

Dec. 15, 1942.

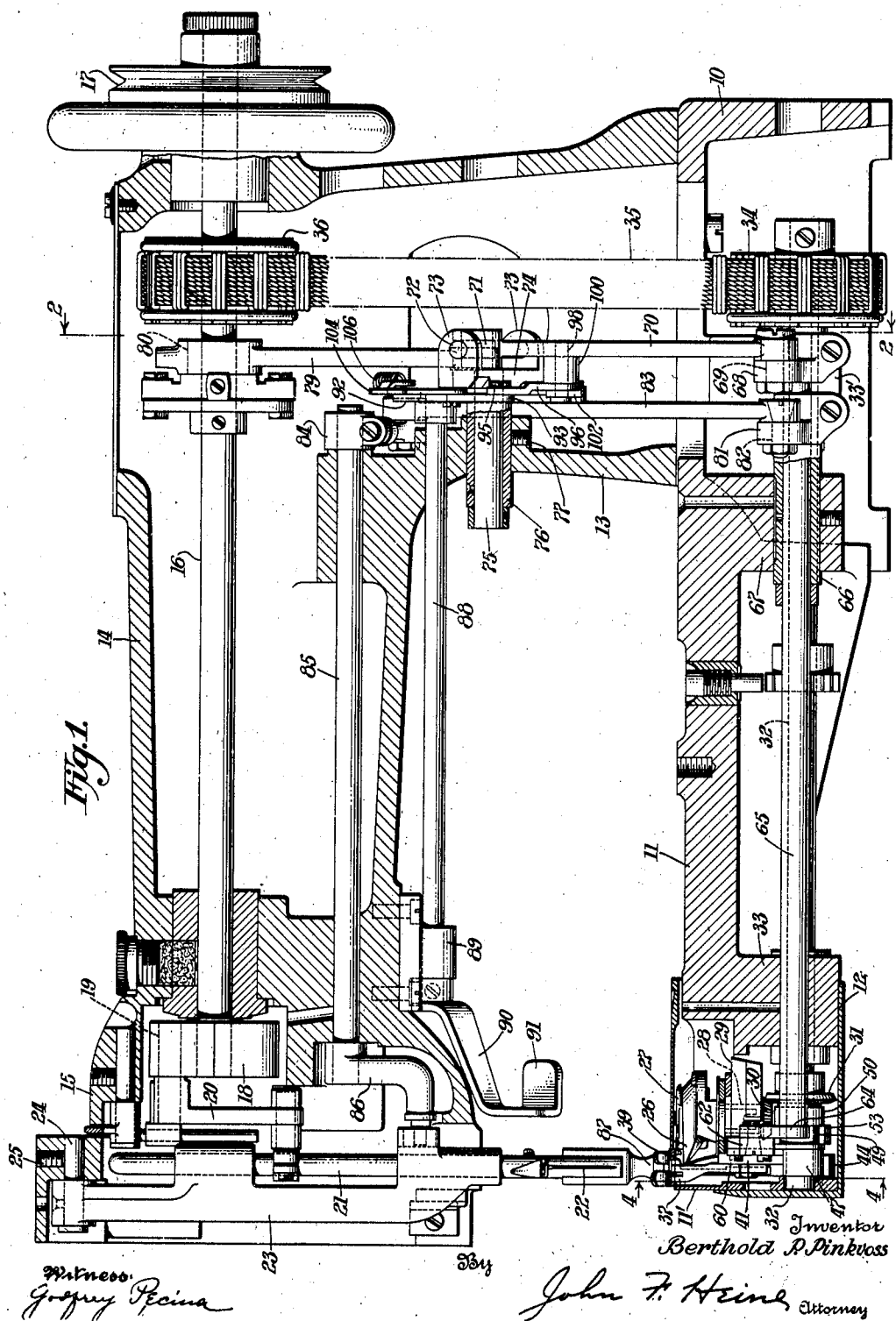
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2,305,556

