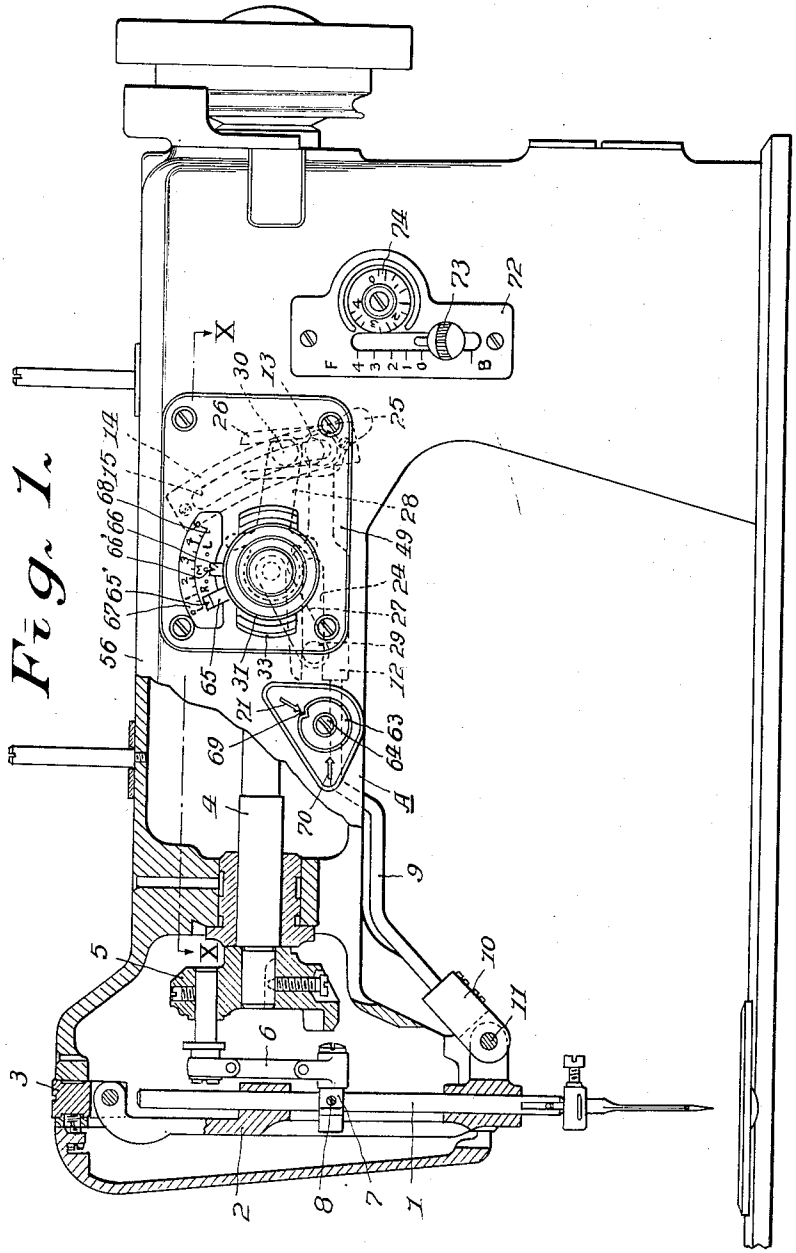
Aug. 7, 1956 KISAKU FUJITA 2,757,626

SEWING MACHINE

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Fig. 1.



