MULTI-NEEDLE FRAME QUILTER SEWING MACHINE

FIG. 1

FIG. 2

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MULTI-NEEDLE FRAME QUILTER SEWING MACHINE


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The present invention is in the sewing machine art relating to stitching various designs, for example upon comforters, quilted mattress tops and the like or embroidery, where the work is held spanned in a movable frame shiftable in its plane as dictated by prescribed movements which may be afforded by automatic pattern control means as exemplified for a single needle sewing machine shown in the Boetcher Patent No. 2,236,421 of March 25, 1941. However, the present invention particularly concerns itself with a multi-needle sewing machine where each needle used will separately but simultaneously accomplish the design effected by frame movement.

Practical construction for a multi-needle sewing machine affords rather short up and down movements to the needle bar and the presser foot. These are not enough to raise said components sufficiently above the needle plate to give the clearance necessary to insert and remove the work-holding frame. It is therefore the principal object of this invention to provide in a multi-needle sewing machine, in which the normal movements of the needle bar and presser foot are comparatively short, novel and improved means by which they may be raised sufficiently to give the required clearance for insertion and removal of said work-holding frame.

Automatic or manual pattern control means being well known, the showing thereof is omitted herein because its incorporation is readily understood to those versed in this art and I will concern myself entirely with disclosing and explaining the special raising mechanism which is my sole novel contribution and in connection therewith will show only such portions of the multi-needle sewing machine as will enable those versed in the art to fully understand this invention.

Another important object of this invention is to provide for easy and precise restoration of the needle bar and the presser foot with their associated driving mechanism to operative sewing condition after the work-holding frame has been mounted.

A further object thereof is to provide novel and improved means in a multi-needle sewing machine of the character described, having the attributes mentioned and which is simple in construction, reasonable in cost, easy to manipulate and efficient in carrying out the purposes for which it is designed.

Other objects and advantages will become apparent as this disclosure proceeds.

One form this invention may assume is to have a multi-needle sewing machine including a horizontal needle bar from which a series of spaced needles extendable through suitable holes or openings in a horizontal presser foot which is below and along the needle bar and normally presses resiliently against the work supported on the needle plate. There is a horizontal rocker shaft above the needle bar. A series of spaced cranks extending from the rocker shaft are respectively linked to the needle bar. Camns on the rocker shaft cause with structure extending upwardly from the presser foot to slightly raise said presser foot at the completion of each stitch to release its hold on the work to permit movement of the work-holding frame. An eccentric on a power-driven shaft is associated with an eccentric rod which is linked to a crank means on the said rocker shaft whereby said rocker shaft is given an oscillatory rotary movement thereby causing the vertical reciprocatory movements of both said needle bar and the presser foot in proper timed relation; said bar and foot being mounted on the machine for movement along the vertical. A clutch or latch means is provided to disconnect the eccentric-driven crank which is on the rocker shaft to enable said crank to be free of said rocker shaft. To afford the required clearance for the work-holding frame, a manually-operated worm is journaled on the last-mentioned crank and is in engagement with a wheel which is secured on the rocker shaft, so that when said crank is free, the turning of said worm in a given direction will give the rocker shaft a further partial turn to cause the needle bar to be raised sufficiently to afford such clearance under the needles, and the presser foot is associated with gear and rack structure at several spaced regions therealong; all gears of such structure being fast on a common shaft which when manually turned a bit, causes the release of the locking elements from the main racks. The common shaft is biased by spring means to hold the rack elements in locking engagement with their respectively related racks. Means are also provided so that upon the resetting of the latch, the needle bar is restored to proper association in the machine for sewing operation and also means to properly reset the presser foot for normal operation in the machine.

A more detailed description and explanation of this invention will now be given.

In the accompanying drawings forming part of this application, similar characters of reference indicate corresponding parts in all the views.

FIG. 1 is a fragmentary front view of a multi-needle sewing machine embodying the teachings of this invention. The needle bar and the presser foot are shown in their positions where they are raised sufficiently to admit or afford the withdrawal of the work-holding frame. Only such parts of the machine are shown as is required to explain this invention.

FIG. 2 is a fragmentary perspective view showing the mechanism employed for raising the needle bar to a sufficient height required as shown in FIG. 1.

FIG. 3 is an end view of FIG. 2, showing only said mechanism.

