

March 15, 1938.

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2,111,394

SEWING MACHINE

Filed July 5, 1935

2 Sheets-Sheet 1

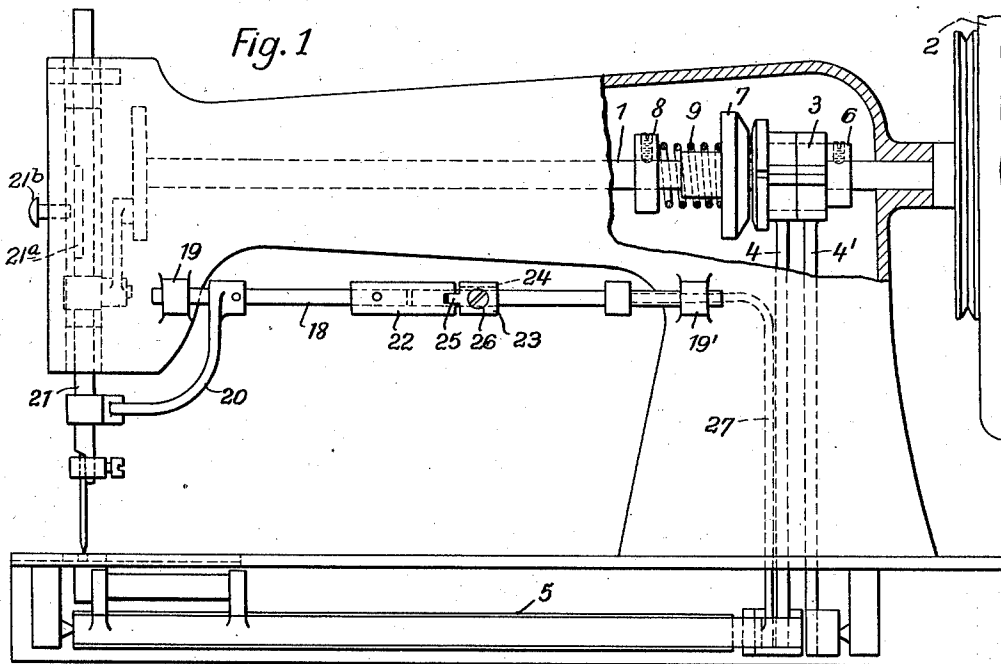
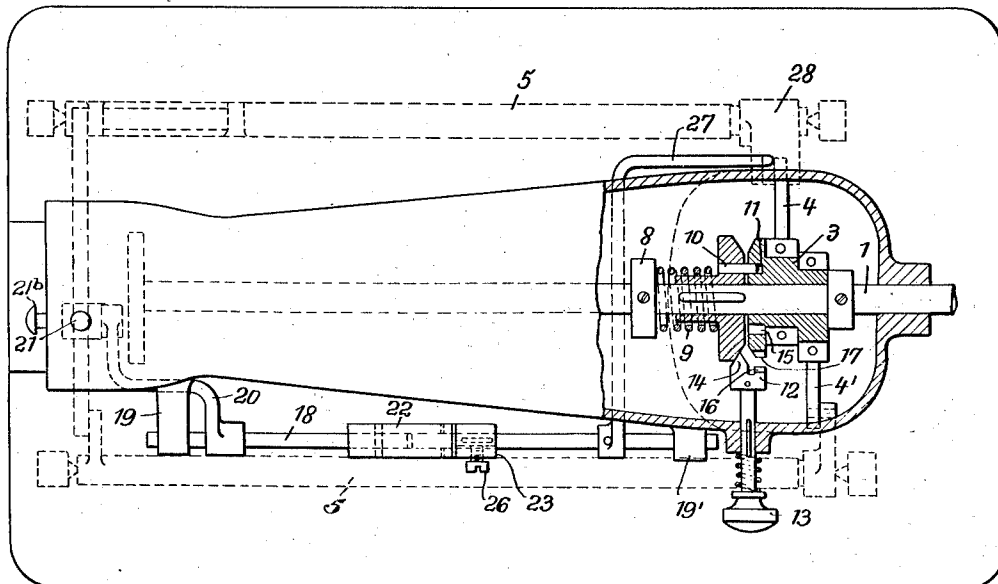