FEEDING MECHANISMS FOR SEWING MACHINES

Filed Nov. 23, 1940

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

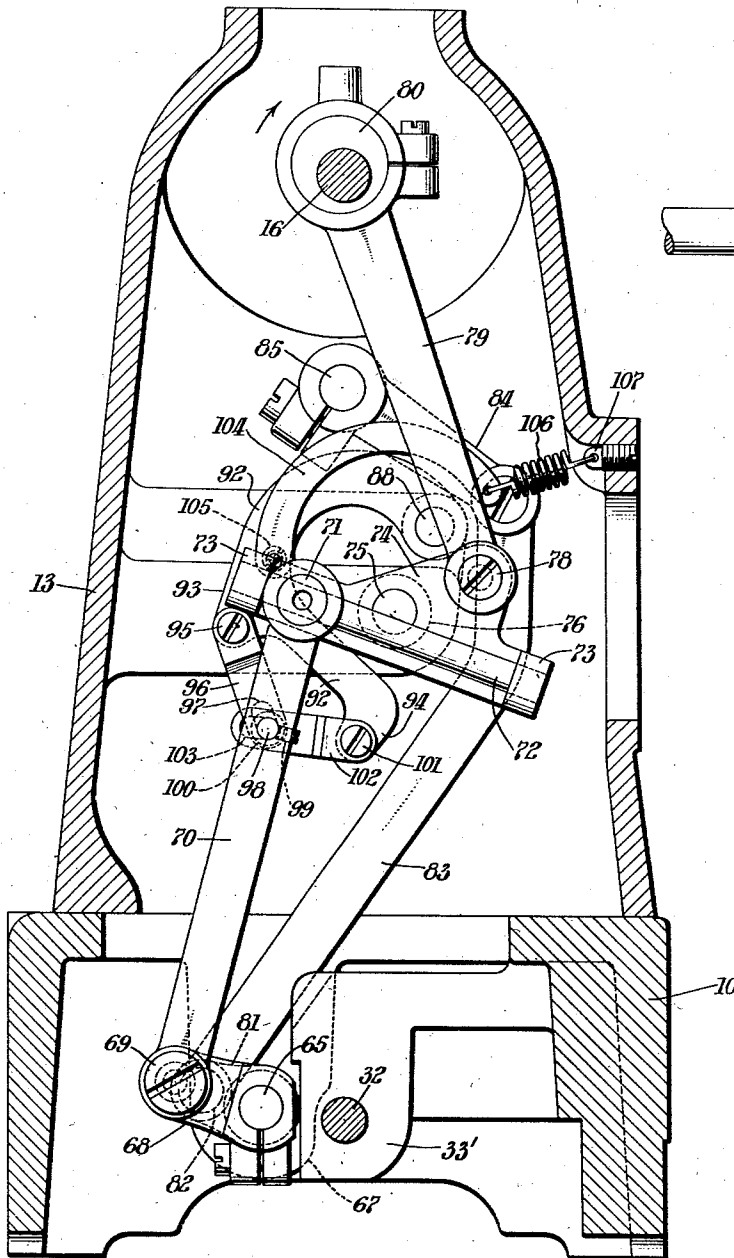


Fig. 2.

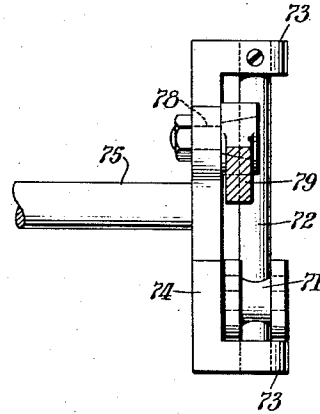


Fig. 8.

