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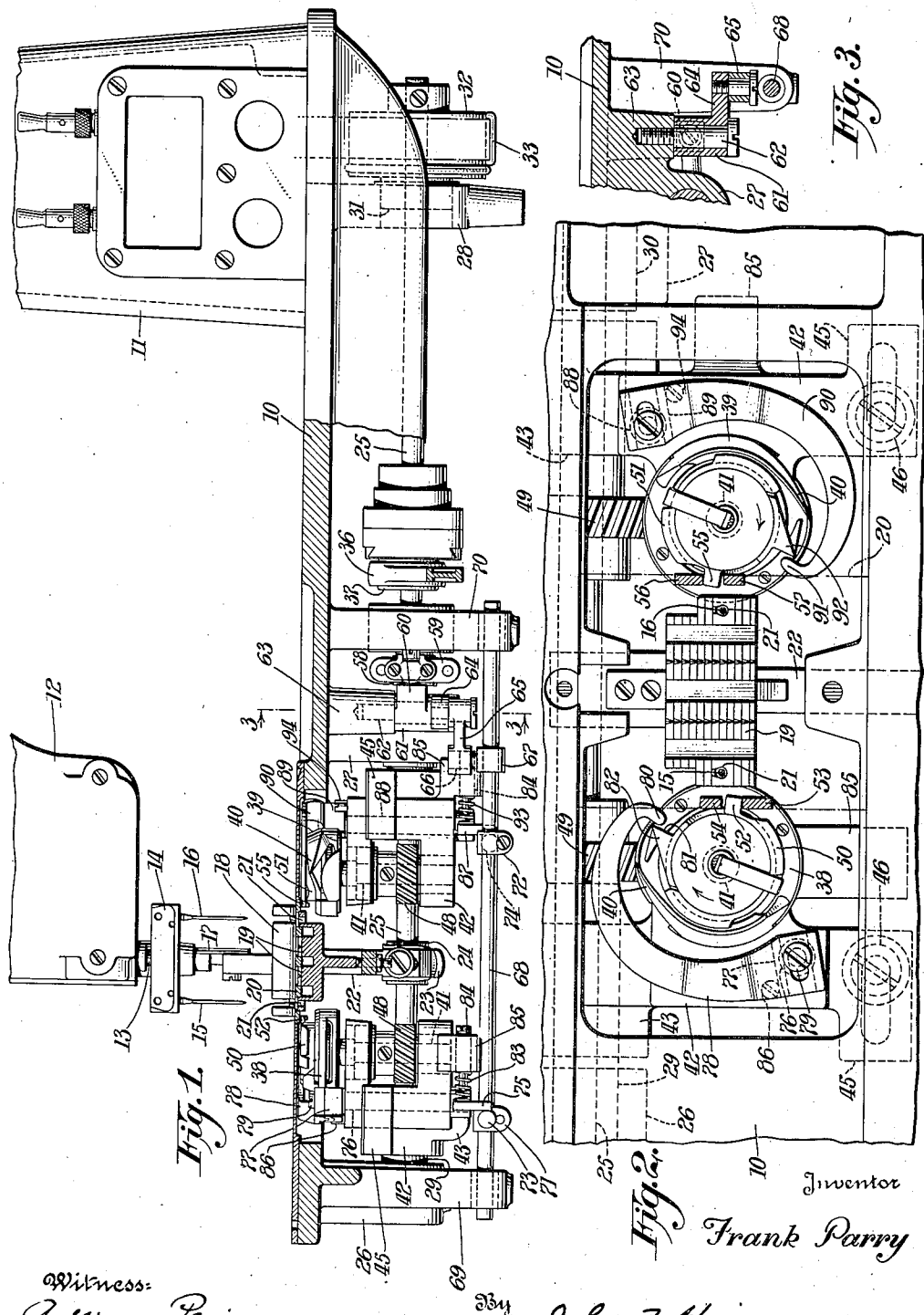
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2,336,368