Fig. 2



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2 Sheets-Sheet 2

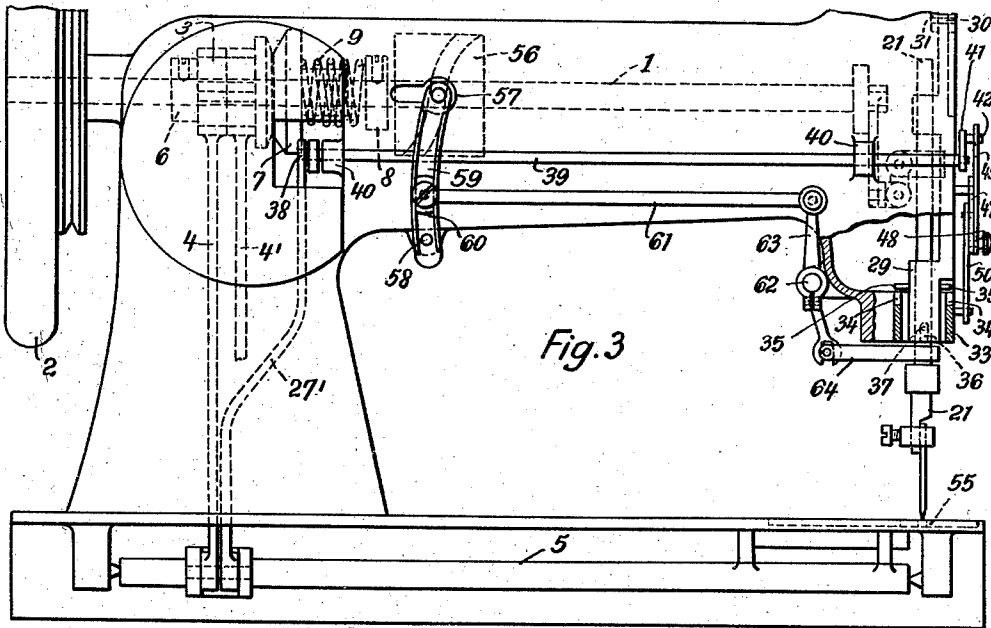


Fig. 3

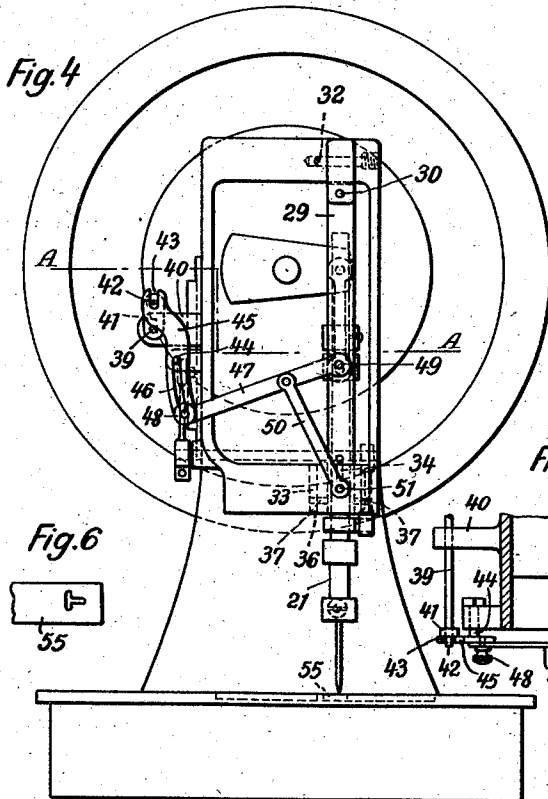
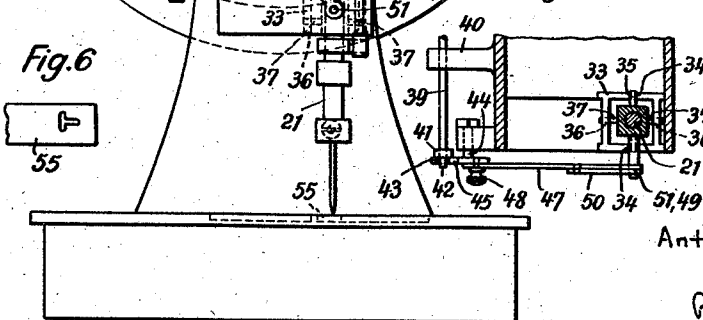