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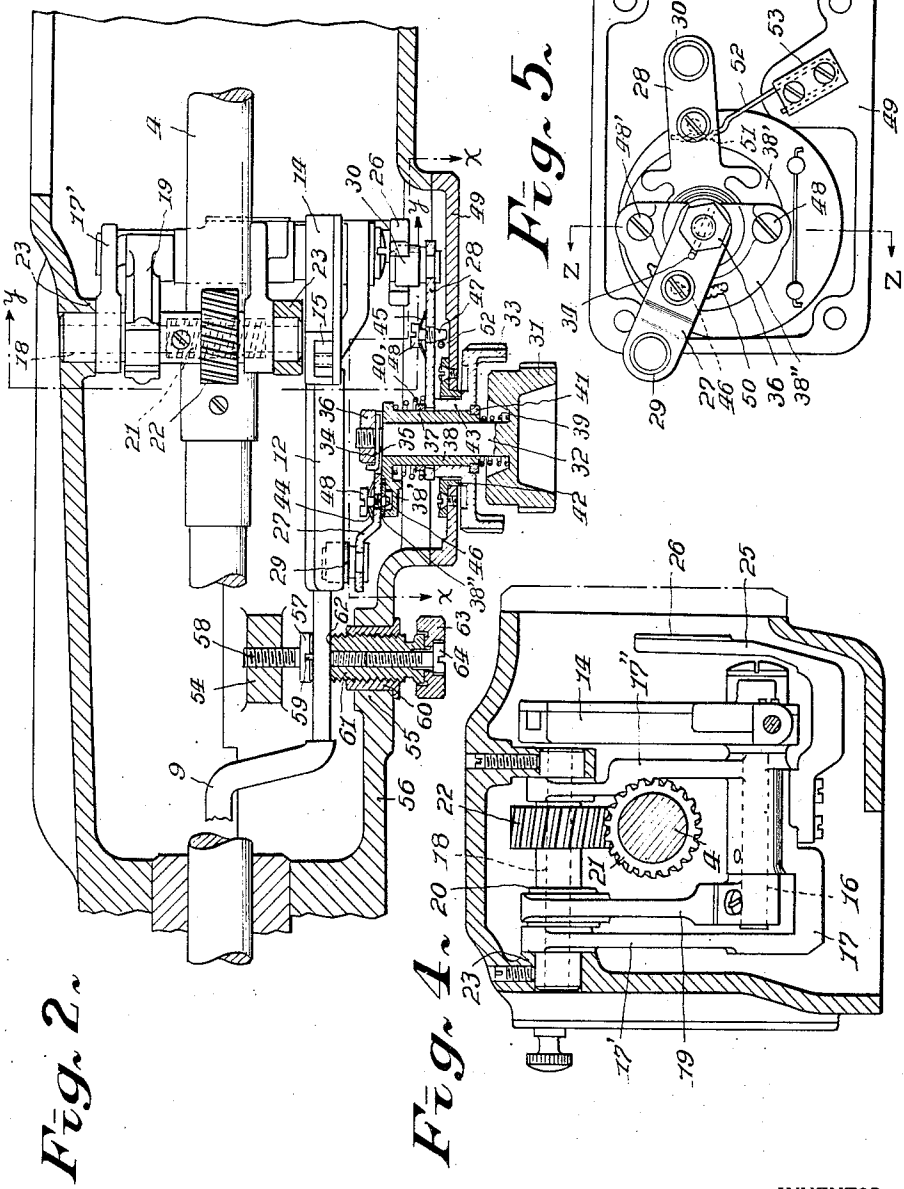


Fig. 2.

Fig. 5.

Fig. 4.

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Fig. 3.

