

Sept. 17, 1935.

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2,014,916

NEEDLE VIBRATION CONTROLLING MECHANISM FOR ZIGZAG STITCH SEWING MACHINES

Filed Dec. 11, 1934

4 Sheets-Sheet 1

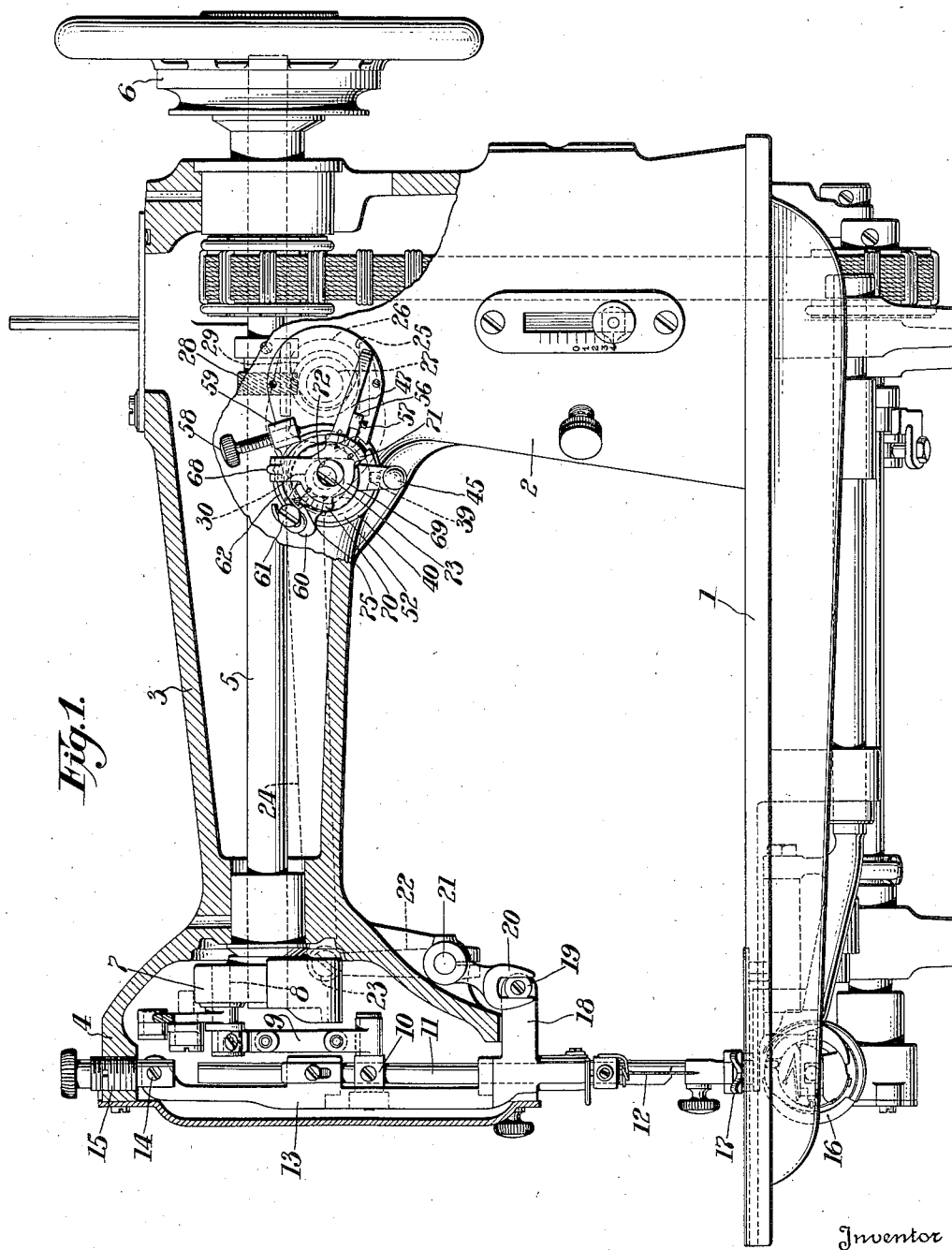


Fig. 1.