Fig. 4

Fig. 5

Fig. 6



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UNITED STATES PATENT OFFICE

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SEWING MACHINE

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The present invention relates to a sewing machine of the needle feeding type and more particularly to sewing machines of this type but in which the customary feed dog has been preserved and which are adapted to zigzag stitching.

The object of the invention is to provide for a sewing machine which can be operated either with the usual feed dog below the work or with the combined feed dog and needle feed, in order that the well-known advantage of the needle feed, viz. to prevent the upper layer of fabric from lagging behind the lower one when a plurality of layers of fabric are sewed together, is made available. On the other hand it is indispensable that the sewing operation can be carried out with only the lower feed dog for ordinary sewing work, so e. g., hemming, curling, ruffling etc. means supplied with every sewing machine would be useless for machines working with the feed dog and needle feed at the same time. Sewing machines working with the combined feed dog and one or multiple needle feed are known per se as special machines. But in the case of such machines it has not yet been possible to work with these machines in the usual way, viz. with the lower feed dog only, as in the special machines referred to the feed dog advances the fabric while the needle is introduced in the fabric, whereas in the usual sewing operation, where the needle does not partake of the advance, the advance must be accomplished by the feed dog when the needle is clear of the work. According to the invention the machine is rendered serviceable for either purpose in such a way that, while the movement of the needle in the direction of advance can be eliminated at will, the penetration of the needle into the fabric is rendered dependent on the action of the feed dog, this action being so controllable that the advance of the feed dog may, according to the particular case, be accomplished when the needle is either within or outside the fabric. This is arrived at in a simple manner in that the eccentric or the like intended for producing the feeding movement of respectively the feed dog and the needle is loosely mounted on the driving shaft which is to produce the vertical reciprocation of the needle, and can be fixed in several positions required while the needle bar can be disengaged from the means producing the advance of that bar.

The embodiment of the invention above described is thus intended for a sewing machine which can be operated either with the usual feed

dog only, which acts below the work, or with the combined feed dog and needle feed.

A further object of the present invention is to provide for such a sewing machine which can be optionally used with the lower feed dog only or with the combined feed dog and needle feed and which can be additionally arranged for a third possibility of use, viz. the production of zigzag stitches. To this end the needle bar frame is suspended by a universal joint or the like in the head of the machine which is provided with a device by which the swinging movement of the needle bar as produced in the direction of advance can be converted into a movement taking place at right angles to the direction of advance, and inversely. When zigzag stitches are to be obtained, the driving eccentric intended for producing the feed dog and needle advance movements must be so set that the advance of the feed dog takes place when the needle is clear of the fabric. Then the drive of the swinging movement of the needle bar frame is rendered inoperative but the driving gear producing the swinging movement thereof transversely to the direction of advance is switched in.

The accompanying drawings show the two said embodiments of the invention and represent in—

Fig. 1 a side elevation of the first embodiment, Fig. 2 a top plan view thereof, both partially in section and substantially showing only the essential members adapted to respectively produce and change the two swinging movements of the needle bar,

Fig. 3 a longitudinal section through the head of the machine and corresponding to the second embodiment referred to,

Fig. 4 a front elevation of the said head,

Fig. 5 a cross section on line A—A of Fig. 4, and

Fig. 6 a top plan view of the needle plate.