FIG. 4 is a rear view of the showing of said mechanism in FIG. 2. In orthographic projection, this FIG. 4 is a side view of FIG. 3.

FIG. 5 is an end view of the presser foot and its associated mechanism for raising it to the required height when needed. The needle bar and parts of its associated structure are also shown. Both the needle bar and presser foot are shown in their disengaged position. FIG. 6 is a fragment of FIG. 5 showing an engagement means shifted to its disengaged position, whereas in FIG. 5 it is shown in engaged position.

FIG. 7 is a perspective view of a bearing structure which is part of FIG. 3.

In the drawings, the numeral 15 designates generally a multi-needle sewing machine including a horizontal needle bar 16 from which depends a plurality of spaced needles 17 enterable through suitable holes in a horizontal presser foot 18 which is below and along the needle bar and normally presses resiliently due to ac-
tion of the spring 19 against the work supported on the needle plate 20 through which the needles pass during operation of the machine, cooperating shuttle means (not shown). There is a horizontal rocker shaft 21 above the needle bar 16, journalied in the side frames, only one of which is shown at 22, through which it extends; the mechanism indicated generally by the numeral 23 being associated with such extending end of said rocker shaft 21. The framework includes the fixed bars 24, 25 to fixedly support substantially similar brackets 26 and 27, one of which is shown in full in FIG. 5. Vertical rods 28 extend upwardly from the needle bar 16 and are slidably mounted in the slide bearings of the brackets 27, thereby mounting said presser foot for up and down movement. Verti-
cal rods 29 associated with the presser foot 18, extend upwardly and are slidably mounted in the slide bearings of the brackets 27, thereby mounting said presser foot for up and down movement. Spaced cranks 30 extending from the rocker shaft 21, are respectively linked to the needle bar 16 by the links 31. Each of the cams 32 on said rocker shaft 21 has a cam follower 33 which bears against the top thereof. These cam followers are carried, one on each of the rods 29.

The mechanism 23 includes the member indicated generally by the numeral 34 which serves as a crank on the rocker shaft 21 when secured to move with it. Said crank 34 has a bearing structure 35 thereof which rotatably supports the short shaft 36 carrying the worm 37 secured thereto, which is in engagement with the gear 38 secured on the rocker shaft 21. Said shaft 36 has the handle 39 and 80' fixed therein at its respective ends. Said crank 34 is linked by the stud 39 to the eccentric rod 40 which extends from the eccentric structure 41 on the power-driven shaft 42. Said crank 34 also has a member a manually manipulable latch 43 housed in the casing 44 on said crank, said latch being biased by the spring 45 to be normally in engagement with the gear 38 because it is in the hole 46 in said gear. Such engagement makes the crank move with the rocker shaft 21. Disengagement of this clutch latch by its withdrawal from said hole, makes the crank loose on the rocker shaft. It is evident that this latch 43 acts as a clutch which is shifted to open position by hand pull on the knob 47.

Referring now to FIG. 5, each of the rods 29 carries fixed bracket structure which are the separate pieces 48 and 50, which together serve as a slide bearing for the vertical disposed rack 49 extending upwardly from the rocker foot and also offer a bearing for supporting the horizontal shaft 51 for all the gears 52 which are in engagement with the racks 49 respectively and for the second shaft 53 for the locking pieces 54 which are short racks of few teeth each. There is a handle 55 on the shaft 51 to turn it and there is a handle 56 on the shaft 53 to turn it. The shaft 53 is biased by a tensed spring 56' fixed to the frame, to hold the locking elements 54 in engagement with their respective related racks 49.

When the latch 43 is engaged in the hole 46 in which it is slidably fitted in the conditions shown in FIGS. 2 and 4, the needle bar 16 is properly positioned for machine operation. When the rocker shaft 21 is in position that lifting of the presser foot 18 would be done by the cams 32 and the presser foot is against the needle plate 20 as in FIG. 5, said presser foot is then in proper position for machine operation. When the latch 43 is disengaged from the hole 46, which is the condition in FIG. 1 where of course the machine is at rest, the crank 34 is loose on the rocker shaft 21, but held against movement because of its association with the stud 39 and the fixed positioned eccentric rod 40. The normal raised position of the needle bar 16 during machine operation, is of course determined by the throw of the eccentric 41, during which the cranks 30 are swung an angular movement equal to the swing of the rocker shaft 21.