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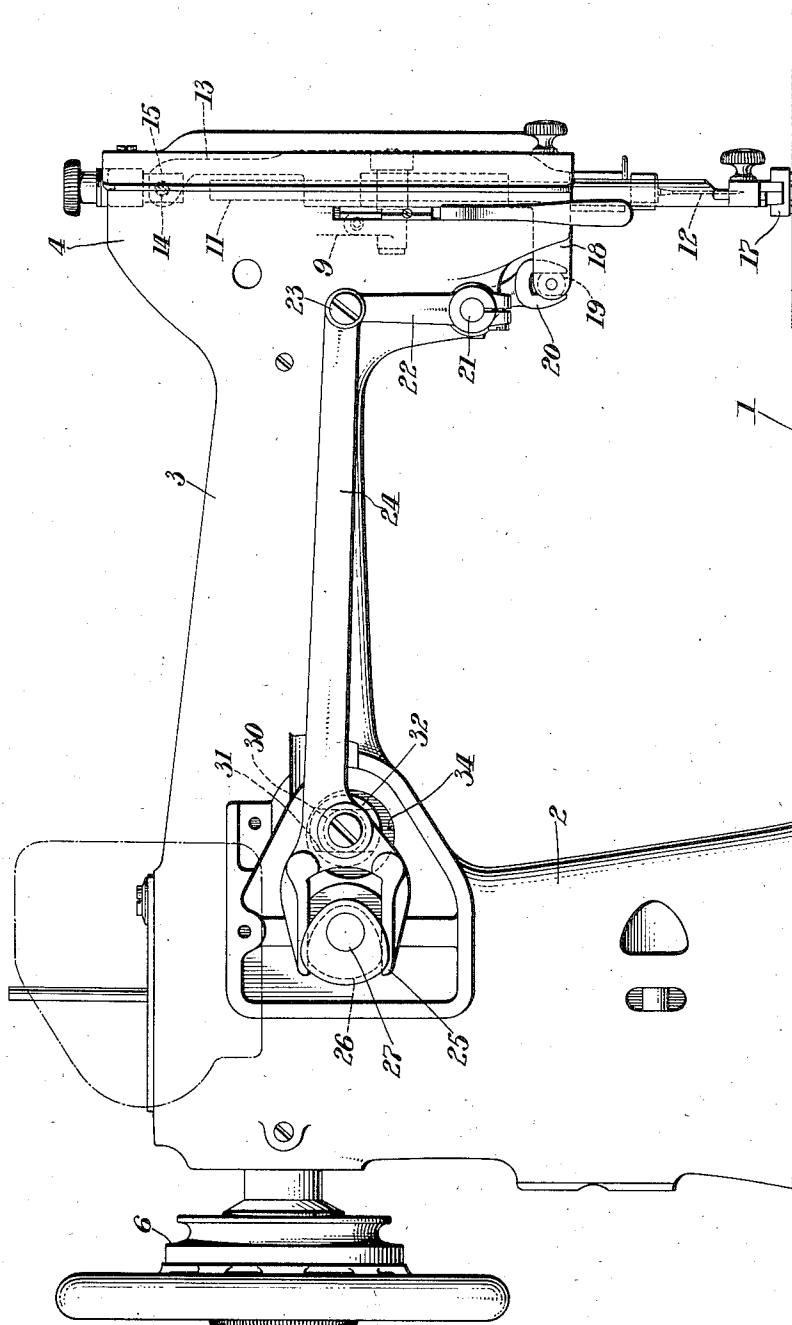
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4 Sheets-Sheet 2



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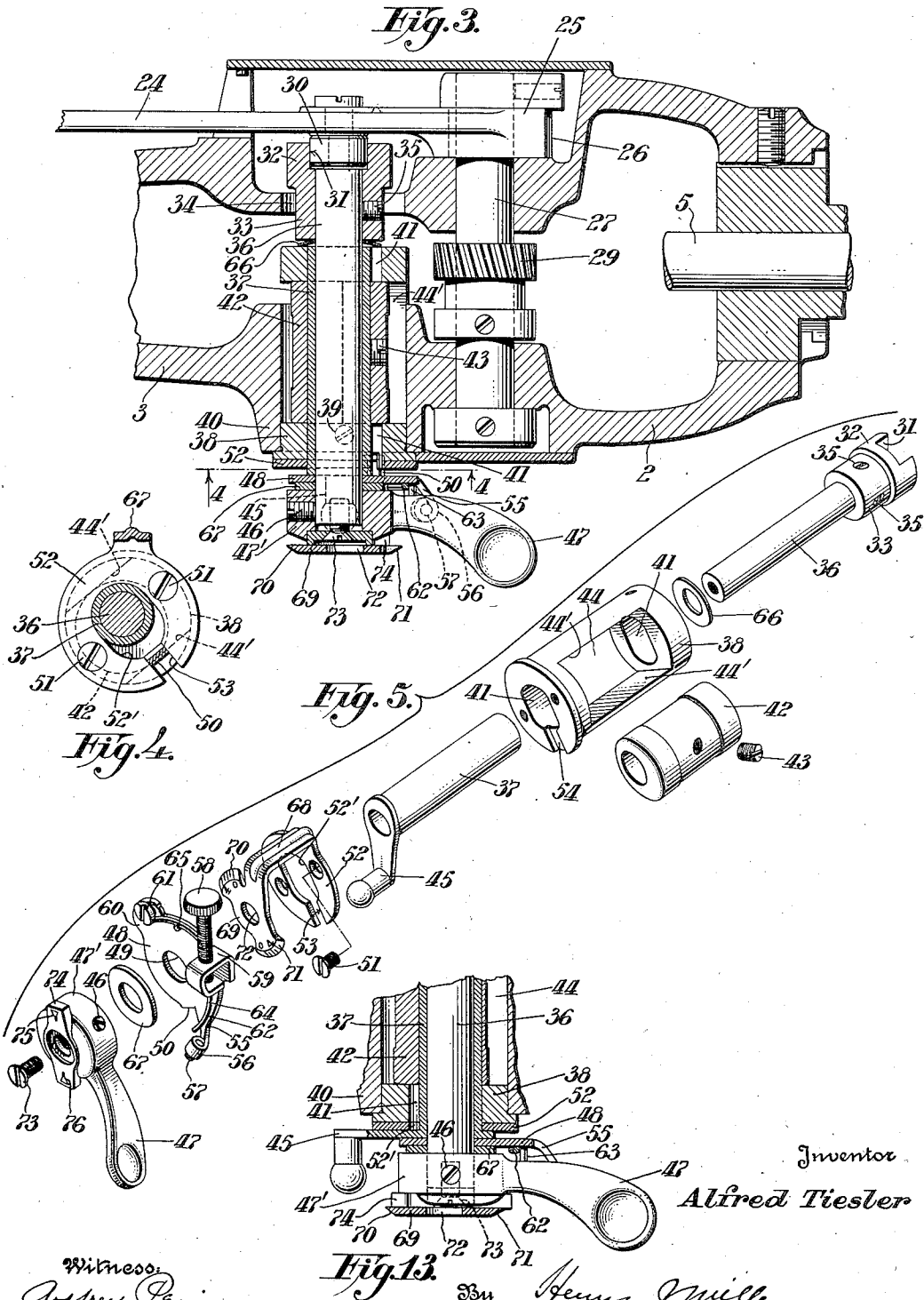
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4 Sheets-Sheet 3



