United States Patent

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[54] **UNIVERSAL WORK FEEDING MECHANISMS FOR SEWING MACHINES**
5 Claims, 3 Drawing Figs.

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[51] **Int. Cl.** **D05b 27/20,** D05b 3/02
[50] **Field of Search** 112/213, 48, 49, 81, 206, 158

[56] **References Cited**

UNITED STATES PATENTS

1,452,633 4/1923 Barnett 112/206X

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27,028 11/1965 Japan 112/213

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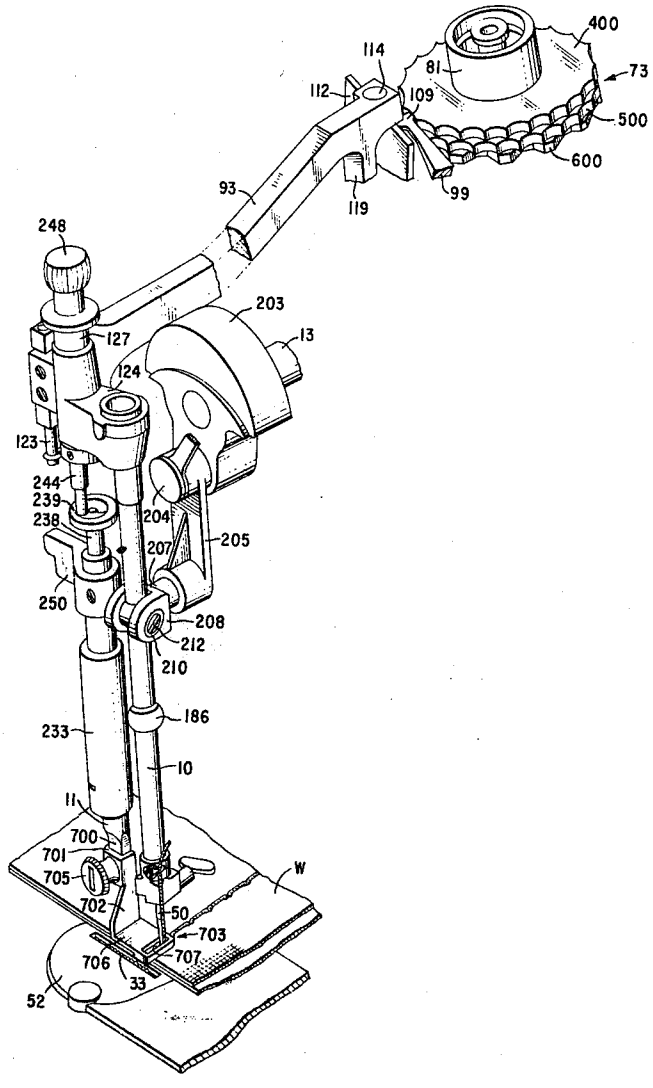
ABSTRACT: A universal work feeding mechanism for a zig-zag sewing machine whereby the needle jogging mechanism may be converted conveniently into a work feeding mechanism for transporting the work fabric laterally of the usual direction of feed of the work through the machine. By means of a novel pattern cam for the needle jogging mechanism of the sewing machine lateral work feeding may be accomplished, and a special sewing machine presser foot facilitates feeding of the work fabric not only in the conventional direction, but also transversely thereof.



