Sept. 14, 1943. F. F. ZEIER 2,329,681

NEEDLE-VIBRATING MECHANISMS FOR SEWING MACHINES

Filed March 19, 1941 5 Sheets-Sheet 1

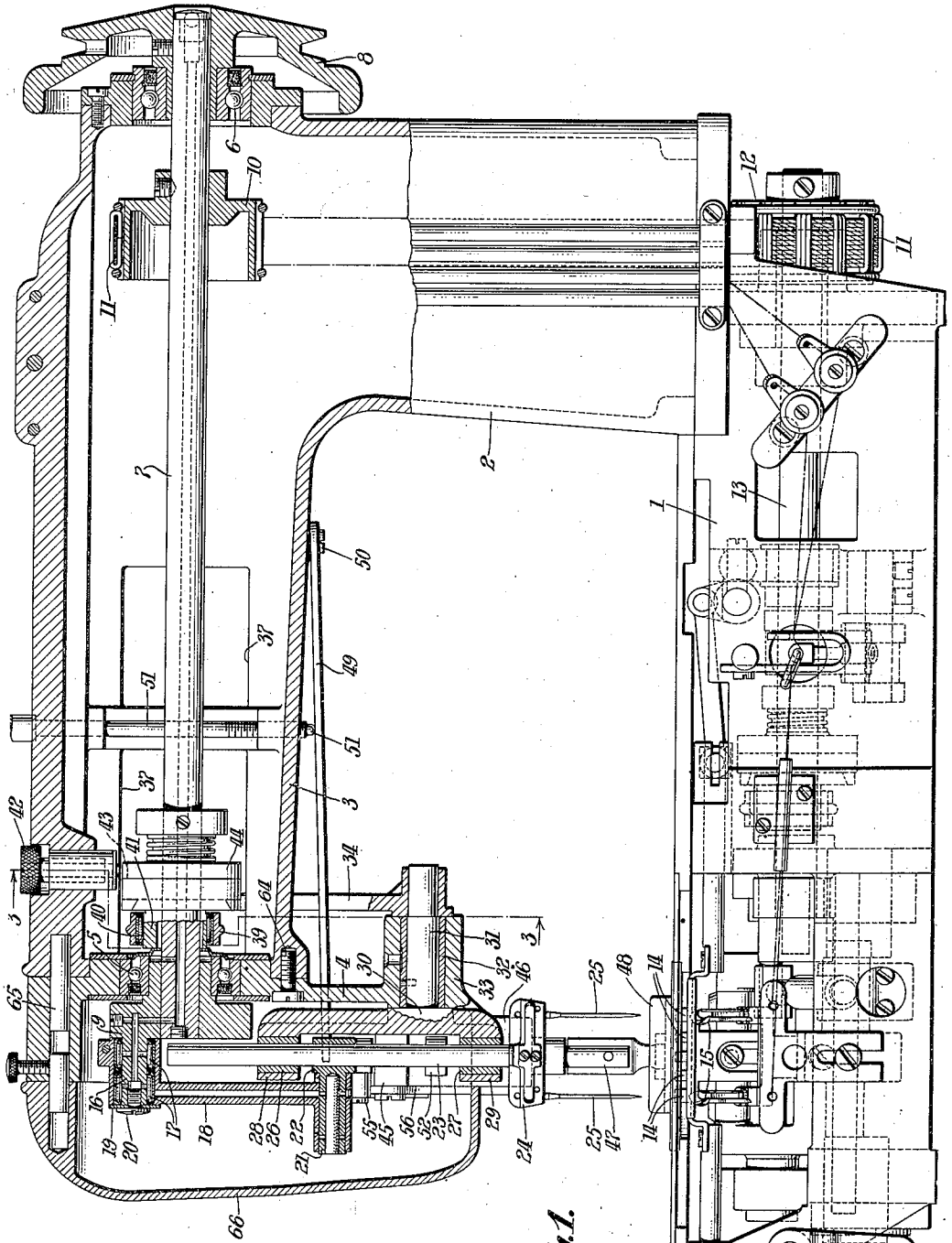


Fig. 1.

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NEEDLE-VIBRATING MECHANISMS FOR SEWING MACHINES

Filed March 19, 1941 5 Sheets-Sheet 2

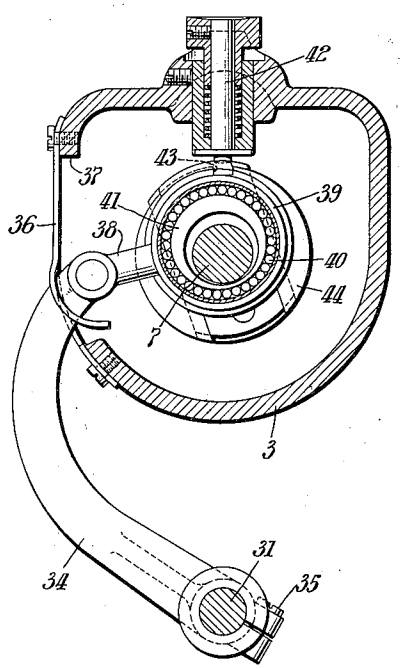


Fig. 3.