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Fig. 13

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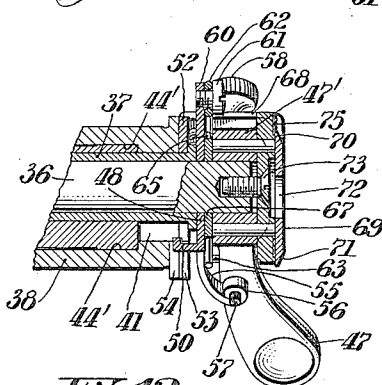
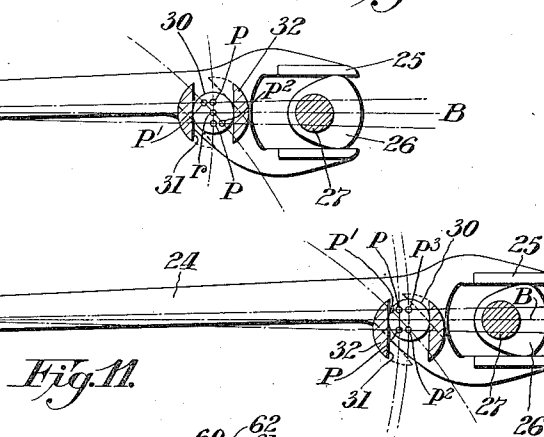
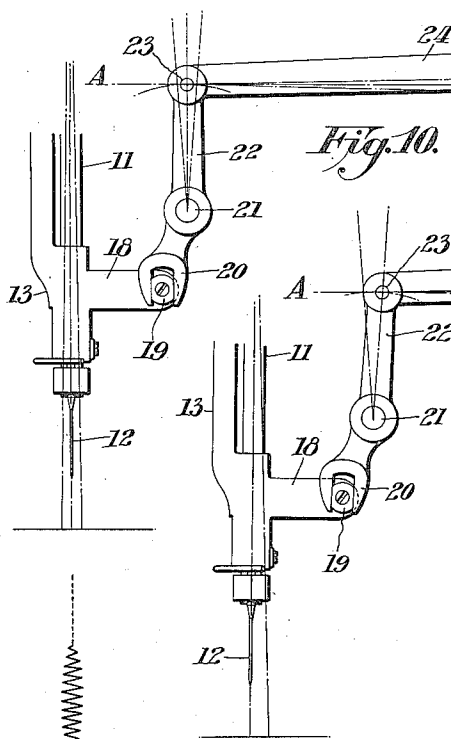
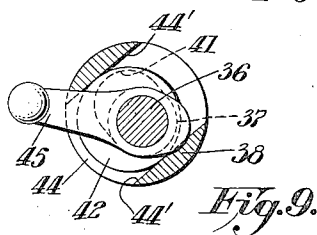
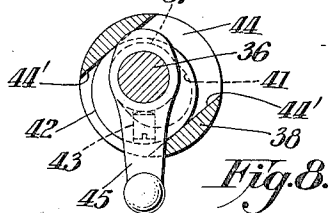
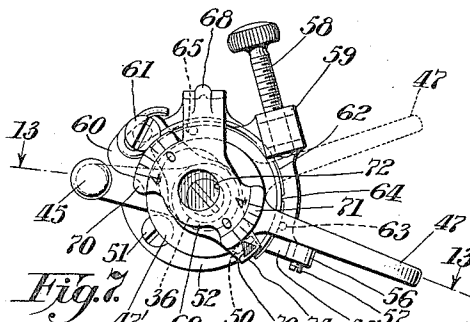
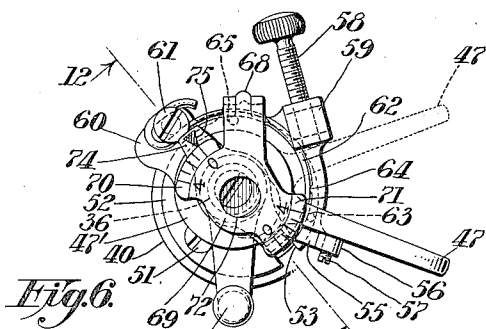
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NEEDLE VIBRATION CONTROLLING MECHANISM FOR ZIGZAG STITCH SEWING MACHINES