LOOP-TAKER MECHANISM FOR SEWING MACHINES

Filed Sept. 3, 1942

3 Sheets-Sheet 1



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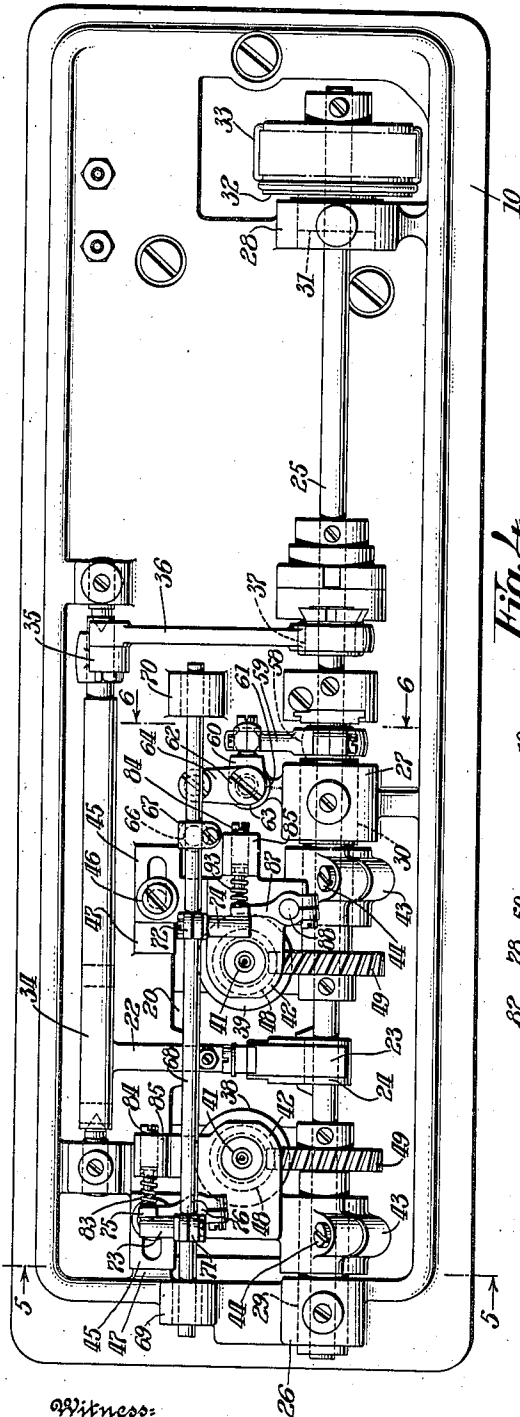
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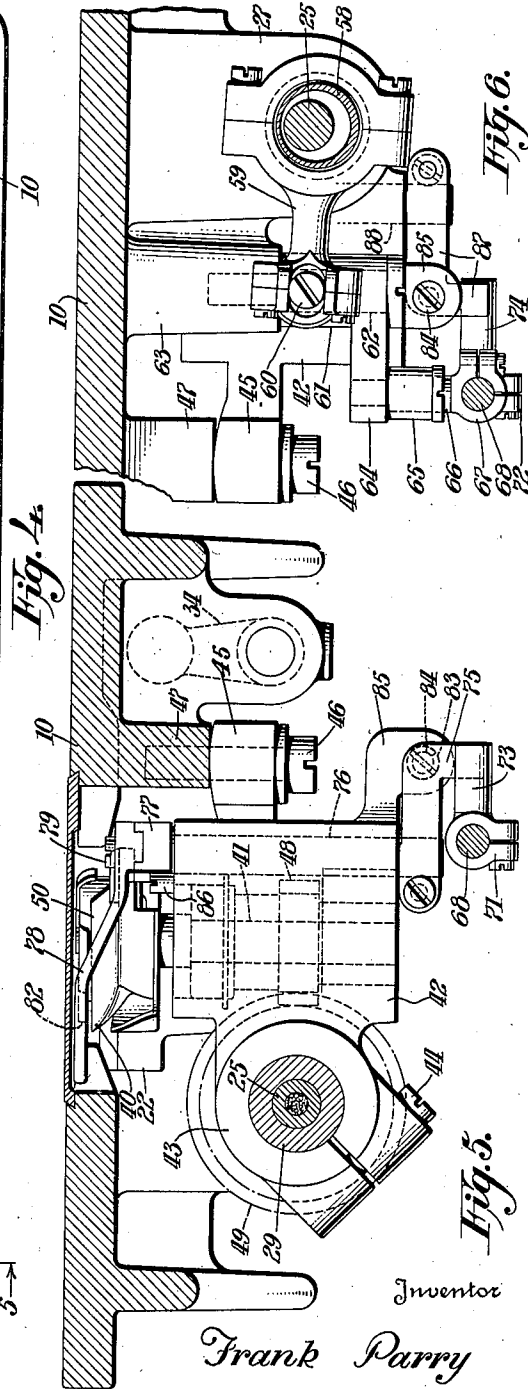
LOOP-TAKER MECHANISM FOR SEWING MACHINES

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3 Sheets-Sheet 2



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LOOP-TAKER MECHANISM FOR SEWING MACHINES