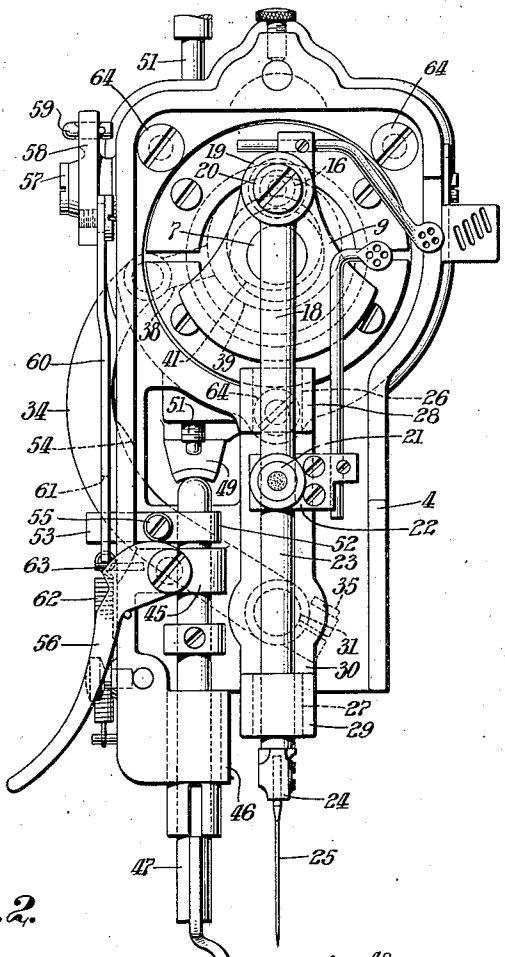
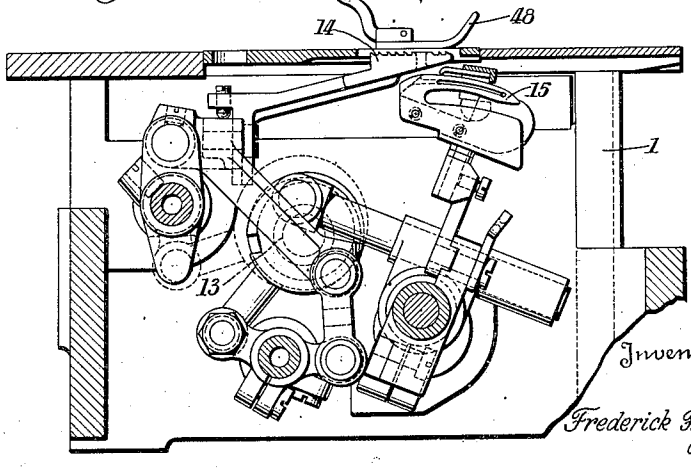


Fig. 2.



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NEEDLE-VIBRATING MECHANISMS FOR SEWING MACHINES

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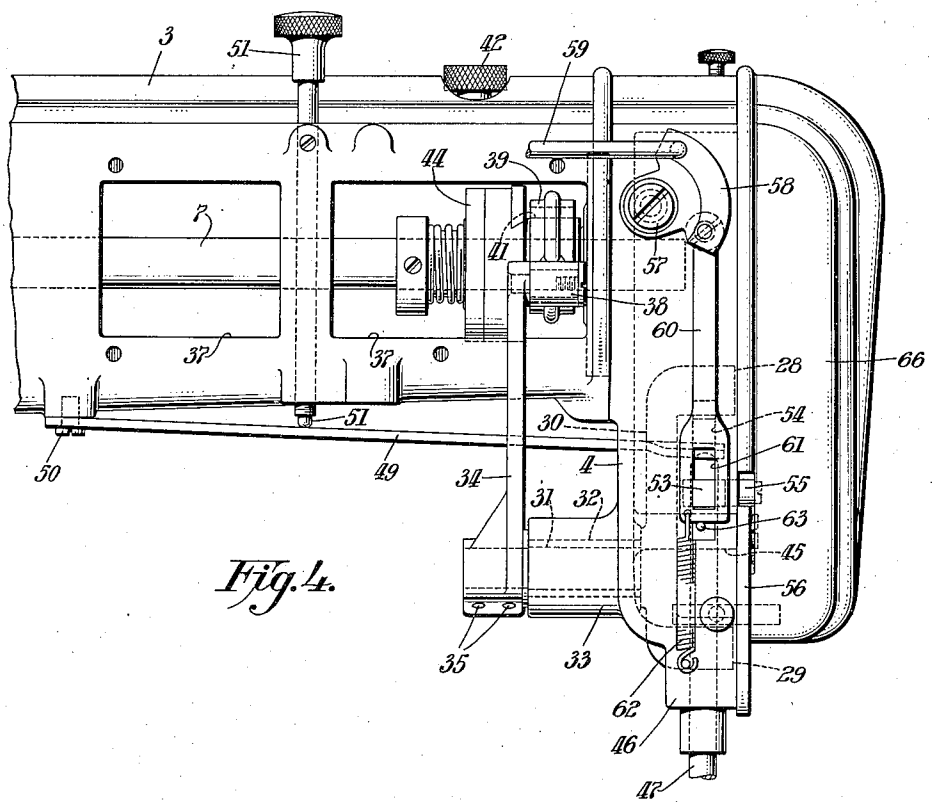


Fig. 4.