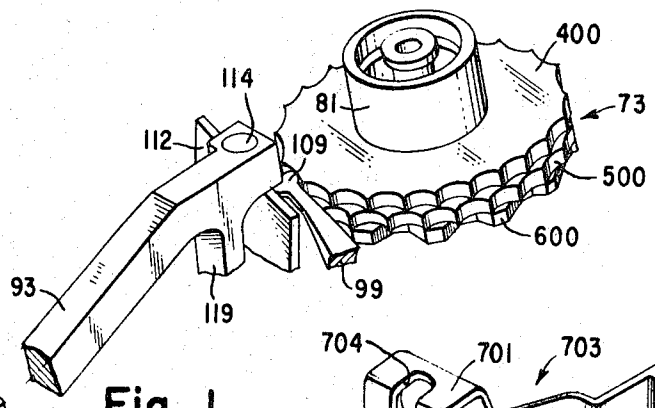


Fig. 1

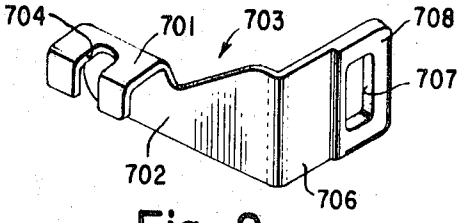
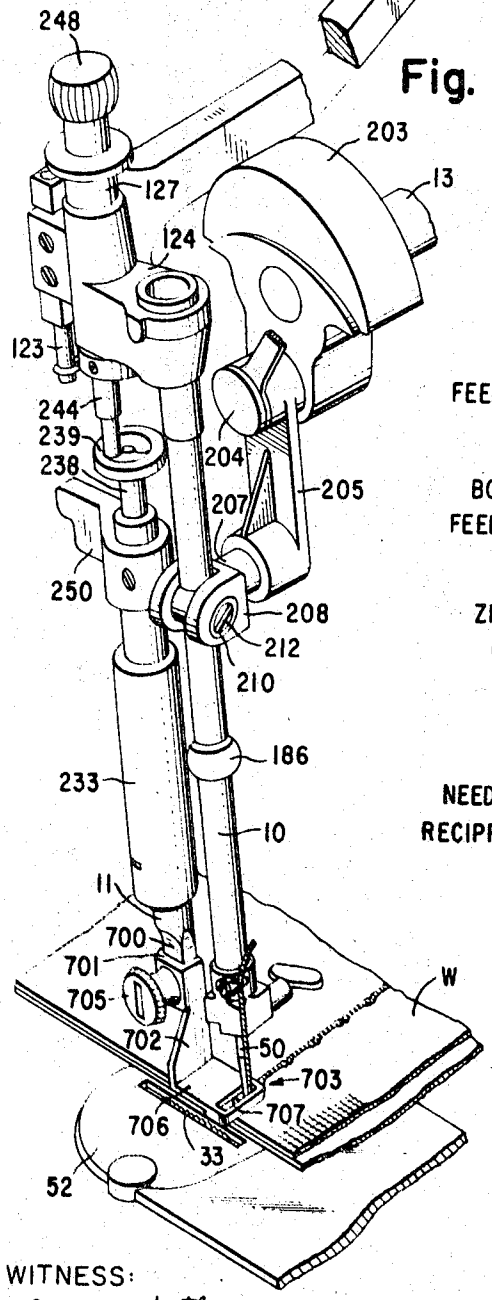