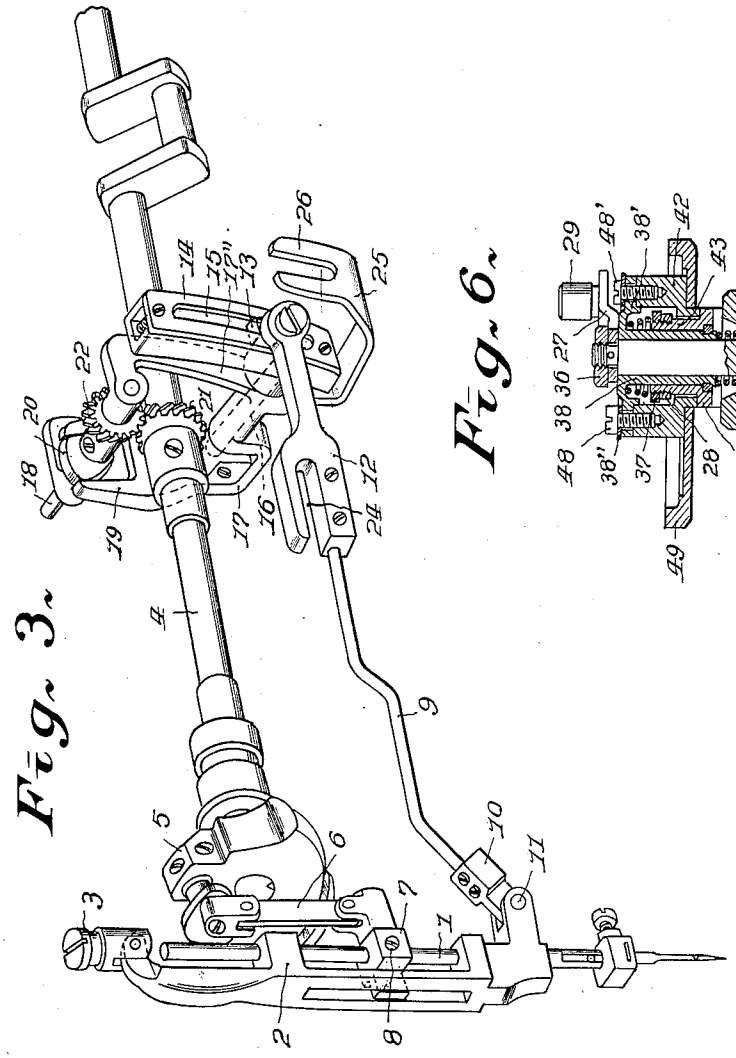


Fig. 6.

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2,757,626

SEWING MACHINE

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Claims priority, application Japan October 6, 1951

9 Claims. (Cl. 112—158)

The present invention relates to a sewing machine, having an improved control device for changing from straight to zigzag stitches and vice versa.

Hitherto, in the usual sewing machine the control device for changing the straight and zigzag stitch is very complex and the zigzag width control dial is usually arranged at a position differing from the position of the stitch position control dial. Therefore, the relative adjustment of the two control dials is very troublesome and the handling of the dials is very inconvenient.

The object of this invention is to provide a relatively simple control device capable of changing easily the sewing operation from straight stitch to zig-zag stitch or vice versa and of adjusting simply and independently each of the said stitchings.

According to this invention, in order to attain the said object, the zig-zag width control dial and stitch position control dial are arranged concentrically in the same position so that each of them may be adjusted individually and independently of each other.

Furthermore, according to this invention, each of the dials is provided with a suitable graduation so that the positions of the adjustments and the relative position of the adjustments may be easily understood. The control device is also constructed so that any manual operation of the control dials may be very smooth and moreover each of the dials may be locked surely and automatically to its adjusted position during their nonoperation.

Hitherto, in the usual control device such as above mentioned there is the disadvantage that a reeling stitch i. e. a nonrectilinear straight stitch may occur owing to the effect exerted on the needle by any rattle or vibration caused by wear of the zig-zag stitching mechanism.

With the object of preventing this disadvantage, hitherto, various constructions have been contrived. It is difficult, however, to prevent effectively the reeling stitch.

Therefore, the further object of this invention is to improve the sewing machine provided with concentric dials such as above mentioned so that said reeling stitch may be effectively prevented. This object has been attained, according to this invention, by a special locking device arranged at the operating rod of the zig-zag stitching mechanism, this device being hereinafter more particularly described in connection with the accompanying drawings. According to such construction, the vibration occurring in any part of the zig-zag stitching mechanism will not be transmitted towards the sewing needle beyond the operating rod. Therefore, the operation of the needle will become very stable, resulting in effective prevention of the reeling stitch.

The said object, other objects, and advantages of this invention will become more readily apparent from the following explanation in connection with the embodiment shown in the accompanying drawings. This embodiment is a preferred form of this invention.

Fig. 1 is a side elevation partially in section.

Fig. 2 is a sectioned plan view taken along the line *xx* in Fig. 1.

Fig. 3 is a perspective view of the main operating structure.

Fig. 4 is a sectional elevation taken along the line *yy* in Fig. 2.

Fig. 5 is an internal side view as seen along the line *xx* in Fig. 2.

Fig. 6 is a sectional elevation of the control dials taken along the line *zz* in Fig. 5.