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NEEDLE-VIBRATING MECHANISMS FOR SEWING MACHINES

Filed March 19, 1941 5 Sheets-Sheet 4

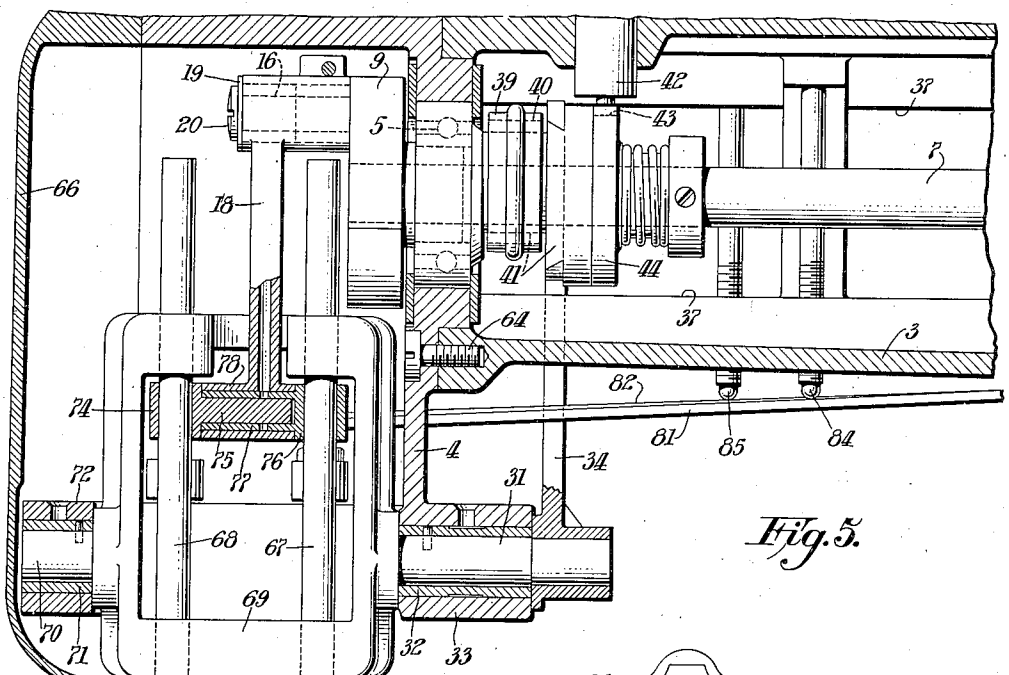


Fig. 5.

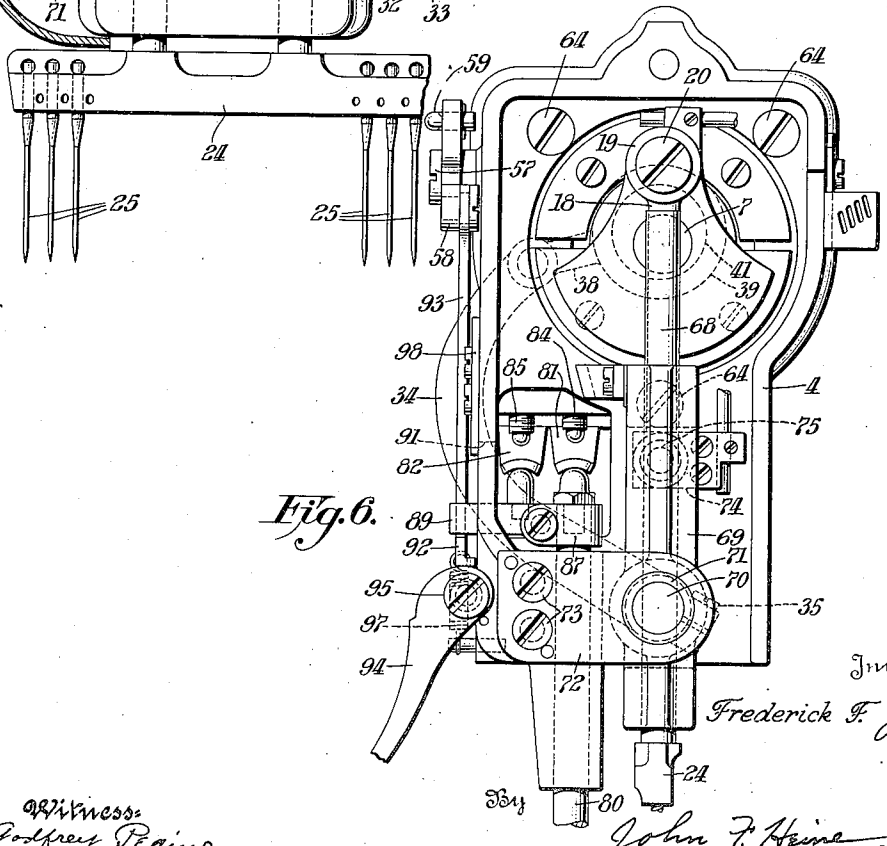


Fig. 6.