Fig. 2



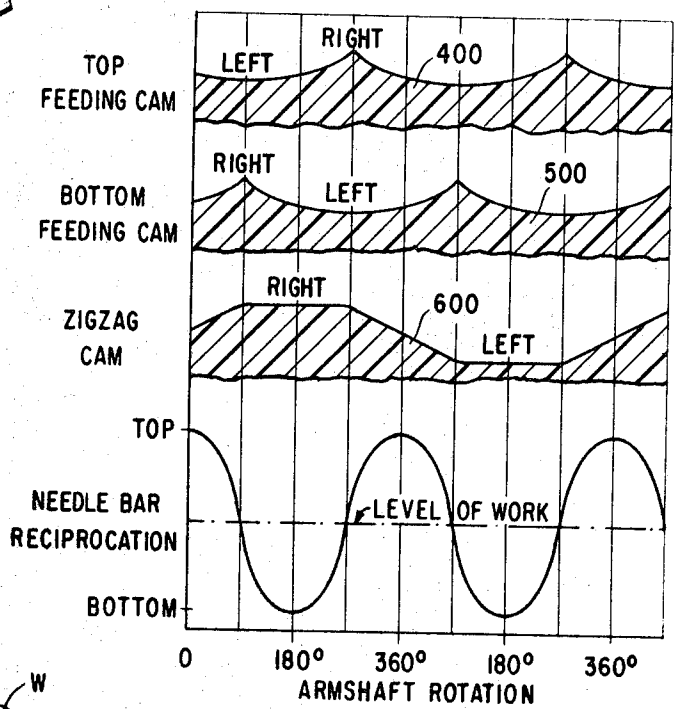


Fig. 3

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UNIVERSAL WORK FEEDING MECHANISMS FOR SEWING MACHINES

BACKGROUND OF THE INVENTION

This invention relates to zigzag sewing machines, and more particularly, to a means for quickly and readily converting a zigzag sewing machine into a straight-stitch sewing machine with the capacity for feeding work fabric in any direction, that is, not only across the sewing machine bed in forward and reverse directions in which conventional drop feed mechanisms transport work fabrics, but also in directions laterally thereof i.e., up or off the sewing machine work supporting bed.

In the present invention the capacity of the zigzag sewing machine to feed the work fabrics laterally of the usual direction of feed is accomplished by modifying the manner in which the needle bar mechanism is jogged laterally of the sewing machine. The work feed laterally of the conventional direction of feed as obtained in the present invention is thus provided by a movement of the needle and is, therefore, within that class of sewing machine feeds heretofore referred to as needle feeds. Needle feed mechanisms are well known in the sewing machine art, but such known needle feed mechanisms have heretofore been used only on industrial type sewing equipment for feeding work in the normal line of feed. Furthermore, a sewing machine, if heretofore equipped with a needle feed mechanism, would have been permanently committed to needle feeding and would not have been at will convertible into a zigzag sewing machine.

The present invention involves conversion of a zigzag mechanism of a sewing machine into a lateral needle feed mechanism so that the household sewing machine user may have at her disposal the option of sewing in any desired direction without turning or shifting the work fabric. Such universal direction feeding capability is extremely advantageous when, for instance, sewing operations become necessary on a workpiece of large dimension as in the darning or embroidering of a tablecloth or the like.

SUMMARY OF THE INVENTION

The aforementioned objects and advantages of this invention are attained by the provision in a zigzag sewing machine of means readily accessible by the machine operator for changing the frequency and the timing of the needle jogging movements relatively to needle reciprocatory movements. In sewing zigzag stitches the frequency of needle jogging movements occurs one complete cycle during two successive needle reciprocations so that the needle will be thrown to the left on one reciprocation and to the right on the succeeding reciprocation. In addition, in zigzag sewing the needle is jogged when out of engagement with the work fabrics. In the present invention the needle is made to transport the work fabrics laterally of the usual direction of work feed by a change in the frequency of needle jogging movement to that of one needle bar jogging cycle for each needle bar reciprocation. Furthermore, the needle jogging in this invention is timed to occur in the same lateral direction during an infinite number of successive needle reciprocations while the needle is in engagement with the work fabric.

The lateral work feeding obtained by this invention ought not to be confused with a multiple stitch zigzag in which the total lateral jogging of the needle in each direction occurs in a series of small successive jogs. In multiple zigzag sewing there is not only no lateral feeding of the work, but also the number of increments increments of jogging in each direction is a limited quantity. In the present invention the lateral jogging movement of the needle in one direction may proceed indefinitely.

For facilitating lateral feeding of the work fabrics the presser foot of the sewing machine is modified in this invention so as to provide for a depending rib surrounding the laterally elongate needle opening in the presser foot. The depending rib is made of substantially uniform cross section configuration completely about the needle opening so as not to favor work transport in any particular direction.

For the disclosure of a sewing machine to which the present invention may be advantageously applied, the specification and drawings of the U.S. Pat. No. 2,862,468, Dec. 2, 1958 to R. E. Johnson are hereby incorporated herein by reference. In particular, the controls for zigzag stitching and the needle bar jogging mechanism for producing zigzag stitches illustrated in FIGS. 2,3,7, and 9 and the description of such needle jogging mechanism in column 5, line 30 to column 12, line 24 of U.S. Pat. No. 2,862,468 is incorporated herein by reference. In addition to and in combination with the disclosure of the above referred to U.S. Pat., the present invention includes a means for feeding work by the action of the needle bar jogging mechanism in a manner illustrated in the accompanying drawing in which:

FIG. 1 is a perspective view of the needle bar jogging mechanism of a sewing machine to which this invention has been applied. Included in this FIG. are a group of pattern cams, the upper two for feeding the work laterally, and the bottom cam for regulating the needle bar jogging motion for zigzag stitching;

FIG. 2 is a bottom perpspective view of the presser foot of this invention; and

FIG. 3 is a graph illustrating linear developments of the three pattern cams, illustrated in FIG. 1, oriented above a graph indicating the endwise reciprocatory movements of the needle bar mechanism illustrated in FIG. 1.