In Figs. 1, 2, 3, and 4, **2** is a sewing bar supported swingably by boss **3**, **1** is a needle holder supported in the bar **2** so that it may be slid upwardly and downwardly, **4** is a driving shaft for driving the needle holder **1** through a crank **5**, link **6**, and supporter **7**. **8** is a screw pin fixing the base part of the supporter **7** with the needle holder **1**. **9** is an operating rod for zigzag stitching, one end **10** of the said rod being pivoted at a pivot **11**. At the base part of the operating rod **9** is fixed a forked body **12** to be used for transmitting the zigzag stitch control and stitch position control towards the needle bar. The joint piece **13** which is provided at the base end of the forked body **12** is fitted in the slot **15** of the controlling frame **14** so that any zigzag swing may be transmitted towards the swing bar **2** through the forward and backward motion of the operating rod **9**, the said motion being caused by the swing of the controlling frame **14** around the swing shaft **16**. The amplitude of the swing can be adjusted in accordance with the position of the joint piece **13** along the slot **15**. When the position of the joint piece in the slot **15** coincides with the center position of the swing shaft **16**, the operating rod **9** does not swing in spite of swing of the controlling frame **14**. However, in proportion to the increment of the distance between the swing shaft **16** and the joint piece **13**, the swing amplitude of the operating rod becomes larger and larger. As is clear from Fig. 4, the swing shaft **16** of the controlling frame **14** is supported rotatably on the U type frame or yoke **17** and the legs **17'** and **17''** of the frame **17** are supported rotatably on the shaft **18**. Therefore, the shaft **16** receives a swing caused by the rotation of the triangular cam **20** fitted in the forked arms **19** of the shaft **16** and causes the swing of the controlling frame **14**. The triangular cam **20** is fixed on the shaft **18** driven by the prime driving shaft **4** through the gears **21** and **22**, the shaft **18** being supported by the boss **23**. **72** is a stitch graduated plate, **73** is a feed regulating lever, and **74** is a feed regulating screw knob.

As is clear from the above description, for adjustment of the amplitude of the zigzag stitch, it is only necessary to alter the relative position between the joint piece **13** and the slot **15** in the controlling frame **14**. On the other hand, for adjustment of the stitch position of the needle bar it is only necessary to adjust forwards and backwards the position of the swing shaft **16** of the controlling frame **14**. The forked part **24** of the forked body **12** and the forked part **26** of the forked body **25** fixed on an end of the U type frame **17** are arranged so as to accomplish these adjustments. The forked parts **24** and **26** define cam follower surfaces between their arms or tines and receive cam rollers **29** and **30** to bear against these cam follower surfaces, the cam rollers **29** and **30** being supported by the controlling levers **27** and **28**. When the forked part **24** is adjusted upwards or downwards by rotation of the lever **27**, then the swing amplitude will be adjusted effectively and when the position of the shaft **16** in the U type frame **17** is displaced leftwards or rightwards through the forked body **25** by means of rotation of the lever **28**, then the adjustment of the stitch position will be done effectively.

As is shown in Figs. 2, 4, and 6, the lever **27** is connected with the end of the shaft **32** of the control dial **31** and the lever **28** is connected with the end of the tubular shaft **43** of the control dial **33**. **34** is a stopper pin, **35**

is a pin hole, 36 is a lock nut, 37 is a nut for fixing the lever 28 with the shaft 43. The shaft 32 and the shaft 43 are supported, respectively, at the inside and outside of the supporting tubular shaft 38 so that each of them may be rotated independently of each other. Moreover, the shaft 32 is supported elastically by means of a spring 39 so that it may be shifted in the axial direction. 40 is a spring pressing the lever 28 and the shaft 43 so as to give resistance to the rotation of the said parts 28 and 43. 41 is a ring determining the relative position of the parts 43 and 38. 42 is an outer stationary shaft supporting the shaft 38. The shaft 43 may be directly supported on the shaft 38 or on the outer shaft 42 fixed on the side wall 49. The shaft 38 is provided with a sidewardly projecting flange 38' attached to the outer stationary shaft 42 by means of set screws 48 and 48'. To the levers 27 and 28 are fixed the pins 46 and 47 through the spring washers 44 and 45. 50 and 51 are locking parts facing the pins 46 and 47. As is clear from Fig. 5, the part 50 is an arcuate zigzag slot having a serrated surface formed in the piece 38'' fixed on the flange 38' and the part 51 is formed as the zigzag serrated end of an elastic wire 52, the base end of the wire being supported on the side wall 49 by a stopper plate 53.