The main shaft 1 intended for producing the vertical reciprocation of the needle is mounted in bearings of the arm of the sewing machine and is driven in the usual way by the wheel 2. The main shaft 1 carries a double eccentric 3 which is loosely mounted thereon and connected through eccentric rods 4 and 4' to rocking shafts 5 disposed below the machine base plate and intended for producing the parallelogram movement for the feed dog. The collar 6 is used as an abutment for the eccentric 3 on the shaft 1 while on the other side of the said eccentric there is disposed a coupling sleeve 7 displaceable on the shaft 1 in a lengthwise direction but secured against angular displacement relatively thereto, this sleeve be-

ing continuously pressed against the eccentric 3 by a pressure spring 9 the opposite end of which bears against another collar 8 carried by the main shaft 1. The said coupling sleeve is provided with a pin 10 engaging with a bore 11 of the eccentric 3. The swinging movement of the needle in the direction of advance is produced in the usual manner, e. g. by a shaft 18 mounted in bosses 19 and 19' of the arm of the sewing machine. Shaft 18 is coupled by means of a curved lever 27 to the crank arm 28 which connects the eccentric rod 4 to one of the rocking shafts 5. A lever 20 is fastened by means of a pin on the said shaft 18 and pivoted to the needle bar 21. When the eccentric 3 rotates, the eccentric rod 4 imparts a swinging movement to the crank arm 28. Lever 27 transmits this movement to shaft 18 and lever 20 keyed to the latter. A swinging movement of the needle synchronous with the reciprocation of the feeding dog is obtained because the other end of lever 20 is slidably pivoted to the needle bar 21. In order that the swinging movement resulting in the needle advance can be eliminated, the shaft 18 is divided into two halves and provided with a coupling sleeve 22 at the joint thereof. A catch 23 is slidably mounted on one of these shaft halves and secured against angular displacement by groove and tongue 24. A projection 25 of the said catch engages a corresponding notch of the sleeve secured on the other half of the shaft 18. By means of the screw 26 the said catch is clamped in respectively the operative and inoperative positions. The swinging movement of the needle may also be prevented by any other suitable means. When the sewing machine working with the combined needle and feed dog feeds is to be adapted to ordinary sewing with the lower feed dog only, it becomes necessary in the first place, to disconnect the needle feed, i. e. prevent movement of the needle bar in the horizontal plane. This may be effected for instance by adjusting the coupling 22. In such event, it is also necessary to adjust the operating cycle of the needle movement with respect to the feed dog operation, because the ordinary feed-dog construction provides for the advancement of the workpiece in the raised position of the needle, while in the case of a combined feed-dog and needle feed the workpiece is advanced in the lower position of the needle. This adjustment of the operating cycle of the needle movement with respect to the feed dog is produced by the adjustment of the coupling sleeve 7 by means of a lateral pin head 12 disposed within the arm of the machine and subject to the pressure of a spring, which pin head 12 is operated manually by a pressure being exerted on the button 13 of the pin, when a cam 14 of the said pin head 12 acts as a wedge on the conical revolving surface of the said sleeve 7. This having been done the pin 10 releases the eccentric 3 so that now the coupling sleeve 7 can be turned through an angle of about 180° by means of the hand wheel 2 until the pin 10 has dropped into a bore 15 provided for in the eccentric 3 diametrically opposed to the bore 11 thereof. While the coupling sleeve is being so turned, a nose 16 of the pin head 12 at the same time engages a notch 17 of the eccentric 3 so as to secure the same against being taken along when the said coupling sleeve is turned.

After the advance of the needle bar has been so eliminated the needle bar 21 is held in the head of the sewing machine in its vertical position for reciprocation, e. g. by means of an adjustable pin

21b which can be shifted into an axially disposed slot 21a in the needle bar 21 to prevent the latter from swinging in the direction of advance, without interfering with the vertical reciprocal movement thereof.