Filed Dec. 11, 1934

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,014,916

NEEDLE-VIBRATION CONTROLLING MECHANISM FOR ZIGZAG-STITCH SEWING MACHINES

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Application December 11, 1934, Serial No. 756,948
In Germany January 26, 1934

11 Claims. (Cl. 112—158)

This invention relates to improvements in zigzag-stitch sewing machines of the laterally vibratory needle type, and has for an object to provide conveniently controllable means for determining a neutral position of non-vibration of the needle at either the center or at one side of the field of lateral throw of the needle, whereby the needle may be caused to vibrate laterally from zero to maximum either across a center line through the field or entirely from one side of the field of vibration of the needle.

Another object of the invention is to provide neutral-position controlling means for a laterally vibratory needle constructed and arranged to maintain a fixed field of maximum vibration of the needle irrespective of the selected neutral position of the needle.

A further object of the invention is to provide simple means for visibly indicating the amplitude of needle vibration in different positions of the mechanism controlling neutral positions of the needle.

With the above and other more specific objects in view, the invention comprises the devices, combinations and arrangements of parts hereinafter described in connection with the accompanying drawings which illustrate a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings, Fig. 1 is a front side elevation, partly in section, of a sewing machine containing the present improvements. Fig. 2 is a rear side elevation of the bracket-arm of the machine. Fig. 3 represents an enlarged section of a portion of the machine bracket-arm, taken substantially in the horizontal plane containing the needle-bar vibrating cam-shaft. Fig. 4 represents a sectional view substantially on the line 4—4 of Fig. 3. Fig. 5 is a disassembled perspective view of the regulating mechanism for controlling the amplitude of needle-vibration and different neutral positions of the needle. Figs. 6 and 7 are enlarged detail views, in front elevation, of the vibration-amplitude and neutral-position controlling mechanism, with the neutral-position controlling lever at different limits of movement in the respective illustrations. Figs. 8 and 9 are detail views representing cross-sections of the adjusting-shaft and its supporting bushing, with the neutral-position controlling lever included to illustrate positions thereof corresponding with those illustrated in Figs. 6 and 7, respectively. Figs. 10 and 11 are detail views of the needle-gate

vibrating pitman, and diagrammatically illustrate the effect of the pitman-controlling mechanism in causing the needle to vibrate across and from one side of a neutral position of non-vibration of the needle. Fig. 12 represents a detail sectional view of the controlling mechanism substantially on the line 12—12 of Fig. 6. Fig. 13 represents a detail sectional view of the controlling mechanism substantially on the line 13—13 of Fig. 7.

The present improvements are illustrated in the drawings and herein described as embodied in the zigzag-stitch sewing machine disclosed in the U. S. patent application of George M. Eames, Serial No. 691,938, filed Oct. 3, 1933.

Referring to the drawings, the sewing machine illustrated therein has a bed-plate 1, affording a work-support, from one end of which bed-plate rises the hollow standard 2 of a bracket-arm 3, overhanging the bed-plate and terminating at its free end in a head 4.

Rotatably journaled in suitable bearings provided in said bracket-arm 3 is a horizontally disposed main shaft 5, extending lengthwise of the bracket-arm and carrying at one end a driving pulley 6. At its opposite end, the main shaft 5 carries a counterbalanced crank-arm 7 provided with a crank-pin 8 connected by a jointed link 9 to a collar 10 suitably secured upon a vertically disposed needle-bar 11.