The dials 31 and 33 may be operated very effectively as follows. If the dial 31 is pushed against the spring 39, the stopper pin 46 will be disconnected from the locking slot 50, resulting in smooth and independent operation of the dial 31. If the dial 31 is released after a suitable adjustment, the dial 31 will be automatically pushed outwards by the spring 39 and the stopper pin 46 will be caught securely at a suitable position in the slot 50. On the other hand, if the dial 33 is rotated, the pin 47 will be displaced along the zigzag wire end 51 receiving a proper pressure of the elastic wire 52, resulting in simple operation of the dial.

In a control device such as above described, there is a possibility that after operation for a long period, a vibration or rattle may occur owing to wear of the mechanism.

According to this invention, the occurrence of such a rattle has been eliminated by a special locking device hereinafter particularly described in connection with Fig. 2.

In Fig. 2, 54 is a boss formed on the base part of the machine body A, 55 is a boss formed on the side wall 56 at the portion of wall 56 opposite boss 54. The shaft 58 of the clipper 57 to be used for pressing the operating rod 9 is screwed in the boss 54 and in the head of the clipper 57 there is provided a slot 59 for receiving a screw driver to be used for adjustment of the clipper position. 61 is a rod screwed in the bushing 60 which is supported in the boss 55, the head of the rod 61 being pressed against the operating rod 9 so as to clip the operating rod 9 between the rod 61 and the clipper 57. 63 is a locking knob secured to the rod 61 by a screw pin 64.

In Fig. 1, each of the parts 65 and 66 is a pointer attached, respectively, to each of the dials 31 and 33 and made of transparent synthetic resin so that the pointer position may be clearly seen even if one of the two pointers lies over the other. 65' and 66' are pointing marks and 67 and 68 are graduations corresponding to the marks 65' and 66'. 69 is a mark which is provided on the locking knob 63 so that the free position or clipping position of the operating rod 9 may be easily indicated by the mark 70 or 71.

The operation of the control device such as above mentioned is as follows:

A. *In making a straight stitch.*—When the zigzag width control dial 31 is pushed and rotated until the mark 65' coincides with the zero point of the graduation 67, then the operating rod 9 will take the lower position and the center of the joint piece 13 coincides with the center axis of the swing shaft 16 of the controlling frame 14, resulting in cessation of the swing transmission from the controlling frame 14 to the operating rod 9. In this case the control center of the stitch position coincides with the zero point. However, the control position of the stitch position, if necessary, may be adjusted towards the right side or the left side. If the dial 31 is released after this operation, this dial will be locked automatically by the engagement of the stopper pin 46 with the slot 50.

Next, if the locking knob 63 is rotated so that the mark 69 will coincide with the locking mark 71, the end 62 of the rod 61 presses the operating rod 9 towards the clipper 57, resulting in locking of the rod 9.

If the driving shaft 4 is operated in the above condition, the straight stitch will be made surely and effectively without receiving any adverse effect caused by rattle of the mechanism because of the secure maintenance of the operating rod 9 in its locked condition.

B. *In making a zigzag stitch.*—(*a*) Zigzag stitch along the center line: In the condition of the above case A, if the mark 69 is controlled to the position indicated by the free mark 70 by rotation of the locking knob 63, then the rod 61 will be released and the operating rod 9 becomes free.

Next, if the amplitude controlling dial 31 is rotated so that the joint piece 13 at the base part of the operating rod 9 departs from the position of the swing shaft 16 of the controlling frame 14, the swing of the said frame 14 will be transmitted to the operating rod 9 and from this rod to the swing bar 2, resulting in a zigzag stitch. The amplitude of the stitching may be adjusted suitably by the graduation 67. If the dial 31 is released, the said mechanism will be locked surely by the engagement of the stopper pin 46 with the locking slot 50.