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3 Sheets-Sheet 3

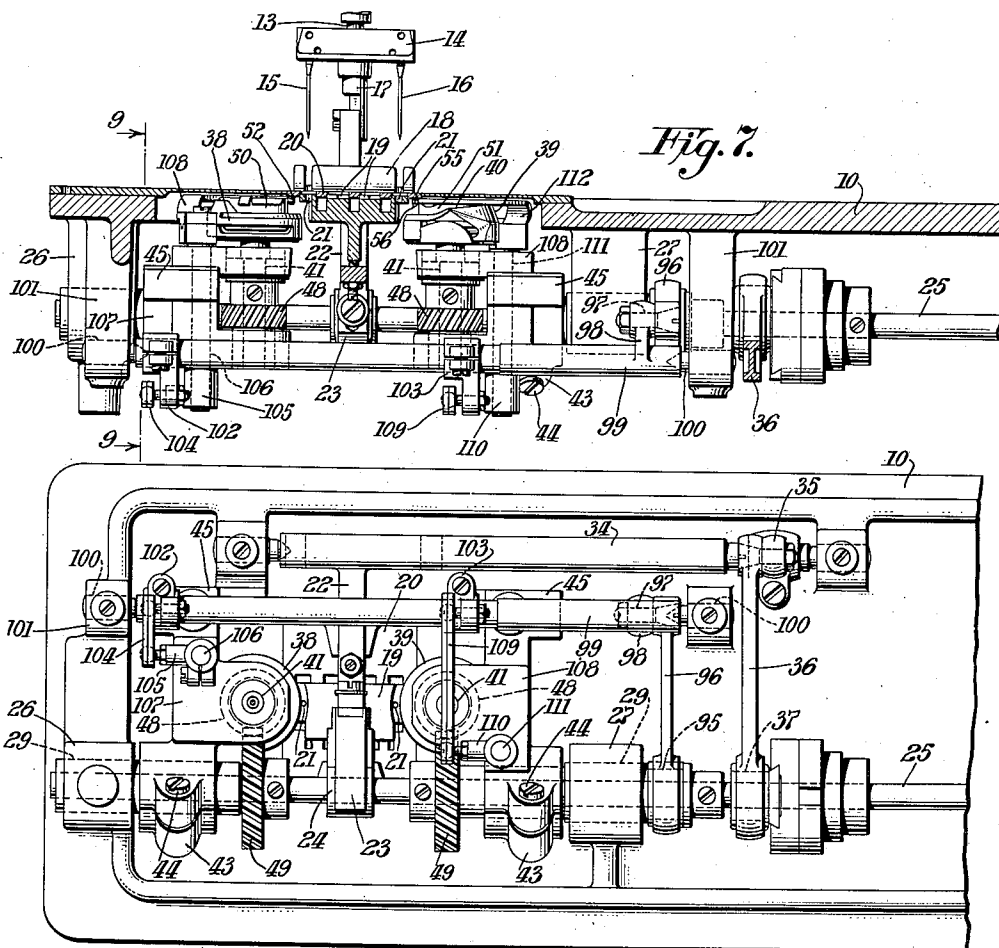


Fig. 8.

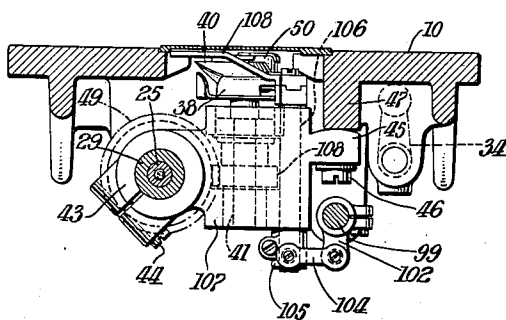


Fig. 9.

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UNITED STATES PATENT OFFICE

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LOOP-TAKER MECHANISM FOR SEWING MACHINES

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13 Claims. (Cl. 112—184)

This invention relates to lock-stitch sewing machines of the type employing a rotary loop-taker for casting thread-loops about a thread-carrier journaled in and restrained against rotation with the loop-taker.

In sewing machines of the type referred to, it has been common to employ devices termed "mechanical-openers" which function, intermittently, to turn or oscillate the thread-carrier in a direction opposite to the direction of rotation of the loop-taker, thereby to provide thread-clearance between the thread-carrier and its rotation-restraining means.

The present invention has for its primary object to provide improved mechanical-opener devices for lock-stitch sewing machines operable at high speeds and having a plurality of rotary loop-takers.

Another object of this invention is to provide simple actuating mechanism for mechanical opener devices of sewing machines having a plurality of rotary loop-takers which are adjustable relatively to each other. Further aims of the invention are to reduce to a minimum any thread-carrier cramping and overheating effects incidental to employment of mechanical openers, and to reduce to a minimum the amplitude of movement of the opener device.

With these and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts which will be described in connection with the accompanying drawings of two embodiments of the invention.

In the drawings, Fig. 1 is a front elevation, partly in vertical section, of a sewing machine containing one form of the improved opener mechanism; the bracket arm of the machine being partly broken away. Fig. 2 is an enlarged top plan view of a portion of the machine bed-plate, with the bed-slides removed and the thread-carrier stop of the throat-plate shown in section, to expose the loop-takers and feed-mechanism. Fig. 3 represents a vertical section of a portion of the bed-plate and taken substantially on the line 3—3 of Fig. 1. Fig. 4 is a bottom plan view of the machine shown in Fig. 1. Figs. 5 and 6 represent enlarged vertical sections transversely of the bed-plate of the machine, the sections being taken respectively on substantially the lines 5—5 and 6—6 of Fig. 4. Fig. 7 is a vertical section taken longitudinally of a portion of the bed-plate of a two-needle sewing machine having a modified form of opener mechanism. Fig. 8 is a bottom plan view of the machine as illustrated in Fig. 7.