In the sewing machine needle bar jogging mechanism illustrated in FIG. 1 of the accompanying drawing, those parts which are also present in the referenced U.S. Pat. No. 2,862,468 will be denoted in the following description by the same reference character as was used in that patent.

In the drawing 10 denotes an endwise reciprocating and laterally vibratory needle bar of the sewing machine which is supported adjacent to a presser bar 11. A rotary mainshaft 13 not only drives the needle bar but also imparts movement in timed relation with the needle bar movement to a loop taker (not shown) and to a feed dog 33 of a conventional four motion or drop feed mechanism. A thread carrying eye pointed needle 50 carried by the needle bar 10, as a result of endwise reciprocation alternately penetrates and is withdrawn from work fabrics W on a throat plate 52 on the sewing machine frame.

Illustrated in FIG. 1 are three coaxial pattern cam discs 400, 500, and 600. These pattern cam discs are supported coaxially and interlocked for rotation together in a cam group or stack 73 in the sewing machine. The cam group 73 is driven from the mainshaft in timed relation therewith and at a predetermined reduced speed. The pattern cam discs differ as to the configuration of the peripheral cam tracks thereon; the top pattern cam 400 being shaped to influence feeding of the work fabrics W from left to right as viewed in FIG. 1; cam 500 being shaped to influence feeding of the work fabrics from right to left as viewed in FIG. 1; and cam 600 being shaped to influence plain zigzag stitching. The pattern cam 400, moreover, is formed with a handle 81 and is adapted to be readily exchangeable atop the cam group or stack 73 while the cams 500 and 600 are permanently secured in the stack. Only three cams have been illustrated in the cam stack to exemplify the three basically different results. It will be understood that the cam stack may include additional pattern cam discs differing as to the shape of the peripheral cam track.

The mechanism for transmitting information from a pattern cam to the sewing machine needle bar 10 includes a pitman 93 which is influenced by a pair of cam followers of which one cam follower 99 is illustrated. The cam follower 99 may be shifted selectively into tracking relation with the periphery of any one of the pattern cam discs 400, 500, or 600 as by any known selecting mechanism. The second cam follower which is not illustrated in the accompanying drawing, will for the purposes of this invention be immobilized as by being placed against a stationary abutment or by being positioned in en-

gagement with a pattern cam disc having a concentric peripheral cam track. The free end **109** of the cam follower **99** abuts an integrating plate **112** pivoted on trunnion pins such as the trunnion pin **114** in a forked end **119** of the pitman **93**. At the opposite extremity, the pitman **93** is connected by a pin **123** to a needle bar gate **124** which is journaled on a hollow stud **127** carried in the machine frame.

The upper portion of the needle bar **10** is mounted in a spherical bearing sleeve (not shown) in the gate **124** and the needle bar is supported near the lower extremity by a spherical bearing sleeve **186** secured in the machine frame. Endwise reciprocation is imparted to the needle bar **10** by a crank **203** on the mainshaft **13**. A crank pin **204** in the crank is embraced by a needle bar drive link **205** which in turn is connected by a pivot pin **207** to the needle bar. The pin **207** is formed with cheeks **208** which pivotally accommodate a cylindrical sleeve **210** which is apertured transversely to accommodate the needle bar and is secured to the needle bar by a setscrew **212**.

The pressure bar **11** is endwise slidable in a supporting sleeve **233** carried in the machine frame. The presser bar is hollow to accommodate a presser spring (not shown) and a lower plunger **238** formed with a plunger cup **239**. An upper plunger **244** slidable in the hollow pivot stud **127** for the needle bar gate engages the plunger cup **239**. An adjusting screw threaded into the stud **127** and abutting the upper plunger serves to regulate the downward spring pressure exerted on the presser bar. An abutment member **250** secured to the presser bar provides both a guide means for preventing turning of the presser bar and also cooperates with presser bar lifting mechanism (not shown).