In order that the machine can also be used for making zigzag stitches a needle bar frame 29 is, by means of a suitable universal joint, such as a Cardan joint 30, 31, 32, a ball joint or the like, mounted in the head of the sewing machine so that the needle bar 21 guided in the said frame 29 can be swung both in the sewing direction and in another direction transversely to the latter. In order that the swinging movement of the needle bar frame is changed from one of the said directions to the other direction and the said frame is allowed to swing in the particular direction and prevented from swinging in the other direction, its lower end is enclosed by a guide frame 33 with a clearance which suffices for the largest amplitude of the swinging movement of the needle bar frame in either direction. The said guide frame 33 is slidably mounted for vertical displacement in the lower wall of the head of the sewing machine and is at the top edge of its lower transverse frame piece provided with two slots 34 opposing each other and which can be engaged by two pins 35 provided on the needle bar frame 29. Also the lower edge of the guide frame 33 is provided with two slots for the pins 37 of the needle bar frame 29, but these slots are offset relatively to the slots 34 and pins 35 respectively.

In the embodiment of the machine as shown by Figs. 3 to 6 the needle feed is on principle operated in exactly the same way as in the embodiment shown by Figs. 1 and 2. On the main shaft 1 there is again loosely mounted the double eccentric 3 which is by the eccentric rods 4 and 4' connected to the rocking shafts 5, which actuate the feed dog in the well-known manner. A lever 27' corresponding to the lever 27 of the embodiment of Figs. 1 and 2 is attached to the rocking shaft 5, and with its top end to a crank 38 keyed to a longitudinal shaft 39. This longitudinal shaft 39 is mounted in suitable bearings 40 of the body of the sewing machine. The free end of the shaft 39 also carries a crank 41 keyed thereto and which with a pin 42 engages a slot 43 of a double-armed lever 45 pivotally mounted as at 44 on the head of the machine. In its lower arm the lever 45 is provided with another slot 46 in which the end of a link 47 is displaceable but susceptible of being fixed by a knurled screw 48. This slot 46 extends as far as the axis 44 of the swinging movement of the lever 45 so that in this manner the swinging amplitude of the link 47 can be adjusted from nil to a maximum. At 49 the link 47 is pivoted to the needle bar frame 29 so that it imparts a reciprocating movement to the same and thus to the needle bar 21 guided therein, provided that the link 47 is secured to the lower end of the slot 46 of the lever 45. When the knurled screw 48 is adjusted to a position coinciding with the fulcrum 44 of the lever 45, then the needle may carry out either the ordinary sewing movements, or the zigzag movement depending upon whether or not the zigzag mechanism is put into operation. However, in this position of the knurled screw no swinging movement of the needle bar in the direction of advance takes place. Between the points of attachment of the said link 47 there is pivoted to the latter another link 50 the lower end of which is at 51 attached to the guide frame 33. When now the

link 47 is displaced within the slot 46 of lever 45 from its extreme position into the inoperative position or inversely thus also the link 50 is taken along and caused to displace the guide frame 33 upwards or downwards so as to couple either the pins 35 with the slots 34 or the pins 37 with the slots 36.

The link 47 occupying its extreme top position, viz. the screw 48 having been set exactly at the fulcrum point 44 of lever 45, the pins 37 have been disengaged from the slots 36 and the needle bar is caused to carry out the usual sewing movement without any needle feed. But when the lever is secured to the lever 45 in its lowermost position within the slot 46, the pins 35 of the needle bar frame have been disengaged from the slots 34 and on the other hand the pins 37 caused to engage the slots 36 of the needle bar frame 33 so that now any swinging movement of the lever 45 as produced by the means referred to will through the link 47 impart a reciprocating feed movement in the sewing direction to the needle bar frame 29 and thus to the needle bar 21.

It is a matter of course that the means intended for producing the needle feed are so arranged that the latter takes place in a synchronous manner when cooperating with the usual feed dog advance, which is obvious from the fact that the needle movements for the needle feed are derived from the same double eccentric 3 which also actuates the said feed dog.