The swinging movements of the cranks 30 give the needle bar 16 its up and down stroke. The relative angular placement of the cranks 30 and thecams 32 on the rocker shaft 21 is such as to cause movement of the needle bar 16 and the presser foot 18 in the timed relation heretofore set forth, as is necessary for the sewing operation, is of course determined by the throw of the eccentric 41, during which the cranks 30 are swung an angular movement equal to the swing of the rocker shaft 21.

Upon withdrawal of the latch 43 after the machine is manually adjusted to have the cranks 30 at their normal raised position and then upon turning the handle 56, movement of the worm 37 and thereby the gear 38, will cause the rocker shaft 21 to turn a part turn whereupon the cranks 30 are lifted sufficiently to liberate needle bar 16 to raised position as shown in FIG. 1. This is done as the first step to attain the clear space necessary above the needle plate 20 shown in FIG. 1. Now, to lift the presser foot 18 to its necessary raised position as in FIG. 1, the handle 56 is moved to turn the shaft 53, thereby swinging away the locking elements 54 from their hold on the racks 49, as shown in FIG. 6, and while holding it so, the handle 55 is moved to turn the shaft 51, whereupon the gears 52 will turn to raise the main racks 49 as required. Upon release of hold on the handle 56, the action of the spring 56 will again cause the elements 54 to engage the main racks 49 and thereby hold the presser foot 18 in its raised position as in FIG. 1. After the frame (not shown) holding work to be operated on is mounted in the machine, the machine is reset to operative condition by turning the handle 56 in reverse direction until the gear members the hole 46, a manipulation positively and properly associating the needle bar 16 to sewing action. Then the presser foot 18 is lowered as may be indicated by a mark 60 thereon or other suitable stop means, by manipulating the handles 55 and 56, which will assure that when the needle bar is brought by action of the rocker shaft 21 to lowest position during sewing operation, said presser foot 18 will resiliently press on the needle plate 20. The machine is now again in operative condition.

The number and spacing of the needles 17 employed in any instance will of course depend upon the design to be effected.

It may also be noted that in small machines, the extensible and contractible rod structure comprising the lower rod part which is the rack 49 and the upper rod part 29 as connected by the elements 48 and 50 which are fixed on said upper rod part 29, and through which elements, the lower rod part can slide upwardly to shorten and then downward to lengthen such rod structure, may be used for the necessary raising and lowering of the presser foot 18. Turning of the rocker shaft 21 may be done by a handwheel (not shown) thereon, in which case the worm 37 and its wheel 38 may be omitted. However, some structure with hole 46 therein must be employed to receive the latch 43.

This invention is capable of numerous forms and various applications without departing from the essential features herein disclosed. It is therefore intended and desired that the embodiment herein shall be deemed illustrative and not restrictive and that the patent shall cover all patentable novelty herein set forth; reference being had to the following claims rather than to the specific description herein to indicate the scope of this invention.

The following are the claims:

1. A new and improved sewing machine affording the lifting of its needle bar and presser foot to give clearance above the needle plate for the insertion and removal of a work-holding frame, including a framework, a horizontal needle bar slidably mounted on said framework for movement along the vertical, a plurality of needles depending from said needle bar, a rod structure comprising an upper rod part and a lower rod part with said lower rod part slidably mounted on said upper rod
part; said lower rod part being fixed to said presser foot; said upper rod part being slidably mounted on said framework for movement along the vertical, a first means releasably holding said rod parts against relative movement, a rocker shaft journaled on said framework, a second means operatively connecting said needle bar and rocker shaft whereby upon oscillatory movement of said rocker shaft, said needle bar will be reciprocated along the vertical, a third means operatively connecting the upper rod part of said rod structure whereby upon oscillatory movement of said rocker shaft, said upper rod part will be reciprocated along the vertical, a power-driven shaft journaled on said framework, a crank mounted on said rocker shaft for free rotation thereon, releasable clutch means releasably securing said crank to said rocker shaft to turn therewith, a rod member pivotally linked to said crank, means driven by said power-driven shaft operatively connecting said rod member to said crank whereby said crank will be oscillated upon rotation of said power-driven shaft; said rod member being moveable only by the operation of said power-driven shaft and said rocker shaft being free for rotation when said crank is loose thereon, said clutch means being capable to hold said crank and rocker shaft in engagement when said crank is only at one certain position on said rocker shaft and means operatively associated with said rocker shaft and crank for turning said rocker shaft when said crank is loose thereon whereby the needle bar is raised sufficiently above the highest position said needle bar reaches during the turning of the power-driven shaft when said clutch means holds said crank and rocker shaft in engagement, to give clearance under the needles for the insertion and removal of the work-holding frame; said first means being manipulatable to allow upward movement of the lower portion of said rod structure whereby the presser foot is raised sufficiently above the highest position said presser foot reaches during the turning of the power-driven shaft while the clutch means holds the crank and rocker shaft in engagement, to allow the insertion and removal of the work-holding frame.