The needle-bar 11 carries at its lower end a needle 12 and is journaled for endwise reciprocation in suitable bearings provided in a vibratory gate 13. The gate 13 is pivotally hung upon a screw-stud 14 carried by a supporting member 15 adjustably threaded into the upper wall of the bracket-arm head 4 to provide for swinging movements of the gate 13 about a pivotal axis substantially transverse to the axis of rotation of the main shaft 5.

Cooperating with the needle 12, below the cloth-plate and in the formation of lock-stitches, is a loop-taker 16 supported for rotation in a vertical plane parallel to and rearwardly of the plane of needle vibration. The loop-taker is rotated twice for each complete needle reciprocation by suitable driving connections with the main-shaft 5. Suitable feeding mechanism of the lower four-motion type is provided for advancing work past the needle in a direction transverse to the plane of needle-vibration, any usual or suitable presser-foot 17 being opposed to the work-engaging portion of the feeding mechanism.

Extending horizontally from the lower end of the gate 13 is an arm 18 of which the free end

extends externally of the bracket-arm head and carries a pivot-block 19. Embracing the pivot-block 19 is the forked end of a rock-arm 20 depending from the front end of a short rock-shaft 21 disposed horizontally transverse to the main shaft 5 and suitably journaled at the under side of the bracket-arm head 4. Extending upwardly from the rock-shaft 21 at the rearward side of the head 4 is a rock-arm 22 of which the free end is connected by a pivot-screw 23 to one end of a pitman 24 disposed horizontally and externally at the rearward side of the bracket-arm 3. The other end of the pitman 24 has a fork or yoke 25 embracing a cam 26 suitably secured upon the rearward end of a cam-shaft 27 journaled in the front and rear walls of the bracket-arm 3, said cam-shaft 27 being disposed below and horizontally transverse to the main shaft 5. A spiral gear 28 carried by the main shaft 5 drives a spiral gear 29 secured upon the cam-shaft 27, whereby the latter is rotated at one half the speed of rotation of the main shaft. From the foregoing it will be understood that, during the operation of the machine, the cam 26 vibrates the pitman 24 laterally about the pivot-screw 23 and that the needle 12 performs one complete reciprocation for each lateral throw of the pitman.

In order to translate the laterally vibratory movements of the pitman 24 into effective end-wise reciprocatory movements, to thereby impart swinging movements to the needle-bar gate 13, a guide-roller 30 is suitably secured upon the pitman adjacent the yoke 25 and at the side of the pitman adjacent to the bracket-arm 3. The guide-roller 30 is shiftably disposed in a guideway 31 constituted by a rearwardly open slot formed in the outer or rearwardly exposed face of an angularly and bodily adjustable guide-head 32. The guideway 31 is preferably arcuate, the center of curvature thereof in one position of the guide-head 32 lying in the pivotal axis of the pitman 24 afforded by its pivotal connection 23 with the rock-arm 22.

The guide-head 32 has a hub 33 extending freely through an opening 34 in the rear wall of the bracket-arm 3, whereby the portion of said guide-head containing the guideway 31 is disposed externally of the bracket-arm at the rear side thereof. The guide-head hub 33 is secured by set-screws 35 upon an adjusting shaft 36 disposed parallel to the cam-shaft and having its longitudinal axis in substantially the horizontal plane containing the axis of rotation of said cam-shaft.

The adjusting-shaft 36 of the guide-head is rotatably journaled in a bearing sleeve 37 supported for turning and bodily lateral movements thereof by a supporting member in the form of a fixed bushing 38 secured by a screw 39 in a suitably apertured bearing-boss 40 provided in the front wall of the bracket-arm 3. The opposite ends of the bearing sleeve 37 are fitted to slide in parallel guide-slots 41 provided in the opposite ends of the bushing 38, said guide-slots being elongated in a direction corresponding to the general direction of the center line of the guideway 31 at its limit of angular movement in which the needle 12 has its maximum lateral throw. The guide-slots 41 therefore confine the bearing-sleeve 37 and the adjusting-shaft 36, journaled in said bearing sleeve, to lateral movement in a path corresponding to the path of movement of the guide-roller 30 in the guideway 31 at the limit of angular movement of the guide-head 32 influencing maximum vibration of the needle. As lateral movement of the adjusting

shaft 36 determines different neutral positions of non-vibration of the needle, it will be understood that the maximum field of vibration of the needle remains fixed when changing from one to another neutral position of non-vibration of the needle. This arrangement has the advantage of maintaining cooperative relationship between the needle and loop-taker within predetermined limits of lateral throw of the needle, so that within set limits no provision need be made for imparting compensating movements to the loop-taker, regardless of the neutral position adjustment of the controlling mechanism.