(*b*) Zigzag stitch along the line displaced from the center line: When the zigzag course is to be displaced towards the right or left side, position control should be effected in addition to the adjustment described in the case (*a*). For the sake of such position control, it is only necessary to rotate suitably the position controlling dial 33. That is, if the dial 33 is rotated towards the right side or the left side, then the U type frame 17 will be rotated around the shaft 18 through the lever 28 and forked body 26, resulting in displacement of the swing shaft 16 towards the left or the right side. As a result, the operating rod 9 is displaced towards the front or rear side and the swing bar 2 is displaced towards the left or the right side. Therefore, the stitching position of the needle bar varies. During such control, the most suitable position of displacement may be easily decided by the relative position of the graduation 68 and the pointing piece 66.

The above description concerns only one illustrative embodiment of this invention. As many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit my invention to specific embodiments thereof except as defined in the appended claims.

I claim:

1. A sewing machine adapted for use selectively for normal straight stitching and for zig-zag sitching comprising, in combination, a machine body, a bar pivotally-mounted at one end in said body for lateral reciprocating movement, a needle carrier mounted in said bar for vertical reciprocating movement, means for vertically reciprocating said needle carrier, a connecting rod pivotally connected to said bar for reciprocating said bar horizontally, and means for transmitting reciprocating movements to said connecting rod, said last-named means being adjustable with respect to the amplitude of the reciprocation and being adjustable to a neutral point of non-reciprocation for straight stitching, and a locking device for rigidly holding the connecting rod when said last-named means is in its neutral position, said locking device comprising means defining an adjustable rigid clamping surface lying on one side of said rod, and means defining a second clamping surface on the opposite side of said rod, said last-named clamping surface being movable

toward said first-named clamping surface to bring said clamping surfaces into frictional engagement with the rod.

2. A sewing machine adapted for use selectively for normal straight stitching and for zig-zag stitching comprising, in combination, a machine body, a bar pivotally-mounted at one end in said body for lateral reciprocating movement, a needle carrier mounted in said bar for vertical reciprocating movement, means for vertically reciprocating said needle carrier, a connecting rod pivotally connected to said bar for reciprocating said bar horizontally, and means for transmitting reciprocating movements to said connecting rod, said last-named means being adjustable with respect to the amplitude of the reciprocation and being adjustable to a neutral point of non-reciprocation for straight stitching, and a locking device for rigidly holding the connecting rod when said last-named means is in its neutral position, said locking device including a clipper element screwed adjustably on a shaft supported on the machine body, a locking rod screwed in the machine body with its forward end at a position opposite said clipper element with the connecting rod lying therebetween and a locking knob secured to said locking rod for moving the locking rod toward said clipper element.

3. A sewing machine adapted for use selectively for normal straight stitching and for zig-zag stitching comprising, in combination, a machine body, a bar pivotally-mounted at one end in said body for lateral reciprocating movement, a needle carrier mounted in said bar for vertical reciprocating movement, means for vertically reciprocating said needle carrier, a connecting rod pivotally connected to said bar for reciprocating said bar horizontally, and means for transmitting reciprocating movements to said connecting rod, said last-named means including a pivotally mounted yoke, driven cam means oscillating said yoke through a predetermined arc during operation of the machine about an adjustable axis, means movable with said yoke defining a slot in the plane of the yoke, said slot having the end of said connecting rod adjustably engaged therewith from a point coinciding with said axis to a point of maximum reciprocation of the connecting rod, means for setting the position of said connecting rod relatively to said slot, said last-named means comprising means connected to said connecting rod defining a cam follower surface, a cam engaged with said surface, means for rotating said cam through a predetermined arc, said rotating means comprising a knob and an arm carrying the cam and means connecting said knob with said arm, a pin carried by said arm and means defining a serrated surface engaged by said pin, each recess in said serrated surface thereby defining a step in the movement of the cam through its predetermined arc, and means for adjusting the relative position of the yoke, said last-named means comprising means connected to said yoke defining a cam follower surface, a cam engaged with said surface, means for rotating said cam through a predetermined arc, said rotating means comprising a knob and an arm carrying the cam, and means connecting said knob with said arm, a pin carried by said arm and means defining a serrated surface engaged by said pin, each recess in said serrated surface thereby defining a step in the movement of the cam through its predetermined arc.