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4 Sheets-Sheet 3

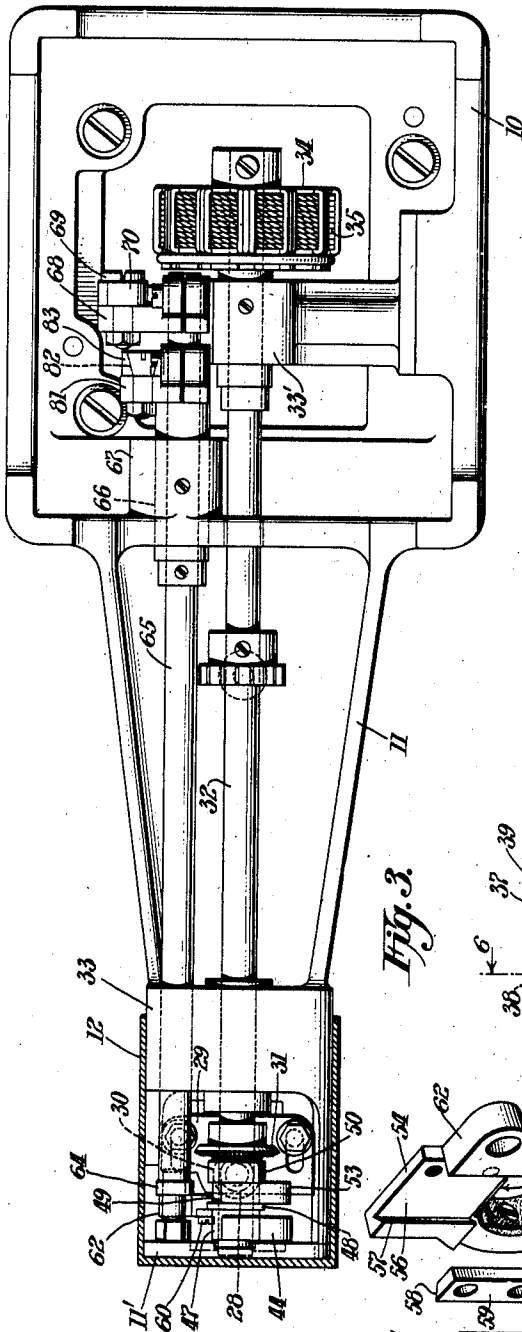


Fig. 3.

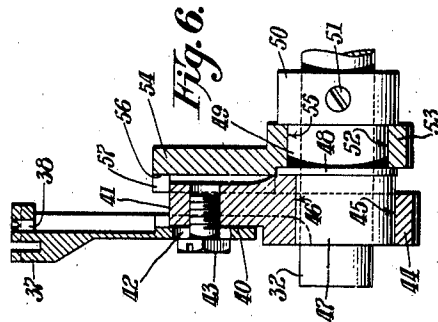


Fig. 6.

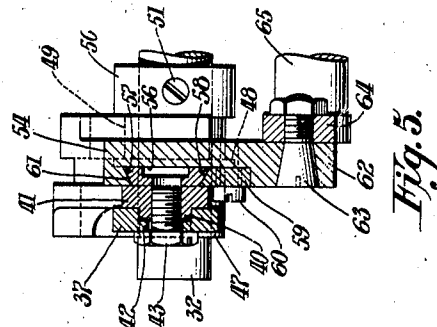


Fig. 5.

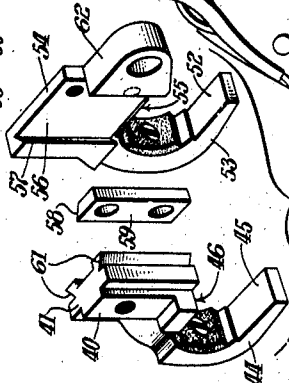


Fig. 7.

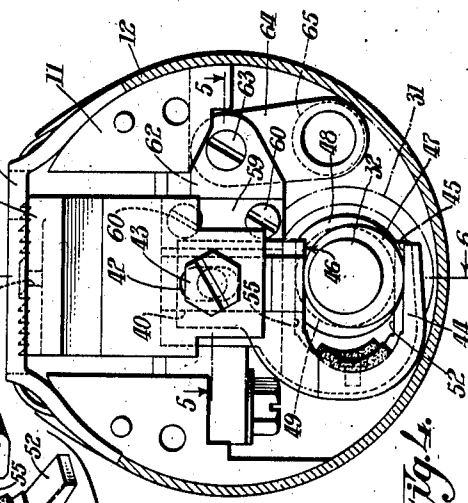


Fig. 4.