In order to manually effect bodily shifting movement of the adjusting shaft 36 and therefore of the axis of angular adjustment of the guide-head 32, an eccentric 42 is secured, by a set-screw 43, upon the bearing sleeve 37 within the ends of the latter. The eccentric 42 is disposed within a recess 44 provided in the bushing 38 between the ends of said bushing containing the guide-slots 41, the opposed and parallel walls 44' which define the recess 44 being substantially transverse to the length of the guide-slots 41 diametrically of the bushing. The front end of the bearing sleeve 37 extends beyond the front end of the bushing 38 and carries, rigidly therewith, an operating arm 45 disposed externally of the front wall of the bracket-arm 3.

By turning the operating arm 45 from one limit of movement, shown in Fig. 6 of the drawings, to the other limit of movement, illustrated in Fig. 7, a combination turning and sliding movement is imparted to the eccentric 42 within its confining walls 44' of the bushing 38, due to the fact that the bearing sleeve 37 which carries the eccentric is confined by the guide-slots 41. The described movement of the eccentric 42 carries the bearing sleeve 37 from one end to the other of the guide-slots 41 and thereby effects a bodily lateral shifting movement of the angular-adjustment axis of the guide-head 32 between fixed limits. Obviously, the operating arm 45 may be turned a less distance than its full throw, if desired, while opposed adjusting screws 45 may be employed to limit lateral movement of the bearing sleeve 37 in the guide-slots 41.

The front end of the adjusting shaft 36 extends forwardly beyond the front end of the bearing sleeve 37 and secured thereto, by a set-screw 46, is the hub 47' of a hand-lever 47 operable to angularly turn the guide-head 32 and thereby change the amplitude of needle-vibration. Stops are provided to limit the degree of turning movement which may be imparted to the hand-lever 47. To this end, a disk 48 having an aperture 49 is mounted upon the adjusting shaft 36, said disk being provided with an anchoring lug 50 as illustrated more particularly in Figs. 4 and 12 of the drawings. Secured by screws 51 upon the front face of the bushing 38 is a split ring 52 having an elongated shaft clearance opening 52' and providing between its ends a lug-retaining slot 53 coinciding with a coacting slot 54 in the front face of the bushing 38. The slots 53 and 54 are entered by the anchoring lug 50, thereby restraining the disk 48 against turning with the adjusting shaft 36. The guide-slots 53 and 54 are lengthwise in alignment with the bushing guide-slots 41 and are of sufficient length to accommodate lateral movement of the disk 48 with the adjusting shaft 36 while holding said disk against rotation. Extending from the disk 48 is an arm 55 terminating in an apertured ear 56 in which is adjustably threaded a stop-screw

57 in the path of movement of the hand-lever 47. The stop-screw 57 functions to determine the position of the guide-head 32 in which the guide-roller 30 idly traverses the guideway 31 and the needle reciprocates in a fixed vertical path. The opposite limit of movement of the hand-lever 47, or the position thereof in which the needle has its maximum amplitude of vibration, is determined by a stop-screw 58 threaded into a reversely bent ear 59 provided upon the disk 48. The disk 48 is also provided with an ear 60 into which is threaded a screw 61 securing one end of a resilient wire 62 having a curved portion yieldingly engaging a pin 63 upon the hand-lever 47. The wire 62 has a notch 64 adapted to be entered by the pin 63 to yieldingly arrest movement of the hand-lever 47 in a median position of its path of movement. The disk is preferably provided with a wire-supporting pin 65. The hand-lever may, of course, be shifted into any position intermediate the stop-screws 57 and 58, to determine any amplitude of needle-vibration from zero to maximum. To yieldingly hold said hand-lever in adjusted position there is provided a friction washer 66 interposed between the hub 33 of the guide-head and the adjacent end of the bushing 38. The disk 48 is disposed between the hub of the operating arm 45 and a washer 67 in engagement with the hub of the hand-lever 47, whereby said disk is restrained against movement endwise of the adjusting shaft 36.

A scale arrangement is provided for visibly indicating, to an operator, different amplitudes of needle-vibration and also the different neutral positions of non-vibration of the needle. To this end, the ring 52 is provided with an arm 68 overhanging the hub of the hand-lever 47 and terminating in a depending scale-plate 69 disposed in front of and spaced from the hub of said hand-lever. The scale-plate 69 has diametrically-opposite segmental dials 70 and 71 which are suitably graduated, said scale-plate also having a central aperture 72 providing for access to a screw 73 which serves to secure an index-member 74 upon the grooved front face of the hub of the hand-lever 47. The index-member 74 is provided with diametrically opposite markings 75 and 76 constituting indices for the dials 70 and 71, respectively, said index-member 74 slidably contacting the rearward face of the scale-plate 69. The indices 75 and 76 are so arranged relatively to the dials 70 and 71 that the indices are alternately hidden behind the scale-plate 69 at the limits of movement of the operating arm 45. Furthermore, the dials are so graduated that when the hand-lever 47 is at its limit of movement determining non-vibration of the needle 12, a turning movement of the operating-arm 45 to change the non-vibration path of the needle brings an index 75 or 76 into indicating position with respect to corresponding markings upon the dials 70 and 71. The bushing 38 and the pitman-controlling mechanism supported thereby constitute an assembly which may be mounted in or detached as a unit from the bracket-arm 3.