Fig. 9 is a vertical section transversely of the bed-plate and taken substantially on the line 9—9 of Fig. 7.

As shown in the drawings, the present invention has been embodied in a two-needle lock-stitch sewing machine. This machine has a frame comprising a work-support or bed-plate 10, from one end of which rises the standard 11 of a bracket-arm terminating at its free end in a head 12 overhanging the work-support 10. Journaled for endwise reciprocation in the bracket-arm head 12 is a needle-bar 13 carrying at its lower end a needle-holder 14. Secured in the needle-holder 14 are two needles 15 and 16 spaced from each other lengthwise of the work-support 10. Also journaled for vertical movement in the head 12 is a spring-depressed presser-bar 17, to the lower end of which is secured a conventional presser-foot 18.

The work is advanced across the work-support 10 by a feed-dog 19, operating through a suitably slotted throat-plate 20 and opposed in its work-engaging movements by the presser-foot 18. In the present machine, the feed-dog 19 is provided with clearance apertures 21 for the needles 15 and 16; said needles having lateral movements while in the work and assisting the feed-dog 19 in advancing the work.

The feed-dog 19 is carried by a feed-bar 22 having a fork 23 engaged by a feed-lift eccentric 24. The eccentric 24 is carried by the usual horizontally disposed bed-shaft 25 extending lengthwise of the work-support. The bed-shaft 25 is rotatably journaled in bearing lugs 26, 27 and 28, depending from the work-support 10; the bearing-lugs 26 and 27 being provided with bearing bushings 29 and 30, respectively, and the bearing-lug 28 being provided with a ball-bearing 31 for the shaft 25. Adjacent the bearing-lug 28, the bed-shaft 25 carries a pulley 32 driven by a belt 33 to rotate the shaft 25 once for each complete needle-reciprocation.

The feed-bar 22 is pivotally connected to a feed-advance rocker 34 suitably fulcrumed at the front side of and below the work-support 10. Operatively connected to a crank-arm 35 depending from the feed-rocker 34 is one end of a pitman 36. At its opposite end, the pitman 36 has a strap embracing a feed-advance eccentric 37 carried by the bed-shaft 25; said eccentric 37 being adjustable as to eccentricity in any usual or preferred way. The described feeding mechanism functions to impart the usual feed-lift and feed-advance movements to the feed-dog 19.

Complemental to the respective needles 15 and

16, in the formation of lock-stitches, are two loop-takers 38 and 39 disposed below the work-support 10 and comprising vertical-axis rotary hooks of conventional construction. The rotary hook 38, which is complementary to the needle 15, has an upwardly open cup-shaped body provided in its side wall with a needle-thread loop seizing and spreading beak 40. The rotary hook 38 is carried by the upper end of a vertically disposed hook-shaft 41 journaled in a supporting bracket 42 for rotation about an axis substantially normal to the work-support 10. The bracket 42 has a split boss 43 clamped by a screw 44 upon the bearing-bushing 29; said bracket also having a foot 45 secured by a screw 46 against the under face of a rib 47 depending from the work-support 10. The described securing means for the bracket 42 provides for adjustment of said bracket lengthwise of the work-support 10 i. e., for adjustment of the bracket 42 transversely of the direction of feed.

The rotary hook shaft 41 carries a spiral-pinion 48 engaged by a spiral driving gear 49 carried by the bed-shaft 25; the proportions of said gear 49 and pinion 48 being such that the rotary hook 38 rotates twice for each complete reciprocation of the needle 15. The rotary hook 39, which is complementary to the needle 16, corresponds structurally to the rotary hook 38 and is similarly supported and actuated; the supporting bracket 42 for the hook 39 being clamped upon the bearing-bushing 30.

Journaled in the respective rotary hooks 38 and 39 are thread-carriers 50 and 51; about which thread-carriers the needle-thread loops are cast by the rotary hooks. The thread-carrier 50 has the rim thereof provided with a nose 52 extending laterally from the thread-carrier and entering a stop-notch formed by spaced stop-lugs 53 and 54 depending from the throat-plate 20 adjacent one side edge thereof. The thread-carrier 51 likewise has the rim thereof provided with a nose 55 extending laterally therefrom and entering a stop-notch formed by spaced stop-lugs 56 and 57 depending from the opposite side edge of the throat-plate 20. The stop-lugs 53 and 56 of the throat-plate act to restrain the thread-carriers 50 and 51 from rotating with their respective hooks; the stop-lugs 54 and 57 being spaced from the lugs 53 and 56 so as to permit of limited turning movements of the thread-carriers in an opposite direction.