2. A machine as defined in claim 1, wherein the above mentioned cooperating turning means for turning the rocker shaft comprises a manually-turnable shaft journaled on said crank, a worm securely carried on said rocker shaft, a worm securely carried on said rocker shaft and a gear secured on the rocker shaft and in engagement with said worm.

3. A machine as defined in claim 2, wherein the clutch means comprises a spring-biased latch movably mounted on said crank; said gear having a hole therein in which said latch is slidably fitted and is withdrawable therefrom.

4. A machine as defined in claim 1, wherein the upper rod part of the rod structure carries bracket structure and the lower rod part is a vertically positioned rocker, slidably mounted for vertical movement on said bracket structure, a horizontal shaft journaled on said bracket structure, a gear securely carried on this shaft, in engagement with said rack, handle means on such gear-carrying shaft to turn it and wherein the first means comprises a toothed element swingably mounted on said bracket structure, in releasable engagement with said rack, spring means normally maintaining such engagement and means to shift said element out of such engagement; said element when engaged with said rack, holding said rack locked in position.

5. A machine as defined in claim 4, wherein the above mentioned cooperating turning means on said crank and rocker shaft for turning said rocker shaft when the said crank is loose thereon, comprises a manually-turnable shaft journaled on said crank, a worm securely carried on said manually-turnable shaft and a gear secured on the said rocker shaft and in engagement with said worm.

6. A machine as defined in claim 5, wherein the clutch means comprises a spring-biased latch mounted on said crank; said gear having a hole therein in which said latch is slidably fitted and is withdrawable therefrom.

7. A machine as defined in claim 1, wherein said clutch means is able to secure said crank to turn with the rocker shaft only when said crank is at a predetermined position on said rocker shaft.

8. A multi-needle frame quilter sewing machine affording the lifting of its needle bar and presser foot to give clearance above the needle plate for the insertion and removal of such frame, including a horizontal needle bar, a horizontal presser foot, a rocker shaft, a means associated with said needle bar and rocker shaft for reciprocating the needle bar along the vertical a predetermined extent of movement upon oscillatory movement of said rocker shaft, a means associated with said presser foot and said rocker shaft for reciprocating said presser foot along the vertical a predetermined extent of movement upon said movement of said rocker shaft, in predetermined timed relation with the movement of the needle bar, a power-driven shaft, a crank on said rocker shaft, mounted for free rotation thereon, releasable clutch means associated with said crank and rocker shaft, releasably securing said crank to said rocker shaft to turn therewith, a rod pivotally linked to said crank, means driven by said power-driven shaft associated with said rod for oscillating said crank a predetermined extent of movement; said rod being moveable only by the operation of said powered shaft and said rocker shaft being free for rotation when the crank is loose thereon, said clutch means being capable to hold said crank and rocker shaft in engagement when the crank is only at a predetermined position on said rocker shaft, means associated with said rocker shaft for turning said shaft to such an extent when said crank is loose thereon, whereby the needle bar is raised a predetermined distance above the highest position said needle bar reaches during the turning of the power-driven shaft while said clutch means holds said crank and rocker shaft in engagement and means associated with said presser foot to raise said presser foot a predetermined distance above the highest position said presser foot reaches during the turning of said power shaft while the said clutch means holds said crank and rocker shaft in engagement.

9. A machine as defined in claim 8, wherein the clutch means comprises a spring-biased latch mounted on said crank; and a gear on said rocker shaft having a hole therein in which said latch is slidably fitted and is withdrawable therefrom.

10. A machine as defined in claim 8, wherein the above mentioned means for turning the rocker shaft comprises a manually-turnable shaft journaled on said crank, a worm securely carried on said manually-turnable shaft and a gear secured on the rocker shaft and in engagement with said worm.

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