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NEEDLE-VIBRATING MECHANISMS FOR SEWING MACHINES

Filed March 19, 1941 5 Sheets-Sheet 5

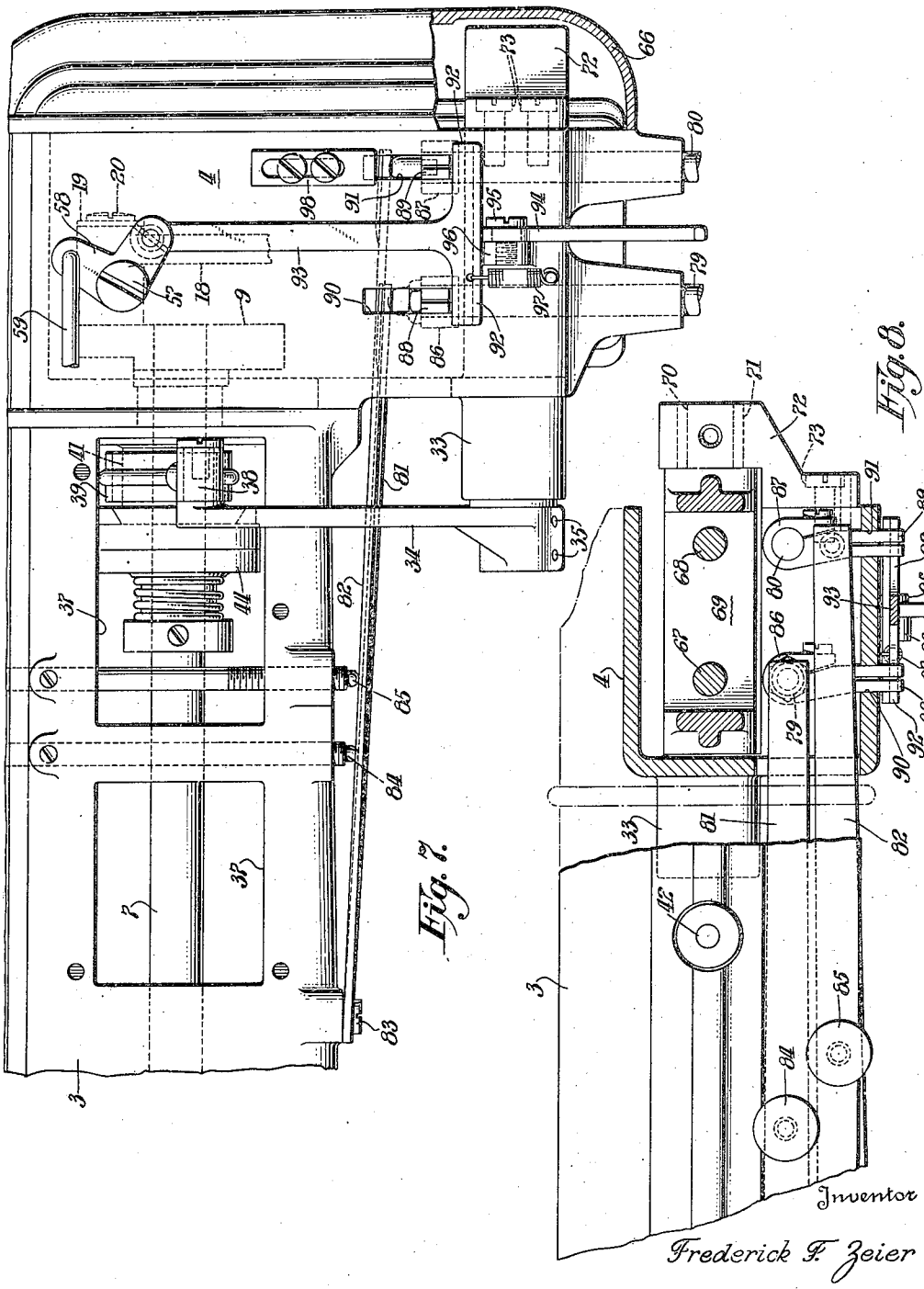


Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE

2,329,681

NEEDLE-VIBRATING MECHANISM FOR SEWING MACHINES

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Application March 19, 1941, Serial No. 384,054

15 Claims. (Cl. 112—213)

This invention relates to improvements in sewing machines, and it is concerned more particularly with mechanism adapted to vibrate the needle transversely of its normal path of reciprocation.

In accepted sewing machine design, it has been common practice to journal the usual endwise reciprocatory needle-bar in spaced bearings provided in a swinging frame fulcrumed upon a suitable pivot-stud projecting from the machine-head. In some cases the pivot-stud is provided at the extreme upper end of the swinging frame, while in other cases the pivot-stud is provided at the extreme lower end of the swinging frame. In each of these cases the connections employed for swinging the needle-bar-frame about its pivot-stud engage the needle-bar-frame at the end opposite to the pivot-stud. These prior constructions proved satisfactory when operated at a nominal rate of speed of the order not exceeding 3000 stitches per minute. At speeds in excess of 3000 stitches per minute and of the order of 4000 to 5000 stitches per minute, the extent of vibration created by the high speed oscillations of the needle-bar-frame approached such proportions that it became necessary to firmly secure the sewing machine upon its supporting table-structure. When so secured the vibrations created in the sewing machine were readily transmitted to the supporting table-structure, which resulted in rendering it more difficult to properly handle the material being sewn and in increasing the fatigue of the operator.

The excessive vibration developed in these prior constructions resulted from the concentration of the combined weights or masses of the needle-bar-frame and the needle-bar journaled therein on one side of the fulcrum-axis of the frame. With the weights of these elements so proportioned the inertia effect created by the oscillation of needle-bar-frame and needle-bar above a nominal speed increased materially and to the extent that at speeds over 3000 stitches per minute it became objectional in many cases to operate the sewing machine successfully.

It is the primary object of the present invention to provide a needle-vibrating mechanism which can be operated at high speeds without developing excessive vibration.

Another object of the invention is the provision of a needle-vibrating mechanism which is compact, rigid in construction and susceptible of high speeds of operation without overthrow.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations, and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of 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 which show by way of illustration two embodiments of the invention:

Fig. 1 is a front elevational view of a sewing machine embodying the invention with the head and part of the bracket-arm in section, showing the pivotal support for the needle-bar-frame and the mechanism for endwise reciprocating the needle-bar.

Fig. 2 is a front end elevational view with the bed in section to show the lower stitch-forming mechanism and the lower four-motion feeding mechanism.

Fig. 3 is a vertical sectional view taken substantially along the line 3—3, Fig. 1.

Fig. 4 is a rear elevational view of the bracket-arm and head, showing the connections for vibrating the needle-bar-frame and for raising the presser-foot.

Fig. 5 is a vertical longitudinal sectional view of the bracket-arm and head of a sewing machine having two needle-bars and two presser-bars.

Fig. 6 is an end elevational view of the head shown in Fig. 5.

Fig. 7 is a rear elevational view of the bracket-arm and head, showing the connections for raising the two presser-bars.

Fig. 8 is a top plan view, partly in section, of the bracket-arm and head, showing the presser-bar spring arrangement.

Refering more in detail to the drawings, the invention is embodied in a sewing machine having a frame comprising a bed 1 from one end of which rises a standard 2 of an overhanging bracket-arm 3 terminating in a head 4. Journaled for rotation in ball-bearings 5 and 6 is a main- or arm-shaft 7 carrying at its outer end the usual belt-driven balance-wheel 8 and at its inner end a counterbalanced needle-bar actuating crank 9. Fast upon the arm-shaft 7 within the bracket-arm 3 is a belt-pulley 10 connected by a clip-belt 11 to a second belt-pulley 12 fast upon the outer end of a lower main- or bed-shaft 13 journaled for rotation in the bed 1, the ratio between the belt-pulleys 10 and 12 being one-to-one. Actuated by the bed-shaft 13 are the usual four-motion work-feeding mechanism including a feed-dog 14 and the looper mechanism including threaded chain-stitch loopers 15. For the sake of brevity a detailed description of the four-motion feeding mechanism will not be herein given, inasmuch as the same is fully described and claimed in my copending application Serial No. 377,296, filed Feb. 4, 1941 and which matured into Patent No. 2,292,258, August 4, 1942. Also for a complete disclosure of the looper mechanism reference may be had to my copending application Serial No. 316,297, filed Jan. 30, 1940 and which matured into Pat-

ent No. 2,312,858, March 2, 1943. It will suffice to say that, in the looper mechanism disclosed in the drawings, the looper 15 is preferably of the two-motion type having loop-seizing and -shedding movements only in the line of feed, the looper advancing to seize the needle-loop in a direction opposed to the direction of feed.