In order to provide thread-clearance space between the thread-carrier nose and the stop-lug opposing rotation of the thread-carrier with the hook, there have been employed various expedients to turn the thread-carrier in an opposite direction. Expedients of this type are commonly termed mechanical-openers. In connection with vertical-axis rotary hooks, it has been the more general practice to provide thread-carrier engaging fingers actuated from eccentrics carried by the vertical hook-shafts. In a mechanical opener of this type, the opener finger necessarily engages and turns the thread-carrier a plurality of times for each stitch-formation; one of the turning movements of the thread-carrier being idle and performing no useful function. While this arrangement has the advantage of permitting employment of a small actuating eccentric for imparting a comparatively short movement to the opener-finger, and also permits of adjustment of the loop-taker supporting bracket, the double action of the opener is a definite speed-

limiting factor due to overheating of the parts at high speed operation of the machine.

It has also been heretofore proposed to actuate a mechanical opener, associated with a vertical-axis rotary hook, from the bed-shaft which rotates once only for each stitch-forming cycle. However, devices of this character have been employed in connection with sewing machines having only one rotary hook and more generally employing a spring-retained cam-follower unadapted to meet and to withstand the extreme high speed requirements. The present invention aims to provide a mechanical opener mechanism particularly well adapted for multiple-needle sewing machines operable at high speeds.

To this end and in the form of the improvement illustrated in Figs. 1 to 6 inclusive, of the drawings, the bed-shaft 25 is provided with a primary actuating element in the form of an eccentric 58, which is preferably ball-shaped peripherally. This eccentric 58 is disposed closely adjacent to the bearing bushing 30, and between said bushing and the feed-eccentric 37. The eccentric 58 is adjustable as to eccentricity; the eccentric supporting and adjusting means employed corresponding substantially with the disclosure in the U. S. patent of Walter Myers, No. 2,128,031, Aug. 23, 1938. However, any other suitable form of adjustable eccentric may be employed.

The eccentric 58 is embraced by the strap of a horizontally forwardly extending pitman 59. At its forward end, the pitman 59 is connected by a ball-joint to a crank-arm 60 of a two-armed rocker 61. The rocker 61 is, in effect, a bell crank lever and is fulcrumed upon a shouldered screw-stud 62 threaded vertically upwardly into a boss 63 extending forwardly from the bed-plate lug 27. The other crank-arm 64 of the rocker 61 is connected by a link 65 to a stud 66 extending upwardly from a collar 67 adjustably clamped upon an actuator-member in the form of an endwise reciprocatory slide-bar 68. At its opposite ends, the slide-bar 68 is slidably supported in suitably bushed lugs 69 and 70 depending from the work-support 10. The slide-bar 68 comprises an intermediary actuator-member which is common to the mechanical openers associated with the two rotary hooks of the machine.

Adjustably clamped upon the slide-bar 68 are the split bosses 71 and 72 of two actuating-elements comprising tappet-arms 73 and 74 suitably spaced from each other lengthwise of the slide-bar 68; the tappet-arm 73 extending horizontally forwardly and the tappet-arm 74 extending horizontally rearwardly from the slide-bar 68. The tappet-arm 73 is positioned to engage the depending free end portion of a forwardly extending angular arm 75 adjustably clamped upon the lower end of an opener-finger rock-shaft 76. The rock-shaft 76 is vertically disposed and is journaled in the rotary hook bracket 42 for oscillatory movements about an axis substantially parallel to the rotation-axis of the rotary hook 38. At its upper end and above the bracket 42, the rock-shaft 76 has a head 77, upon which one end of a vibratory arm 78 is secured by a screw 79 for horizontal adjustment.

The vibratory arm 78 is curved to extend circumferentially about the rotary hook 38 and to provide an opener-finger 80 which is directed inwardly from the arm 78 toward the axis of ro-

tation of the rotary hook 38; said rock-shaft 75 and opener-finger 80 being disposed at substantially diametrically opposite sides of the thread-carrier 50. The opener-finger 80 is adapted to engage a substantially straight edge 81 of a cam-ear 82 extending outwardly from the thread-carrier 50 to overlie the rim of the rotary hook 38. The edge 81 of the thread-carrier cam-ear 82 preferably extends substantially radially from the thread-carrier, thereby to minimize cramping of the thread-carrier in its bearing by the action of the opener-finger 80 and, further, to permit of reduction to a minimum of the requisite stroke of the opener-finger.

The action of the tappet-arm 73 to oscillate the rock-shaft 75 is yieldingly opposed by a buffer-spring 83 which bears upon the lower rock-shaft arm 75 at the side thereof opposite to that engaged by the tappet-arm. The buffer-spring 83 is coiled about the reduced portion of a shouldered stud 84 which is adjustably threaded into a lug 85 depending from the hook-bracket 42. The buffer-spring 83 therefore functions to impart a return oscillation to the rock-shaft 75 upon retraction of the tappet-arm 73 from the rock-shaft arm 75. The return movement of the rock-shaft 76, under the action of the spring 83, is limited by a stop-screw 86 threaded into the top wall bracket 42 in position for engagement by the head 77 of the rock-shaft 76. In this stop-position of the rock-shaft 76, the opener-finger 80 is spaced slightly from the cam-ear 82 at the time when the thread-carrier nose 52 has been returned into engagement with the throat-plate stop-lug 53.