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4 Sheets-Sheet 4

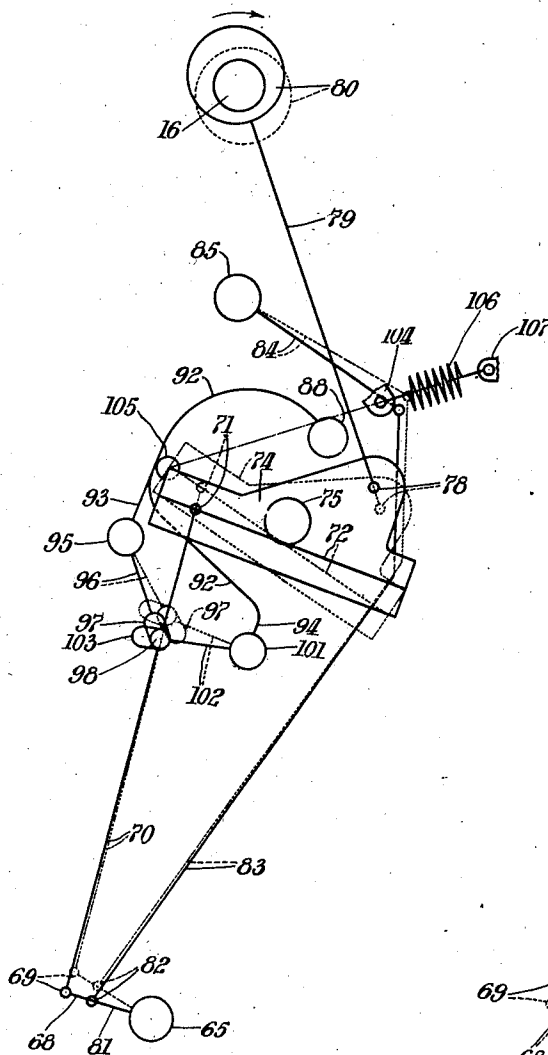


Fig. 9.

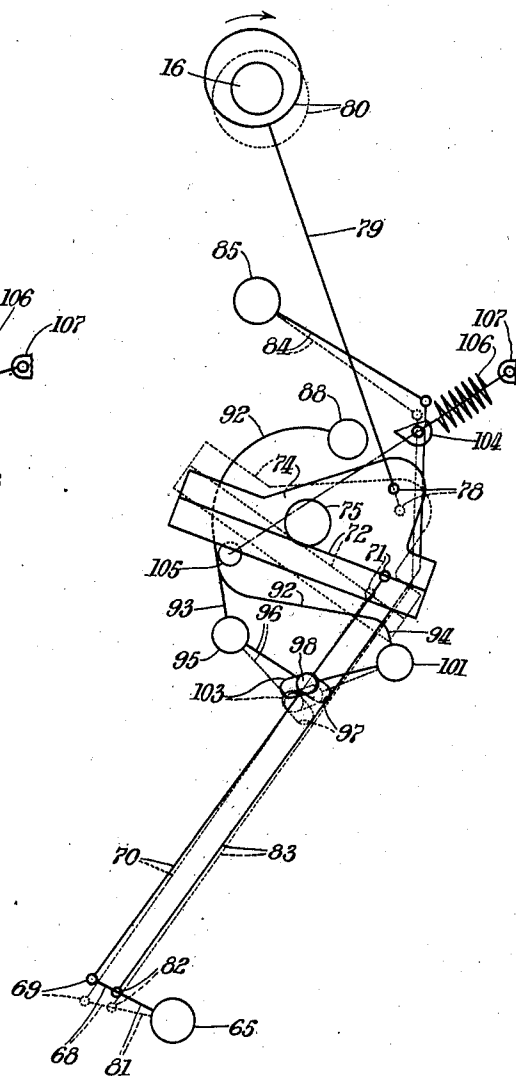


Fig. 10.