Referring now to the mechanism within the machine-head 4, as illustrated in Figs. 1 to 4, inclusive, it will be seen in Fig. 1 that the needle-bar actuating crank 9 is provided with a crank-pin 16 having preferably mounted thereon two needle-bearings 17 snugly received in the apertured upper end of a tubular link 18 maintained on the crank-pin 16 by a washer 19 and a cap-screw 20. The lower end of the link 18 is apertured to receive a pin 21 integral with a split collar 22 clamped upon the usual needle-bar 23. Carried at the lower end of the needle-bar 23 is a suitable needle-clamp 24 having mounted therein needles 25. Through the mechanism just described the needle-bar 23 is reciprocated endwise in proper timed relation with the complemental loopers 15 to produce chain-stitches.

The needle-bar 23 is journaled in bearing bushings 26 and 27 provided in the spaced arms 28 and 29 of a substantially C-shaped needle-bar-frame 30 formed preferably of aluminium or other lightweight material and provided with a horizontally projecting fulcrum-rod 31 having pinned thereon to rotate therewith a wear-resistant sleeve 32 mounted for oscillation in an extended lug 33 preferably formed integral with the machine-head 4. In order to minimize vibration and also the effort required to oscillate the needle-bar-frame 30 and the needle-bar 23 journaled therein, it is desirable that the fulcrum-rod 31 be located so that its longitudinal axis substantially coincides with the center of the combined mass of the needle-bar-frame and needle-bar. In the machine illustrated, the axis of the fulcrum-rod 31 coincides with the center of the combined mass of the needle-bar-frame and the needle-bar when the latter is at the bottom portion of its work-penetrating stroke, or when feeding of the work is taking place. This is advantageous for the reason that at the time of greatest strain on the needle-vibrating mechanism, the combined weight of the needle-bar-frame and needle-bar is equally distributed on opposite sides of the axis of the fulcrum-rod 31, thus minimizing the moment of inertia to be overcome by the needle-bar vibrating eccentric 41. To support the needle-bar-frame 30 rigidly the sleeve 32 and the lug 33 are preferably made relatively long, see Fig. 1. In addition to providing a rigid support for the needle-bar-frame the relatively long bearing simplifies the construction of the frame 30 in that it obviates the use of supplemental guiding means for preventing the cramping of the frame 30 on its fulcrum-rod.

The needle-bar-frame 30 in the machine illustrated is oscillated in timed relation with the four-motion feed-dog 14 through mechanism comprising a rearwardly and upwardly curved rock-lever 34 preferably clamped at its lower end by screws 35 upon the reduced end-portion of the fulcrum-rod 31. At its upper end the rock-lever 34 projects through a suitable clearance opening (Fig. 3) provided in a sheet-metal cover-plate 36 adapted to close the openings 37 formed in the rear wall of the bracket-arm 3. Connected to actuate the upper end of the rock-lever 34 is one end of a relatively short pitman 38 formed at its other end with a strap 39 embracing the outer race of a conventional needle-bearing 40 mounted upon an adjustable eccentric 41 secured to rotate with the arm-shaft 7. In order that the mechanism employed for oscillating the needle-bar-frame may be compactly arranged thereby to not encroach upon the work-handling space beneath the bracket-arm 3, the rock-lever 34 is curved upwardly so that it may be arranged in close proximity to the machine-head 4, and the adjustable eccentric 41 is disposed adjacent the needle-bar actuating crank 9. It will be understood that as the arm-shaft 7 is rotated the eccentric 41 actuates the pitman 38 which in turn operates the rock-lever 34 to oscillate the needle-bar-frame about the axis of the fulcrum-rod 31. The extent of oscillatory movement imparted to the needle-bar-frame is dependent upon the amount of eccentricity of the eccentric 41, and in order to vary the amplitude of the oscillatory movements of the needle-bar-frame to harmonize the same with the stitch-length to which the lower feeding mechanism is set, the eccentric 41 is made adjustable. No detailed description of the constructive features of the adjustable eccentric 41 shown in the drawings will be herein given for the reason that the same is fully described in the U. S. patent to W. Myers, No. 2,128,031, dated Aug. 23, 1938.

To effect adjustment of the eccentric 41 the top of the bracket-arm 3 has mounted therein a detent 42, the details of construction of which are similar to those illustrated in the U. S. patent to W. Myers, No. 2,063,264, dated Dec. 8, 1936. When it is desired to adjust the amplitude of oscillation of the needle-bar-frame 30 the detent 42 is depressed until the inner end thereof enters a stop-notch 43 in the adjusting-member 44 of the eccentric 41, after which if desired the detent can be partly rotated and locked in depressed position. With the adjusting-member 44 of the eccentric 41 thus latched against turning, suitable manual turning of the arm-shaft 7 will effect the desired adjustment of the eccentric 41.