The other tappet-arm 74, carried by the slide-bar 68, is positioned to engage an arm 87 adjustably clamped upon the lower end of an opener-finger rock-shaft 88 to extend forwardly from said rock-shaft. The rock-shaft 88 is vertically journaled in the supporting bracket 42 for the rotary hook 39; said rock-shaft 88 having at its upper end a head 89 upon which is adjustably secured an arm 90 provided at its free end with an opener-finger 91. The opener-finger 91 is adapted to engage a cam-ear 92 extending from the thread-carrier 51 for the purpose of oscillating said thread-carrier oppositely to the direction of rotation of the rotary hook 39. Similarly to the rock-shaft 76, the rock-shaft 88 is returned by a spring 93 to a stop-position determined by a screw 94 threaded into the bracket 42 for engagement by the rock-shaft head 89. The opener mechanisms associated with the rotary hooks 38 and 39 therefore correspond structurally as well as functionally.

The hook-brackets 42 are conventionally adjustable toward and from each other to accommodate different spacings of the needles. Inasmuch as the mechanical openers associated with the two rotary hooks are carried by the respective hook-brackets, said openers are shifted with the rotary hooks upon adjustment of the latter. The slide-bar 68 extends lengthwise parallel to the paths of adjustment of the hook-brackets 42 and, therefore, the tappet-arms 73 and 74 may be adjusted upon the slide-bar 68 to accommodate different adjusted positions of the hook-brackets.

In the operation of the machine illustrated in Figs. 1 to 6, inclusive, of the drawings, the actuating eccentric 58 imparts to the slide-bar 68 endwise reciprocatory movements of a constant amplitude, regardless of different selected positions of the rotary hooks. The amplitude of movement of the slide-bar 68 is greater than

necessary to actuate the mechanical openers, so that a fractional portion only of the movement of the slide-bar is effective. While, therefore, the eccentric 58 rotates at one half the speed of rotation of the rotary hooks, the opener-fingers 80 and 91 have imparted thereto a minimum of properly timed movement requisite to perform their functions of separating the thread-carrier stops for passage of the needle-thread loops.

In the modified embodiment of the invention illustrated in Figs. 7 to 9, inclusive, of the drawings, the bed-shaft 25 of the sewing machine likewise carries a primary actuating element which may be in the form of an eccentric 95 secured upon the bed-shaft for rotation therewith. The eccentric 95 is embraced by a strap of a pitman 96 connected by a pivot-screw 97 to an up-standing crank-arm 98 of an intermediate actuator-member in the form of a rock-shaft 99 disposed substantially parallel to the bed-shaft 25 and between said bed-shaft and the feed-advance rocker 34. The rock-shaft 99 is supported at its opposite ends by pintles 100 suitably secured in lugs 101 depending from the work-support 10.

Suitably clamped upon the rock-shaft 99 for individual adjustment endwise of said rock-shaft are the split-hubs of two actuating elements comprising crank-arms 102 and 103 depending from the rock-shaft 99. The crank-arm 102 is pivotally connected, preferably by a ball-joint, to one end of a short link 104. The opposite end of the link 104 is similarly connected to a crank-arm 105 clamped upon the lower end of an opener-finger rock-shaft 106. The rock-shaft 106 is vertically journaled in a hook-bracket 107 and, at its upper end, carries an opener-arm 108. The opener-arm 108 is similar to the opener-arms 76 and 90 hereinbefore described and operates in a similar manner to oscillate the thread-carrier 50 of the rotary hook 38.

The rock-shaft crank-arm 103 is likewise pivotally connected by a link 109 to an arm 110 clamped upon the lower end of a rock-shaft 111; the link 109 being longer than the link 104, inasmuch as the rock-shafts 106 and 111 are disposed at opposite sides of a vertical plane containing the axes of rotation of the two hook-shafts 41. At its upper end, the rock-shaft 111 carries an opener-arm 112 associated with the rotary hook 39 for oscillating the thread-carrier 51 thereof.

As in the first described form of the improvement, the modified construction provides a simple train of connections with a single rotary actuating element for operating mechanical-openers associated with two rotary hooks adjustable relatively to each other; the openers being effective to oscillate the respective thread-carriers once only for two rotations of the rotary hooks.

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

1. In a sewing machine having stitch-forming mechanism including a plurality of rotary loop-takers, thread-carriers journaled in and restrained against rotation with said loop-takers, and a plurality of mechanical-openers for oscillating said thread-carriers in directions opposite to the directions of rotation of said loop-takers, the improvement which consists in the provision of a rotary actuating eccentric, an actuator-member common to said mechanical-openers, means for operating said actuator-member from said eccentric, and means including a plurality

of actuating-elements carried by said actuator-member for operating said mechanical-openers.

