigzag sewing machine according to claim 7, comprising a hollow housing structure in which said deflecting mechanism and said feed mechanism are

12

mounted, a ring-shaped hollow frame structure mounted on said housing and protruding therefrom on the operator's side of the machine, said ring-shaped handle member being rotatably mounted on said frame structure, and said lifter cam and said selector cam being concentrically fixed to said handle member and located adjacent thereto within said frame structure.

15. In a zigzag sewing machine according to claim 14, said lifter cam and said selector cam forming an integral piece and having an annular shoulder engaging said frame structure so as to rotatably secure said handle member to said frame structure.

16. In a zigzag sewing machine having a housing and a needle bar, a stitch-pattern control mechanism having a set of coaxially rotatable control cams for automatic control of fancy-stitch patterns and provided with a cam follower adapted to be operatively connected during operation of the machine with said needle bar and movable into an active position in engagement with a selected one of said cams and into an inactive position out of engagement therewith, said set and said follower being axially displaceable relative to each other for cam selection, a manually actuable control member movable in a single path of planar motion and having given positions of rest spaced from each other along said path, stitch-pattern indicator means with which said manual member coacts to indicate different stitch patterns in said respective positions, said manually actuable control member having a manual control knob mounted at a fixed location of said housing and being provided with control means for effecting a selecting operation of said follower relative to said cam set as well as for transferring said follower member back and forth between said active and inactive positions thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,662,417	Mascherpa	Dec. 15, 1953
2,907,221	Haupt	Oct. 6, 1959
2,939,336	Hetzer	June 7, 1960
2,971,482	Koike	Feb. 14, 1961

FOREIGN PATENTS

783,358	Great Britain	Sept. 25, 1957
1,038,887	Germany	Sept. 11, 1958

OTHER REFERENCES

German application No. 1,011,263, printed June 27, 1957 (KL 52a 9/01).