Referring now to Figs. 2 and 4, it will be observed that there is journaled for endwise movement in spaced lugs 45 and 46 on the machine-head 4 a presser-bar 47 carrying at its lower end a presser-foot 48. The presser-bar 47 is spring-biased toward the work-support by one end of a leaf-spring 49 which extends lengthwise of the bracket-arm 3 and is secured at its other end by a screw 50 to the bracket-arm. The pressure applied by the leaf-spring 49 is controlled by an adjusting screw 51 threaded into the bracket-arm 3 and at its lower end engaging the leaf-spring 49. To prevent the presser-bar 47 from turning in its supporting lugs 45 and 46, the presser-bar has clamped thereon adjacent its upper end a split collar 52 formed with a rearwardly extending guide-arm 53, the free end of which extends into a guide-slot 54 provided in the rear wall of the machine-head 4. In addition to preventing the presser-bar 47 from turning, the guide-arm 53, through the medium of its clamping screw 55, overlies the usual hand-controlled presser-foot lifting lever 56 pivotally mounted upon the presser-bar lug 45.

Treadle-controlled means is also provided for raising and lowering the presser-foot. This means, in part, is shown in Figs. 2 and 4. Pivotally mounted upon a stud 57 threaded into the rear wall of the machine-head 4 is a rock-lever 58 connected to be actuated by a link 59 from

suitable treadle or knee-shift mechanism (not shown). Also connected to the rock-lever 58 is a depending link 60 having an enlarged lower end which is apertured, as at 61, to receive the free end of the presser-bar guide-arm 53. Connected between the lower end of the depending link 60 and the machine-head 4 is a coil-spring 62 which yieldingly maintains the depending link 60 in contact with a stop-pin 63 when the presser-bar is lowered.

It will be observed in Fig. 1 that the machine-frame is preferably designed so that the head 4 may be machined and the mechanism assembled within the same separately from the remainder of the frame and when completed attached as a unit to the free end of the bracket-arm 3. In the present machine the head 4 is adapted to be attached to the bracket-arm 3 by fastening screws 64 and locating pins 65. A suitably shaped face-cover 66 is mounted upon the open face of the machine-head 4 to enclose the mechanism within the head. The machine-head disclosed in Figs. 1 to 4, inclusive, is fitted with a single needle-bar and a single presser-foot, the single needle-bar being preferable when the stitching operation to be performed by the machine requires the use of a single needle or a plurality of needles in which the distance or gauge between the two outermost needles is relatively small. When the gauge between the outermost needles becomes considerable it is desirable to use a plurality of needle-bars journaled in laterally spaced bearings in the machine-head, for the reason that the multiple needle-bars effectively steady the needle-clamp against turning without requiring the use of the more or less complicated needle-clamp steadying means necessarily employed heretofore on prior machines having only a single needle-bar. Figs. 5 to 8, inclusive, disclose a machine-head 4 fitted with two needle-bars and two presser-bars, the head shown being adapted to be attached to the bracket-arm 3 in a manner similar to that employed for attaching the single needle-bar head to the bracket-arm.

Referring to Fig. 5 the two needle-bars 67 and 68 are journaled for endwise reciprocation in a substantially U-shaped frame 69 supported by the machine-head 4. The right-hand vertical limb of the U-shaped frame 69 is formed with the fulcrum-rod 31 having fixed thereon, as in the machine illustrated in Fig. 1, the sleeve 32 journaled in the extended supporting lug 33 integral with the machine-head 4. Clamped upon the reduced end-portion of the fulcrum-rod 31 is the rock-lever 36 actuated by the adjustable eccentric 41 to oscillate the needle-bar frame 69 in timed relation with the lower work-feeding mechanism. To steady and additionally support the needle-bar-frame 69, the left-hand vertical limb is formed with a second fulcrum-rod 70 disposed in axial alinement with the fulcrum-rod 31 and having pinned thereon to rotate therewith a wear-resistant sleeve 71 journaled in a bearing provided in a bracket 72 attached by screws 73 to the face of the machine-head 4. The needle-bars 67 and 68 are reciprocated endwise in their respective limbs of the needle-bar-frame 69 (Fig. 5) by the link 18 connected at its upper end to the counterbalanced crank 9 on the arm-shaft 7. To facilitate the machining of the bearings for the two needle-bars in the needle-bar-frame a compound cross-bar connection is employed for operatively connecting the link 18 to the two needle-bars 67 and 68. Clamped to the needle-bar 68 is a split collar 74 having integral therewith a pin 75. Clamped to the needle-bar 67 is a split collar 76 having integral therewith a sleeve 77 adapted telescopically to receive the pin 75. Externally embracing the sleeve 77 is the apertured lower end 78 of the needle-bar actuating link 18. It will be obvious from the above description that a connection is provided between the two needle-bars which is composed of a plurality of interfitting parts having sufficient lost motion between them to automatically compensate for any slight degree of non-parallelism of the axes of the two needle-bars 67 and 68. The use of such a connection simplifies the machining operations required to produce the two pairs of needle-bar bearings in the frame 69.

Journaled for endwise movement in bearings provided in the machine-head 4 rearwardly of the needle-bars 67 and 68 are two presser-bars 79 and 80 adapted to carry at the lower ends separate presser-feet (not shown). Both of the presser-bars 79 and 80 are spring-biased toward the work-support; presser-bar 79 being acted upon by one end of a leaf-spring 81 which extends lengthwise of the bracket-arm 3 and is secured at its other end to the bracket-arm, and presser-bar 80 being acted upon by one end of a second leaf-spring 82 which also extends lengthwise of the bracket-arm 3 and is secured at its other end by a screw 83 to the bracket-arm. The pressure applied by the leaf-springs is controlled by two adjusting screws 84 and 85 threaded into the bracket-arm 3 and at their lower ends engaging their respective leaf-springs. To prevent the presser-bars 79 and 80 from turning in their bearings they have clamped thereon collars 86 and 87 formed with rearwardly extending vertically split guide-arms 88 and 89, the free ends of which extend into guide-slots 90 and 91 provided in the rear wall of the machine-head 4.