2. In a sewing machine having a plurality of rotary loop-takers, supporting means providing for adjustment of said loop-takers relatively to each other, thread-carriers journaled in and restrained against rotation with said loop-takers, a rotary actuating shaft, driving connections with said shaft for rotating said loop-takers, and a plurality of mechanical-openers associated with said loop-takers for oscillating said thread-carriers oppositely to the directions of rotation of the loop-takers in which the respective thread-carriers are journaled, the improvement which consists in the provision of an actuator-member common to said mechanical-openers, means for operating said actuator-member from said shaft, and means including a plurality of actuating elements adjustably carried by said actuator-member for actuating said plurality of mechanical-openers.

3. In a sewing machine having stitch-forming mechanism including a plurality of endwise reciprocatory needles, a plurality of rotary loop-takers complementary to said needles in the formation of lock-stitches, a rotary loop-taker actuating shaft, driving connections with said shaft for rotating said loop-takers a plurality of times for each rotation of the shaft, thread-carriers journaled in and restrained against rotation with said loop-takers, and a plurality of mechanical-openers associated with said loop-takers for oscillating the thread-carriers oppositely to the directions of rotation of said loop-takers, the improvement which consists in the provision upon said shaft of an actuating-eccentric common to said plurality of mechanical-openers, and operative connections with said actuating-eccentric for separately actuating said mechanical-openers.

4. In a sewing machine having a work-support, stitch-forming mechanism including a plurality of endwise reciprocatory needles, a plurality of rotary loop-takers disposed below said work-support, thread-carriers journaled in and restrained against rotation with said loop-takers, an actuating shaft journaled below said work-support, and a plurality of mechanical-openers associated with said loop-takers for oscillating said thread-carriers oppositely to the directions of rotation of the loop-takers in which the respective thread-carriers are journaled, the improvement which consists in the provision of an actuating-element carried by said shaft, an actuator-member common to said plurality of mechanical-openers, means for operating said actuator-member from said actuating element, and means including separate devices carried by said actuator-member for operating said mechanical-openers.

5. In a sewing machine having a work-support, stitch-forming mechanism including a plurality of endwise reciprocatory needles, a plurality of rotary loop-takers disposed below said work-support and each performing a plurality of rotations for a complete stitch-forming cycle of the machine, thread-carriers journaled in and restrained against rotation with said loop-takers, a rotary actuating shaft journaled below said work-support and performing one rotation only in a stitch-forming cycle, and a plurality of mechanical-openers associated with said loop-takers for oscillating said thread-carriers oppositely to the directions of rotation of the loop-takers in which the respective thread-carriers are jour-

naled, the improvement which consists in the provision of an actuating-element carried by said shaft for rotation therewith, an actuator-member common to said plurality of mechanical-openers, means for operating said actuator-member from said actuating-element, and means including separate devices carried by said actuator-member for operating said mechanical-openers.

6. In a sewing machine having a horizontally disposed work-support, work-feeding mechanism, a plurality of vertically reciprocatory needles operating in unison through said work-support, a plurality of vertical-axis rotary loop-takers complementary to said needles in the formation of separate rows of lock-stitches, thread-carriers journaled in and restrained against rotation with said loop-takers, a rotary actuating shaft disposed horizontally below said work-support, driving connections between said shaft and said loop-takers, and a plurality of mechanical openers associated with said loop-takers for oscillating said thread-carriers in directions opposite to the directions of rotation of the respective loop-takers in which the thread-carriers are journaled, the improvement which consists in the provision of an actuator-member common to said plurality of mechanical-openers, means for operating said actuator-member from said shaft, and means including separate devices carried by said actuator-member for actuating said mechanical-openers.

7. In a sewing machine having a work-support, a plurality of endwise reciprocatory needles having their paths of reciprocation substantially normal to said work-support, a rotary actuating shaft disposed below said work-support, a plurality of rotary loop-takers having their axes of rotation substantially normal to said work-support and to said shaft, driving connections with said shaft for rotating each of said loop-takers a plurality of times for each rotation of said shaft, thread-carriers journaled in and restrained against rotation with said loop-takers, a plurality of mechanical-openers associated with said loop-takers for oscillating said thread-carriers in directions opposite to the directions of rotation of the respective loop-takers in which the thread-carriers are journaled, and supporting brackets for said loop-takers and mechanical-openers, said brackets being mounted for adjustment lengthwise of said shaft, the improvement which consists in the provision of an actuator-member common to said plurality of mechanical-openers and lengthwise disposed substantially parallel to said shaft, means for operating said actuator-member from said shaft, and means including a plurality of actuating-elements carried by said actuator-member for operating said mechanical-openers, said actuating-elements being mounted upon said actuator-member for adjustment lengthwise thereof.