At the lower extremity the presser bar **11** is slabbed as at **700** to provide locating surfaces for a securing seat portion **701** formed on a shank **702** of a presser foot indicated generally at **703**. The seat portion **701** is slotted as at **704** to accommodate a thumb screw **705** by which the presser foot is secured to the presser bar. The presser foot **703** is formed with a sole plate **706**. A laterally elongate needle aperture **707** is formed in the presser foot sole plate to accommodate lateral jogging of the needle, and a rib **708** which depends from the sole plate **706** surrounds the needle aperture **707** and is of substantially uniform cross-sectional configuration completely about the needle aperture. The resistance which is offered by the presser foot to the transport of the work fabric W will therefore be substantially equal in all directions.

Prior to a detailed explanation of the work feeding pattern cams of this invention and their operation, certain of the controls of the sewing machine disclosed in the referenced U.S. Pat. No. 2,862,468 will be described. While this invention is not limited to use with the specific machine of the referenced patent, it is necessary that this invention be practiced with a zigzag sewing machine having controls which are the equivalent to those to be described hereinbelow.

The control dial **151** of U.S. Pat. No. 2,862,468 serves to select the cam tracking position of the cam follower **99**. When the pointer **165** is set opposite the indicium "Special," the cam follower will track the profile of the exchangeable cam on top of the cam stack, i.e., the pattern cam **400** of FIG. **1** in the accompanying drawing. To place the follower **99** in cooperation with the uppermost pattern cam permanently secured in the stack, i.e., pattern cam **500** of FIG. **1** in the accompanying drawing, the pointer **165** must be shifted to a position opposite the indicium R. Depending upon the specific location of the zigzag pattern cam **600** in the stack, the pointer **165** must be positioned opposite the appropriate indicium in order to bring the cam follower into tracking relation therewith.

The handle **87** of U.S. Pat. No. 2,862,468 influences the bight or width of zigzag stitching. By bight is meant the extent of lateral jogging movement of the needle during the formation of zigzag stitches. When, in accordance with this invention, the needle jogging mechanism is adapted for lateral feeding of the work, the bight adjusting handle **87** will influence lateral stitch length; setting the handle **87** opposite the indicium **5** will influence the largest lateral stitch length, and setting the handle opposite the indicium **1** will reduce the lateral stitch length to zero. The handle **45** of U.S. Pat. No. 2,862,468 influences the stitch length and direction of work feed along the conventional line of work feed across the sewing machine bed by the feed dog **33**. With this invention the conventional drop feed of the sewing machine may be combined with the lateral feed derived from the needle jogging mechanism to shift the work in a laterally inclined or a curved path. If a purely lateral feed at right angles to the usual line of feed as required, however, the conventional work feed regulating handle **45** must be set to a position corresponding to zero stitch length, or any of the known drop feed throwout mechanisms must be rendered effective.

In FIG. **3** of the accompanying drawing, a fragment of the profile of each of the pattern cams **400, 500** and **600** has been developed in relation to a graph indicating the position of the point of the needle **50** with respect to the level of the work W. The needle-jogging mechanism is such that a lobe or projection on a cam disc periphery corresponds to a position of the needle at the right-hand side of the slot **707** is in the presser foot. It is also pointed out that in this needle-jogging mechanism, it is a change of pattern cam track radius which effects a lateral shift of the needle.

In FIG. **3**, therefore, the lobes of the pattern cams **400, 500**, and **600** are labeled "Right" and the valleys of the cams are labeled "Left" to indicate the corresponding lateral position of the needle.

As indicated in FIG. **3**, the zigzag pattern cam **600** is formed with lobes and valleys which are timed with respect to needle reciprocation to provide a transition only while the needle is withdrawn from the work and to provide each complete cycle of transitions at one-half of the frequency of needle reciprocation. In other words, during zigzag stitching the needle moves only while out of the work and in opposite directions laterally of the normal line of feed during alternate stitches.