As already mentioned, the machine shown by Figs. 3 to 6 is not only susceptible of being changed from the ordinary sewing operation to the needle feed but also suited for zigzag stitching. In order that the needle is enabled to accomplish a reciprocating movement both in the direction of the needle feed and transversely thereto in the needle plate (Fig. 6), the opening intended for the passage of the needle and otherwise having the shape of a hole is replaced by a T-shaped slot so that the needle plate need not be changed for the several kinds of stitches. To change the mode of operation of the machine from the needle feed to zigzag stitching, first the knurled screw 48 is adjusted into the position coinciding with the fulcrum 44. Thus the needle feed mechanism is rendered ineffective and at the same time by means of lever 50 the guide frame 33 is raised to a position in which the pins 37 of the needle bar frame 29 have been disengaged from the slots 36 and the needle bar has been freed for its zigzag movements. On the other hand the pins 35 have engaged the slots 34 to prevent the needle bar from taking any movement in the direction of advance. For the production of the zigzag movement, the main shaft carries a cam 56 keyed thereto and with which engages a roller 57 of a rocking lever 59 pivoted as at 58 on the arm of the machine. This rocking lever 59 is provided with a guide for an adjustable block 60 which can be secured to the lever 59 in different positions. To the said block is attached a link 61 the other end of which is pivoted to one end of a double-armed lever 63 pivotally mounted as at 62 on the head of the machine. The other end of this double-armed lever 63 is adapted to actuate the needle bar 21 through a connecting rod 64. As already mentioned, the said block 60 is slidably mounted in the guide of the rocking lever 59. When the block 60 is in a position coinciding with the fulcrum 58 of the rocking lever 59 no rocking movement is imparted to the lever 63 and thus no zigzag movement is produced. But by the block 60

being displaced so as to have a definite distance from the fulcrum 58 of the rocking lever 59, the amplitude of the zigzag stitches so produced can be modified at will.

The zigzag movement of the needle frame 29 and the displacement of the same is accomplished by the means shown in Fig. 3.

What is claimed as new, is—

1. In a sewing machine, a feed dog, a needle, means for reciprocating the needle, means for advancing the feed dog in timed relation to the needle reciprocation, means cooperable with said last-named means for swinging the needle in the direction of feed dog advance, means for rendering the needle-swinging means inoperative, and means for adjusting the timing between the needle reciprocation and the feed dog advance so that the feed dog advance may be selectively caused to take place either with the needle in the work or with the needle withdrawn from the work.

2. In a sewing machine, a feed dog, a needle, means including a shaft for reciprocating the needle, a needle bar, means comprising an eccentric loosely mounted on said shaft for advancing the feed dog in timed relation to the needle reciprocation, means releasably engaging said needle bar for swinging the needle in the direction of feed dog advance, and means for releasably securing said eccentric to said shaft in different angular positions thereof so that the feed dog advance may be selectively caused to take place either with the needle in the work or with the needle withdrawn from the work.

3. In a sewing machine, the combination of claim 2, in which said last-named means comprises a coupling sleeve splined on said shaft and adapted to engage with said eccentric in the different angular positions of the latter, and a spring normally pressing said sleeve into engagement with the eccentric.

4. In a sewing machine, the combination of claim 2, in which said last-named means comprises a coupling sleeve splined on said shaft and adapted to engage with said eccentric in the different angular positions of the latter, said sleeve having a conical surface, a spring normally pressing said sleeve into engagement with the eccentric, and a pin slidably mounted in the machine and having a cam surface adapted to bear against said conical surface to disengage said sleeve from said eccentric.

5. In a sewing machine, the combination of claim 2, said eccentric having a notch therein, and said eccentric-securing means comprising a sleeve splined on said shaft and engageable with the eccentric, a spring normally pressing said sleeve into such engagement, said sleeve having a conical surface, and a releasing pin having a cam surface adapted to bear against said conical surface to disengage said sleeve from said eccentric, said pin having also a projection adapted to engage within said notch at a time of disengagement.