8. Loop-taker mechanism for sewing machines comprising, in combination, a rotary actuating shaft, a rotary loop-taker performing a plurality of rotations for each rotation of said shaft, a thread-carrier journaled in and restrained against rotation with said loop-taker, a vibratory opener-finger operable to oscillate said thread-carrier, an opener-finger actuating tappet-arm for oscillating said thread-carrier oppositely to the direction of rotation of said loop-taker, spring means yieldingly opposing vibration of said opener-finger under the action of said tappet-arm, stop means limiting the return move-

ment of said opener-finger under the action of said spring, an actuating eccentric carried by said rotary shaft, and operative connections with said eccentric for actuating said tappet-arm.

9. Loop-taker mechanism for sewing machines comprising, in combination, a rotary actuating shaft, a rotary loop-taker performing a plurality of rotations for each rotation of said shaft, a thread-carrier journaled in and restrained against rotation with said loop-taker, an actuating eccentric carried by said shaft, a pitman having a strap embracing said eccentric, a reciprocatory tappet-arm connected for actuation by said pitman, a vibratory opener-finger operable to engage and oscillate said thread-carrier, and connections including an arm disposed for intermittent engagement by said tappet-arm for vibrating said opener-finger.

10. In a sewing machine having a rotary actuating shaft, a loop-taker supporting bracket mounted for adjustment lengthwise of said shaft, a loop-taker journaled in said bracket for rotation about an axis substantially normal to said shaft, driving connections with said shaft for rotating said loop-taker a plurality of times for each rotation of said shaft, a thread-carrier journaled in and restrained against rotation with said loop-taker, and a thread-carrier engaging opener-finger for periodically oscillating said thread-carrier oppositely to the direction of rotation of the loop-taker, the improvement which consists in the provision of an actuator-member lengthwise disposed substantially parallel to said shaft, connections with said shaft for operating said actuator-member, and means for actuating said opener-finger from said actuator-member including an actuating element mounted upon said actuator-member for adjustment lengthwise thereof.

11. In a sewing machine having a rotary actuating shaft, a plurality of loop-taker supporting brackets mounted for adjustment relatively to each other lengthwise of said shaft, loop-takers journaled in said brackets for rotation about axes substantially normal to said shaft, driving connections with said shaft for rotating each of said loop-takers a plurality of times for each rotation of said shaft, thread-carriers journaled in and restrained against rotation with the respective loop-takers, opener-fingers pivotally supported upon the respective brackets for vibration about axes substantially parallel to the rotation-axes of said loop-takers, said opener-fingers being disposed to engage and to oscillate the respective thread-carriers oppositely to the directions of rotation of the loop-takers, the improvement which consists in the provision of an actuator-member lengthwise disposed substantially parallel to said shaft, an actuating eccentric carried by said shaft, a pitman connected

to operate said actuator-member from said eccentric, a plurality of actuating arms carried by said actuator-member for adjustment relatively to each other lengthwise of said actuator-member, and means for operating said opener-fingers from said actuating arms.

12. In a sewing machine having a rotary actuating shaft, a plurality of loop-taker supporting brackets mounted for adjustment relative to each other lengthwise of said shaft, loop-takers journaled in said brackets for rotation about axes substantially normal to said shaft, driving connections with said shaft for rotating each of said loop-takers a plurality of times for each rotation of said shaft, thread-carriers journaled in and restrained against rotation with the respective loop-takers, opener-fingers pivotally supported upon the respective brackets for vibration about axes substantially parallel to the rotation-axes of said loop-takers, said opener-fingers being disposed to engage and to oscillate the respective thread-carriers oppositely to the directions of rotation of the loop-takers, the improvement which consists in the provision of an actuator-bar lengthwise disposed substantially parallel to said shaft, means for endwise reciprocating said actuator-bar from said shaft, a plurality of tappet-arms carried by said actuator-bar for adjustment relative to each other lengthwise of the actuator-bar, and tappet-engaged arms supported for vibratory movements with the respective opener-fingers.

13. In a sewing machine having a rotary actuating shaft, a plurality of loop-taker supporting brackets mounted for adjustment relatively to each other lengthwise of said shaft, loop-takers journaled in said brackets for rotation about axes substantially normal to said shaft, driving connections with said shaft for rotating each of said loop-takers a plurality of times for each rotation of said shaft, thread-carriers journaled in and restrained against rotation with the respective loop-takers, opener-fingers pivotally supported upon the respective brackets for vibration about axes substantially parallel to the rotation-axes of said loop-takers, said opener-fingers being disposed to engage and to oscillate the respective thread-carriers oppositely to the directions of rotation of the loop-takers, the improvement which consists in the provision of a rock-shaft lengthwise disposed substantially parallel to said shaft, a rotary eccentric carried by said shaft, means for actuating said rock-shaft from said eccentric, a plurality of crank-arms carried by said rock-shaft for adjustment relatively to each other lengthwise of the rock-shaft, and separate operative connections for vibrating the respective opener-fingers from said crank-arms.

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