As indicated in FIG. **3**, the lateral feed cams **400** and **500** differ from the zigzag cam **600** in two respects; first, the frequency of each complete cycle of needle jogging transitions is equal to that of needle reciprocations; and second, a transition of lateral position is purposely made to occur during needle penetration of the work. The difference between the cams **400** and **500** resides in the direction of needle jogging while the needle is penetrating the work; this direction being from left to right as viewed in FIG. **1** in the case of the pattern cam **400** and right to left in the case of the pattern cam **500**.

In order to produce the stitching illustrated in FIG. **1**, therefore, using a sewing machine as disclosed in the referenced U.S. Pat. No. 2,862,468, a pattern cam **400** must be inserted atop the cam stack **73** and a presser foot **703** secured to the presser bar. The cam selection dials should then be set to A and "Special" and the drop feed regulator **45** should be set to zero. Operation of the machine with a setting of the bight lever at other than the **1** indicium will produce the stitching depicted.

If used as described above, existing sewing machines may be operated in accordance with this invention without the use of special tools or without any dismantling or revision of the sewing machine. If only cam **400**, i.e., only the exchangeable cam position is used for accommodating a lateral feed cam, then feeding laterally in the opposite direction will entail either an exchange of cams on top of the stack or a manual shift of the work, 180° about the axis of the needle.

Since the zigzag mechanism as disclosed is spring biased toward a position of cam follower engagement with a cam profile, the energy for lateral work feeding in a direction from right to left will be obtained from the needle jogging return spring and will not be as positive as the cam influenced motion which is the case when feeding laterally from left to right as viewed in FIG. **1**.

The present invention, therefore, provides for the simple conversion either by selection or insertion of an appropriate cam of practically any cam controlled zigzag sewing machine into a sewing machine capable of feeding work fabric in any

desired direction. Having thus set forth the nature of this invention, what is claimed herein is:

We claim:

1. In a sewing machine having an actuating mechanism, a needle carrying bar supported for lateral jogging movement and for endwise reciprocation alternately to move a needle carried thereby into and out of engagement with a work fabric being sewn, needle carrying bar reciprocating mechanism driven by said actuating mechanism, lateral needle carrying bar jogging mechanism driven by said actuating mechanism in timed relation with said needle carrying bar reciprocating mechanism and first means effective to produce zigzag stitches by laterally jogging said needle carrying bar jogging mechanism only during movement of a needle carried by said bar out of engagement with a work fabric being sewn, the improvement comprising operator influenced means for at will rendering said needle carrying bar jogging mechanism effective to jog said needle carrying bar in a lateral direction during engagement of the needle with a work fabric being sewn on successive reciprocations of said needle carrying bar.

2. A sewing machine as set forth in claim 1 in which said operator influenced means comprises a device for changing the timed relation between said needle bar jogging and said needle bar reciprocating movement from one cycle of lateral jogging movement during a plurality of successive needle reciprocations for zigzag sewing to one cycle of lateral jogging movement during each needle reciprocation for transverse feeding of the work.

3. A sewing machine as set forth in claim 1 in which said first means includes a response producing record driven in timed relation with said reciprocating mechanism and imparting commands for each lateral jogging movement of said needle bar for the formation of zigzag stitches, and in which said operator influenced means comprises a different response producing record differing only in the timing and frequency with which commands for lateral jogging movement of said needle bar are imparted relatively to the operation of said reciprocating mechanism and second means for rendering said different response producing record effective.

4. A sewing machine as set forth in claim 3 in which said lateral needle bar jogging mechanism comprises a needle bar jogging link connected to said needle bar, and a cam follower operatively influencing said needle bar jogging link, and in which said response producing records comprise pattern cam discs having peripheral cam tracks selectively engageable with said cam follower.

5. A sewing machine as set forth in claim 1 in which a presser foot is provided for sustaining in the path of needle reciprocation a work fabric being sewn, and in which said presser foot is formed with a laterally elongated needle opening and with a depending rib surrounding said needle opening, said rib being of substantially uniform cross-sectional configuration completely about said needle opening.