6. In a sewing machine, the combination of claim 1, said needle-swinging means including a sectional shaft, and said means for rendering the swinging means inoperative comprising a separable coupling for the sections of said shaft.

7. In a sewing machine, a feed dog, a needle, means for reciprocating the needle, means for advancing the feed dog in timed relation to the needle reciprocation, means for selectively swinging the needle either in the direction of feed dog advance or in a transverse direction for effecting

zigzag stitches, means for rendering the needle-swinging means inoperative, and means for adjusting the timing between the needle reciprocation and the feed dog advance so that the feed dog advance may be selectively caused to take place either with the needle in the work or with the needle withdrawn from the work.

8. In a sewing machine, a feed dog, a needle, a needle bar, a needle bar frame, a universal-joint mounting for said needle bar frame, means for reciprocating the needle bar within said needle bar frame, means for advancing the feed dog in timed relation to the needle reciprocation, means for selectively swinging the needle bar either in the direction of feed dog advance or in a transverse direction or securing it against any swinging, and means for adjusting the timing between the needle reciprocation and the feed dog advance so that the feed dog advance may be selectively caused to take place either with the needle in the work or with the needle withdrawn from the work.

9. In a sewing machine, the combination set forth in claim 7, together with means operative during each swinging movement for preventing swinging movement in any other direction.

10. In a sewing machine, the combination set forth in claim 8, together with means operative during each swinging movement for preventing swinging movement in any other direction, said last-named means comprising a vertically shiftable guide frame enclosing the lower end of the needle bar frame, said guide frame having a pair of aligned slots in its upper edge and a second pair of aligned slots in its lower edge, said second pair of slots being angularly offset with respect to the first-mentioned pair, a pair of pins carried by the needle bar frame and adapted to engage with the upper slots when the guide frame is raised, and a second pair of pins carried by the needle bar frame and adapted to engage with the lower slots when the guide frame is lowered.

11. In a sewing machine, the combination set forth in claim 8, together with means operative during each swinging movement for preventing swinging movement in any other direction, said last-named means comprising a vertically shiftable guide frame enclosing the lower end of the needle bar frame, said guide frame having a pair of aligned slots in its upper edge and a second pair of aligned slots in its lower edge, said

second pair of slots being angularly offset with respect to the first-mentioned pair, a pair of pins carried by the needle bar frame and adapted to engage with the upper slots when the guide frame is raised, a second pair of pins carried by the needle bar frame and adapted to engage with the lower slots when the guide frame is lowered, and a series of levers for shifting said frame and simultaneously rendering operative the means for swinging the needle bar in the direction of the work.

12. In a sewing machine, a feed dog, a needle, a needle bar, means for reciprocating the needle, means for advancing the feed dog in timed relation to the needle reciprocation, means for selectively swinging the needle bar in the direction of feed dog advance or in a transverse direction; said feed dog advancing means including a shaft and an eccentric thereon; said swinging means for swinging the needle bar in the direction of the work comprising a double-armed lever with a slot in one arm thereof, means for transmitting the eccentric movement to the unslotted lever arm, a link pivoted to the needle bar, means for adjustably securing the other end of said link in said slot; and means operative during said swinging movement to prevent swinging in any other direction, said means including a vertically shiftable guide frame enclosing the lower end of the needle bar, and a link pivotally extending between a midportion of said first-named link and said guide frame.

13. In a sewing machine, a feed dog, a needle, a needle bar, means for reciprocating the needle, means for advancing the feed dog in timed relation to the needle reciprocation, means for selectively swinging the needle bar in the direction of feed dog advance or in a transverse direction; said needle-reciprocating means including a shaft; said swinging means for swinging the needle bar in a transverse direction comprising a cam on said shaft, a rocking lever with a slot therein, said slot extending over the fulcrum of said lever, a cam follower on the end of said lever, a block slidably mounted in said slot, and links operatively interposed between said block and the needle bar, the amplitude of swing being variable upon shifting the position of said block, and said amplitude being zero when the block is positioned over the fulcrum of said rocking lever.

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