Referring to Figs. 6 and 7 it will be observed that the free ends of the guide-arms 88 and 89 preferably project sufficiently beyond the rear wall of the machine-head 4 to overlie the opposite ends of the horizontal limb 92 of an inverted T-shaped member 93 connected at its upper end to the rock-lever 58 which, as previously described, is pivotally mounted upon the stud 57 and connected to a suitable treadle or knee-shift mechanism, whereby the presser-bars 79 and 80 may be manually raised. In addition to this presser lifting mechanism, there is provided the usual hand-controlled presser-foot lifting lever 94 which is preferably pivoted at its upper end on a screw 95 threaded in a lug 96 integral with the machine-head 4. When the lifting lever 94 is raised the cam-section on the upper end thereof engages the inverted T-shaped member 93 and through the horizontal limb 92 thereof raises the two presser-bars 79 and 80. The inverted T-shaped member 93 is normally maintained in yielding contact with the cam-section of the lifting lever 94 by a coil-spring 97 acting between the member 93 and the machine-head 4. To limit the height to which the presser-bars may be elevated there is provided upon the machine-head 4 an adjustable stop 98 which may be set to limit vertical movement of the presser-bar guide-arm 89 in the guide-slot 91.

From the foregoing it will be understood that the present invention contemplates a needle-bar-frame vibrating mechanism which may be operated at very high rates of speed with no overthrow and wherein the shocks incident to the rapid starting and stopping of the needle-bar

frame, in its oscillation, are practically eliminated; which is compact and rigid in construction; and which lends itself to simple incorporation in a sewing machine head which can be assembled as a separate unit and applied to any one of a plurality of bracket-arms. It will also be understood that although it is desirable that the oscillatory needle-bar-frame be made of aluminum so that its mass may be maintained as small as possible, any other lightweight material may be satisfactorily employed.

It will be observed in Figs. 1 and 5, that the head 4 is a complete unit capable of being produced as a separate assembly and applied to any one of a plurality of bracket-arms differing in length or shape. The head-assembly comprises a housing having a pair of vertically spaced bearing apertures of which the upper one is fitted with the ball-bearing 5 and the lower one is fitted with the bearing sleeve 32. It will be understood that the needle-bar-frame 30 and its fulcrum-rod 31 can be inserted in the lower bearing aperture in the head and that the hub of the needle-bar crank 9 can be inserted into the ball-bearing 5, after which all the needle-bar-actuating mechanism can be assembled properly within the head 4. The head-assembly can be readily applied to the selected bracket-arm by means of the fastening screws 64 and the locating pin 65.

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

1. A sewing machine having a frame including a bracket-arm terminating in a head, a rotary shaft journaled in said bracket-arm, a needle-bar, a needle carried thereby, means including a crank mounted on said rotary shaft for endwise reciprocating said needle-bar, a needle-bar-frame disposed within said head and provided with at least one bearing in which said needle-bar is endwise slidable, a fulcrum-rod journaled in the lower portion of said head and supporting said needle-bar-frame for oscillatable movements about an axis substantially coinciding with a line passing through the center of mass of said needle-bar-frame and the needle-bar endwise slidable therein when the latter is at the lower end of its stroke, an actuating eccentric fast on said rotary shaft adjacent the crank mounted thereon, a rock-lever secured at its lower end upon said fulcrum-rod and extending upwardly in close proximity to the head thereby to not encroach upon the work-handling space beneath said bracket-arm, and a pitman-connection between said eccentric and said rock-lever.

2. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said frame, a plurality of endwise reciprocatory needle-bars, needles carried thereby, an oscillatory needle-bar-frame fulcrumed on said head and providing bearings in which said needle-bars are endwise slidable, means for oscillating said needle-bar-frame about its fulcrum, and means connecting said needle-bars to said actuating shaft for reciprocation thereby, said means including a pair of elements telescopically arranged and secured to said needle-bars.

3. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said frame, a pair of endwise reciprocating needle-bars sustained by said head, needles carried thereby, a pin secured on one of said needle-bars, a sleeve secured on the other of said needle-bars and arranged telescopically to receive said pin, a link embracing said sleeve, and means connecting said link to said actuating shaft for imparting reciprocations to said needle-bars.

4. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm, an oscillatory needle-bar-frame fulcrumed on said head and having upstanding limbs provided with bearings, means for oscillating said needle-bar-frame, a pair of spaced needle-bars endwise reciprocable in said needle-bar-frame bearings, needles carried by said needle-bars, a needle-bar driving link operatively connected at one end to said actuating shaft, and a connection including a pair of elements telescopically arranged for operatively securing the other end of said needle-bar-driving link to said pair of needle-bars.

5. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm, an oscillatory needle-bar-frame fulcrumed on said head and having upstanding limbs provided with bearings, means for oscillating said needle-bar-frame, a pair of spaced needle-bars endwise reciprocable in said needle-bar-frame bearings, needles carried by said needle-bars, a pin secured on one of said needle-bars, a sleeve secured on the other of said needle-bars and arranged to telescopically receive said pin, a link embracing the external surface of said sleeve, and means connecting said link to said actuating shaft for imparting reciprocation to said needle-bars.

6. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm, a plurality of endwise reciprocatory needle-bars, needles carried thereby, a needle-bar-frame having upstanding limbs providing bearings in which said needle-bars are endwise slidable, fulcrum-rods secured to the upstanding limbs of said needle-bar-frame and disposed in alinement with one another to support the needle-bar-frame on said head for oscillatable movements about a horizontal axis, and means operated by said actuating shaft for oscillating said needle-bar-frame about its supporting fulcrum-rods.

7. A sewing machine having a frame including a bracket-arm terminating in a head formed with a pair of laterally spaced bearings, an actuating shaft journaled in said bracket-arm, a pair of laterally spaced endwise reciprocatory needle-bars, needles carried thereby, a needle-bar frame formed with a pair of upstanding limbs providing bearings for said needle-bars, fulcrum-rods journaled in the laterally spaced bearings in said head and secured to said needle-bar-frame to support the same for oscillatable movements about an axis substantially coinciding with a line passing through the center of mass of the needle-bar-frame and the needle-bars journaled therein, and means operated by said actuating shaft for oscillating said needle-bar-frame about its supporting fulcrum-rods.

8. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm, a pair of laterally spaced endwise reciprocatory needle-bars, needles carried thereby, means including a pair of telescopically arranged elements secured to said needle-bars for connecting said needle-bars to said actuating shaft for reciprocation thereby, a substantially U-shaped needle-bar-frame formed with bearings in its respective limbs in which said needle-bars are endwise slidable, a fulcrum-rod journaled in said frame

and secured to said needle-bar-frame for supporting the same for oscillatable movements about an axis arranged substantially parallel with the axis of said actuating shaft, and means operatively connected to said actuating shaft and including a connection secured to said fulcrum-rod for oscillating said needle-bar-frame about its supporting fulcrum rod.

9. A sewing machine having a frame including a bracket-arm terminating in a head formed with a pair of laterally spaced bearings, a rotary shaft journaled in said bracket-arm lengthwise thereof, an oscillatory needle-bar-frame disposed within said head, a pair of in-line fulcrum-rods secured to said needle-bar-frame and journaled in the laterally spaced bearings in said head, said fulcrum-rods supporting said needle-bar-frame for oscillatable movements about an axis arranged substantially parallel with the axis of said rotary shaft, means operatively connected to said rotary shaft and including a connection secured to one of said fulcrum-rods for oscillating said needle-bar-frame about its fulcrum axis, a pair of laterally spaced needle-bars endwise reciprocable in said needle-bar-frame, and means for reciprocating said needle-bars, said last-named means including a link actuated by said rotary shaft and operable in the space between the two laterally spaced needle-bars.

10. A sewing machine having a frame including a bracket-arm terminating in a head formed with a bearing, a bracket secured to said head and having formed therein a bearing in alinement with the bearing in said head, an oscillatory needle-bar-frame disposed within said head, a pair of in-line fulcrum-rods secured to said needle-bar-frame and journaled in the aforementioned alined bearings, means including a connection secured to one of said fulcrum-rods for oscillating said needle-bar-frame about its fulcrum axis, a pair of needle-bars endwise reciprocable in said needle-bar-frame, needles carried thereby, and means for reciprocating said needle-bars.

11. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm, a needle-bar, a needle carried thereby, means including a crank mounted on said actuating shaft for endwise reciprocating said needle-bar, a needle-bar-frame disposed within said head below the level of said actuating shaft and provided with at least one bearing in which said needle-bar is endwise slidable, a fulcrum-rod journaled in said head and supporting said needle-bar-frame for oscillatable movements about an axis coinciding with the center of mass of said needle-bar-frame and needle-bar when the latter is at the bottom of its stroke, means including a lever secured to said fulcrum-rod for oscillating said needle-bar-frame about its supporting fulcrum-rod, and an eccentric mounted on said actuating shaft adjacent said head for imparting operative movements to said last named means.

12. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm, a needle-bar, a needle carried thereby, means including a crank mounted on said actuating shaft for endwise reciprocating said needle-bar, a needle-bar-frame disposed within said head and provided with at least one bearing in which said needle-bar is endwise slidable, a fulcrum-rod journaled in said head and supporting said needle-bar-frame for oscillation about an axis coinciding with the center of mass of said needle-bar-frame and needle-bar when the latter is at the lower end of its stroke, an eccentric fast on said actuating shaft adjacent the crank mounted thereon, a lever secured at one end to said fulcrum-rod and extending toward said actuating shaft in close proximity to said head, and a pitman connecting the other end of said lever to said eccentric, the joint between said lever and pitman being located within the confines of said bracket-arm.

13. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm and projecting into said head, a needle-bar, a needle carried thereby, means including a crank mounted on that portion of said actuating shaft projecting into said head for endwise reciprocating said needle-bar, a needle-bar-frame disposed within said head below the level of said actuating shaft and provided with at least one bearing in which said needle-bar is endwise slidable, a fulcrum-rod journaled in said head and supporting said needle-bar frame for oscillation about an axis arranged beneath the level of and parallel with the axis of said actuating shaft, an eccentric fast on said actuating shaft adjacent the crank mounted thereon, a lever secured at its lower end to said fulcrum-rod and extending upwardly in close proximity to the head thereby to not encroach upon the work-handling space beneath said bracket-arm, and a pitman connecting the upper end of said lever to said eccentric.

14. A unitary head-assembly adapted for use in a sewing machine having a bracket-arm provided with an actuating shaft, including, a housing having a plurality of spaced bearing apertures formed therein, a crank journaled in one of said bearing apertures and adapted to be operatively connected to said actuating shaft, a fulcrum-rod journaled in another of said bearing apertures, a needle-bar-frame disposed within said housing and supported by said fulcrum-rod, a needle-bar journaled for endwise reciprocation in said needle-bar-frame, and means connecting said crank to said needle-bar for reciprocating the same.

15. A sewing machine having a frame including a bracket-arm terminating in a head, an actuating shaft journaled in said bracket-arm and projecting into said head, a needle-bar, a needle carried thereby, a crank mounted on that portion of said actuating shaft projecting into said head, a needle-bar-frame disposed within said head and provided with a pair of spaced bearings in which said needle-bar is endwise slidable, a fulcrum-rod sustained by said head and supporting said needle-bar-frame for oscillation about an axis arranged beneath the level of the axis of said actuating shaft, a link connected at one end to said crank and at its other end to said needle-bar between the spaced bearings on said needle-bar-frame, an eccentric fast on said actuating shaft adjacent the crank mounted thereon, a lever secured at one end to said fulcrum-rod and extending upwardly in close proximity to the wall defining the machine head, and a pitman connecting the upper end of said lever to said eccentric.

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