4. A sewing machine adapted for use selectively for normal straight stitching and for zig-zag stitching comprising, in combination, a machine body, a bar pivotally-mounted at one end in said body for lateral reciprocating movement, a needle carrier mounted in said bar for vertical reciprocating movement, means for vertically reciprocating said needle holder, a connecting rod pivotally connected to said bar for reciprocating said bar horizontally, and means for transmitting reciprocating movements to said connecting rod, said last-named means including a pivotally mounted yoke, driven cams means oscillating said yoke through a predetermined arc during

operation of the machine about an adjustable axis, means movable with said yoke defining a slot in the plane of the yoke, said slot having the end of said connecting rod adjustably engaged therewith from a point coinciding with said axis to a point of maximum reciprocation of the connecting rod, means for setting the position of said connecting rod relatively to said slot, said last-named means comprising means connected to said connecting rod defining a cam follower surface, a cam engaged with said surface, means for rotating said cam through a predetermined arc, said rotating means comprising a knob and an arm carrying the cam and means connecting said knob with said arm, a pin carried by said arm and a plate having a slot with a serrated side surface engaged by said pin, each recess in said serrated surface thereby defining a step in the movement of the cam through its predetermined arc, and means for adjusting the relative position of the yoke, said last-named means comprising means connected to said yoke defining a cam follower surface, a cam engaged with said surface, means for rotating said cam through a predetermined arc, said rotating means comprising a resiliently pressed knob and an arm carrying the cam, and means connecting said knob with said arm, a pin carried by said arm and a resilient wire having an end provided with a serrated surface engaged by said pin, each recess in said serrated surface thereby defining a step in the movement of the cam through its predetermined arc.

5. A sewing machine as defined in claim 3, wherein said knobs are concentrically arranged.

6. A sewing machine as defined in claim 3, wherein a control dial is provided for the means for setting the position of the connecting rod relatively to the slot in the means movable with the yoke and a control dial is provided for the means for adjusting the angular position of the yoke, said control dial having indicia indicating selected positions and having cooperating pointers.

7. A sewing machine as defined in claim 3, wherein a control dial is provided for the means for setting the position of the connecting rod relatively to the slot in the means movable with the yoke and a control dial is provided for the means for adjusting the angular position of the yoke, said control dial having indicia indicating selected positions and having cooperating transparent pointers.

8. A sewing machine adapted for use selectively for normal straight stitching and for zig-zag stitching comprising, in combination, a machine body, a bar pivotally mounted at one end in said body for lateral reciprocable movement, a needle holder mounted in said bar for vertical reciprocable movement, means for vertically reciprocating said needle holder, a connecting rod pivotally connected to said bar for reciprocating said bar horizontally, means pivotable about an axis for transmitting reciprocating movements to said connecting rod, means movable with said last-named means and defining a slot, said slot having the end of said connecting rod adjustably engaged therein from a point coinciding with said axis to a point of maximum reciprocation of the connecting rod, means for setting the position of said connecting rod relatively to said slot, and means for adjusting the angular position of said pivotable means, said setting means including a U-shaped member having a first roller carried by a first arm movable therein, said adjusting means comprising a U-shaped member having a second roller carried by a second arm movable therein, one of said arms being connected to a shaft and the other of said arms being connected to a concentric tubular member enclosing said shaft, and control dials connected respectively to said shaft and to said tubular member, a second tubular member connected to the machine body interposed between said shaft and said first-named tubular member, said shaft being rotatable interiorly of said second tubular member and said first-named tubular member being rotatable about the interior of said second

tubular member, whereby said shaft and said first-named tubular member may be separately rotated for selectively moving said setting means and said adjusting means.

9. A sewing machine as defined in claim 8, wherein each arm carries a pin and said machine further comprises means defining a serrated surface engaged by the pin of one of said arms and means defining a second serrated surface engaged by the pin of the other of said arms, and spring means normally urging said pins and their respective serrated surfaces into engagement.

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