In the downwardly swung position of the operating arm 45, illustrated in Figs. 6 and 8 of the drawings, the fulcrum-axis of the adjusting shaft 36 is disposed at the upper limit of its movement within the inclined slots 41 of the bushing 38 and the non-vibration path of the needle is located centrally of its field of vibration, as illustrated in Fig. 10 of the drawings. Referring to Fig. 6, it will be observed that the index 75 is exposed above the dial 70, while the index 76 is concealed

behind the dial 71. In this position of the operating-arm 45, and when the hand-lever 47, employed to control the vibration amplitude of the needle, is disposed at its lower limit of movement, the index 75 points to the zero graduation of the dial 70 and is indicative of the fact that upon operation of the machine the needle will be reciprocated in a fixed path which, as above indicated, is located centrally of its field of vibration. This is due to the position of the guideway 31 which, as shown in full lines in Fig. 10, is now disposed in a neutral position wherein the guide-roller 30 idly traverses said guideway in a path P, P, which has the pivot-screw 23 as its center, whereby no endwise movement is imparted to the pitman 24. If the hand-lever 47 is now turned to its dotted line position in Fig. 6, the guideway 31 will be correspondingly turned angularly into a position of maximum influence upon the pitman 24, the center of the guide-roller 30 now traversing a path P', P², which extends equal distances to opposite sides of and intersects the angular-adjustment axis r of the guideway 31. Consequently, the component of said movement of the guide-roller projected upon the line A—B represents the extent of endwise movement imparted to the pitman 24 to vibrate the needle laterally, the throw of the needle to opposite sides of its neutral path of reciprocation being obviously equal. In the described position of the operating arm 45, any positions of the hand-lever 47 from zero to maximum throw of the needle will be visibly indicated by the index 75 in connection with the dial 70.

When the operating arm 45 is turned into the upper limit of its movement, while the hand-lever 47 remains at its upper limit of movement, the fulcrum-axis of the adjusting shaft 36 will be laterally displaced in a direction corresponding substantially to the length of the guideway, i. e., in substantially the path P', P², illustrated in Fig. 10. As heretofore explained, this is due to the fact that the guide-slots 41 are elongated in a direction substantially corresponding to said path P', P². The lateral displacement of the adjusting shaft effects a corresponding displacement of the index-member 74 carried by said shaft, bringing into view the index 76 below the dial 71 and concealing the index 75 behind the dial 70. Consequently, any turning movement of the hand-lever 47 will now be visibly indicated by the index 76, instead of the index 75. Furthermore, the exposure of the respective indices 75 or 76 is an indication of whether the needle has its neutral position of non-vibration at the center or at one side of its field of vibration.

Referring now more particularly to Fig. 11, it will be observed that the lateral shifting of the adjusting shaft 36, from the position illustrated in Fig. 10, has displaced the fulcrum-axis r of the guideway 31 into coincidence with the lower limit P² of movement of the center of the guide-roller 30. Consequently, operation of the hand-lever 47 now effects angular adjustment of the guideway 31 about said point P² and the guide-roller 30 has a path of travel varying from its neutral path P², P³ to its path P', P² of maximum influence upon the pitman 24, the neutral path of reciprocation of the needle being entirely at one side of its field of vibration.

While in the sewing machine herein described the axis of the adjusting shaft 36 is laterally shiftable to one side only from its position r illustrated in Fig. 10, it will be evident that, by suit-

ably lengthening the guide-slots 41, said adjusting shaft might be shifted to the opposite side of said position 7, whereby the needle would have a neutral path of non-vibration at the opposite side of its field from that illustrated in Fig. 11. For descriptive purposes, the direction of lateral adjustment of the fulcrum-axis of the guideway 31 has been herein described as corresponding substantially to the length of the guideway in one extreme position of angular adjustment thereof. It is to be understood, however, that said lateral adjustment of the guideway axis may be effected at any time, regardless of the angular position of the guideway 31.

Having thus set forth the nature of the invention, what I claim herein is:—

1. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, a loop-taker complementary to said needle in the formation of stitches, a pitman connected to vibrate said gate, means for actuating said pitman, an angularly adjustable guideway for controlling the effective needle-gate vibrating movements of said pitman, means for angularly adjusting said guideway into a predetermined position of maximum influence upon said pitman, and means for bodily displacing said guideway in a direction corresponding substantially to the direction of the length thereof while in said position of maximum influence upon said pitman.

2. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, a loop-taker complementary to said needle in the formation of stitches, a pitman connected to vibrate said gate, means for actuating said pitman, an angularly adjustable guideway for controlling the effective needle-gate vibrating movements of said pitman, means for angularly adjusting said guideway into a predetermined position of maximum influence upon said pitman to vibrate said needle, and means for bodily displacing said guideway into different positions maintaining a constant field of maximum vibration of said needle.

3. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, a loop-taker complementary to said needle in the formation of stitches, a pitman connected to vibrate said gate, means for actuating said pitman, a guideway angularly adjustable about an axis for controlling the operative movements of said pitman, a guide-stud carried by said pitman and traversing said guideway during the operation of the machine, means for angularly adjusting said guideway, and means for bodily displacing said guideway to shift its axis of angular adjustment to and from positions thereof passing through the median and extreme throw positions of said guide-stud in said guideway.

4. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, a loop-taker complementary to said needle in the formation of stitches, a forked pitman connected to vibrate said gate, a rotary actuating cam embraced by the fork of said pitman to impart laterally vibratory movements to the pit-

man, an angularly adjustable guideway, a guide-stud carried by said pitman to traverse said guideway during the operation of the machine, means for angularly adjusting said guideway from a neutral position into positions inducing endwise reciprocatory movements of the laterally vibratory pitman to thereby impart vibratory movements to said gate, and means whereby said guideway may be displaced in a direction corresponding substantially to the direction of the length thereof while in a predetermined angularly adjusted position of maximum pitman-reciprocating influence of the guideway.

5. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, a pitman connected to vibrate said gate, means for laterally vibrating said pitman, an angularly adjustable guideway, a guide-stud carried by said pitman to traverse said guideway during operation of the machine, a supporting member, an adjusting shaft carrying said guideway and journaled in said supporting member for rotary and bodily lateral adjustment therein, means including an eccentric for laterally displacing said adjusting shaft in said supporting member, and manually operable means for turning said adjusting shaft to effect angular adjustment of said guideway.

6. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, a pitman connected to vibrate said gate, means for laterally vibrating said pitman, an angularly adjustable guideway, a guide-stud carried by said pitman to traverse said guideway during operation of the machine, a supporting member having parallel guide-slots and spaced parallel walls defining a recess intermediate said guide-slots, an adjusting shaft carrying said guideway, a sleeve laterally movable in said guide-slots and providing a journal for said adjusting shaft, an eccentric carried by said sleeve and disposed to peripherally engage said recess walls, manually operable means for turning said eccentric to thereby locate the neutral path of non-vibration of said needle in different positions, and manually operable means for turning said adjusting shaft between predetermined limits to control the amplitude of needle vibration.

7. In a sewing machine, a frame, a needle-bar, a needle carried by said needle-bar, a laterally vibratory gate hung upon said frame and in which said needle-bar is journaled for endwise reciprocation, a pitman connected to vibrate said gate, means for actuating said pitman, a guide-stud carried by said pitman, an assembly comprising a supporting member, a bearing-sleeve mounted in said supporting member for lateral displacement, an adjusting shaft rotatably journaled in said bearing-sleeve, a guideway carried by said adjusting shaft and engaged by said guide-stud, manually operable means for laterally shifting said bearing-sleeve, and manually operable means for turning said adjusting-shaft within its bearing-sleeve to thereby effect angular adjustment of said guideway, said assembly being mounted in and detachable from said frame as a unit.

8. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, means for vibrating said gate controllable to vary the amplitude of needle-vibration with respect to different neutral paths of non-vibra-

tion of said needle, and separate means individually effective for visibly indicating the amplitude of needle-vibration with respect to different neutral paths of non-vibration of said needle.

- 5 9. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, means for vibrating said gate, controlling means for locating said gate in different neutral paths of non-vibration of said needle, controlling means for varying the amplitude of needle-vibration, and means alternately rendered effective and ineffective upon relocation of said gate for visibly indicating the amplitude of needle-vibration.

- 10 10. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, means for vibrating said gate, manually operated needle-gate controlling means for re-locating said gate in different neutral paths of

non-vibration of said needle, manually controlled means for varying the amplitude of needle-vibration, and a dial and related index relatively shifted upon operation of the needle-gate controlling means and thereby alternately rendered effective and ineffective to visibly indicate the amplitude of needle-vibration. 5

11. In a sewing machine, a needle-bar, a needle carried by said needle-bar, a vibratory gate in which said needle-bar is journaled for endwise reciprocation, means for reciprocating said needle-bar, means for vibrating said gate, manually operated needle-gate controlling means for re-locating said gate in different paths of non-vibration of said needle, manually controlled means for varying the amplitude of needle-vibration, a plurality of stationary dials, and indices individually cooperative with different ones of said dials, said indices being arranged to be alternately visibly exposed and concealed upon operation of said needle-gate controlling means. 15 20

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