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FEEDING MECHANISM FOR SEWING MACHINES

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Application November 23, 1940, Serial No. 366,802

10 Claims. (Cl. 112—210)

This invention relates to feeding mechanisms for sewing machines and has for its primary object to provide improved means for controlling the effective action of a work-engaging feeding element, whereby the direction of feed may be reversed at will during the operation of the machine.

A further object of the invention is to provide a compound needle and drop-feed mechanism with conveniently operable means for reversing the direction of feed. Other and more specific objects of the invention will be apparent from the following description and claims.

The invention comprises the devices, combinations and arrangements of parts hereinafter described in connection with the accompanying drawings, which illustrate a sewing machine provided with a preferred embodiment of the improved feeding mechanism.

Fig. 1 is a longitudinal vertical section of a sewing machine containing the improved feeding mechanism. Fig. 2 is an enlarged vertical transverse section of the bracket-arm standard, substantially on the line 2—2 of Fig. 1. Fig. 3 is a bottom plan view of the machine. Fig. 4 is an enlarged transverse vertical section of the work-arm of the machine, the section being taken substantially on the line 4—4 of Fig. 1. Fig. 5 represents a horizontal section of the feed-dog carrier on substantially the line 5—5 of Fig. 4. Fig. 6 represents a vertical section of the feed-dog carrier substantially on the line 6—6 of Fig. 4. Fig. 7 represents a disassembled perspective view of the feed-dog carrier. Fig. 8 represents a detail view in top plan of the feed-reversing guide-rocker and slide-block, with the guide-rocker actuating pitman shown partly in section. Figs. 9 and 10 are diagrammatical views of the feed-reversing actuating mechanism in reverse and forward feed positions thereof, respectively.

As shown in the drawings, the sewing machine has a frame comprising a substantially rectangular base 10, from which horizontally extends an integral work-arm 11 provided at the free end thereof with an end-closure plate 11' and with a generally cylindrical end-cap 12. Mounted upon the base 10 is the hollow standard 13 of a tubular bracket-arm 14, which latter terminates at its free end in a head 15 overhanging the free end portion of the work-arm 11.

Rotatably journaled in the bracket-arm 14 is a horizontally disposed and rotary main actuating shaft 16, carrying at one end a belt-pulley 17. At its opposite end, the shaft 16 carries a crank-disk 18 provided with a crank-pin 19, connected by means of a link 20 to a vertically disposed needle-bar 21 intermediate the ends thereof. The needle-bar 21 carries at its lower end an eye-pointed needle 22 and is journaled

for vertical reciprocation in a swinging frame 23. The frame 23 is pivotally supported at its upper end by a fulcrum-pin 24 secured in the bracket-arm head 15 by a set-screw 25. The fulcrum-pin 24 is disposed so that pivotal-axis of the frame 23 is substantially parallel to the axis of rotation of the main-shaft 16, whereby the frame 23 is free to swing transversely of the length of the bracket-arm 14.

Complemental to the needle 22 in the formation of lock-stitches is a loop-taker 26 of the vertical-axis rotary hook type and in which is journaled the usual thread-carrier 27 about which the loop-taker 26 casts needle-thread loops in the formation of lock-stitches. The loop-taker 26 is carried by a vertical shaft 28 rotatably journaled in a bracket 29 supported at the free end of the work-arm 11, the lower end of said shaft carrying a bevel-pinion 30. In driving engagement with the pinion 30 is a bevel-gear 31 carried by a horizontally disposed actuating shaft 32 journaled in a bearing-lug 33 of the work-arm 11 and in a lug 33' in the base 10, the ratio of the pinion 30 and gear 31 being such that the loop-taker 26 rotates twice for each rotation of the actuating shaft 32. The shaft 32 is disposed in parallelism with the main shaft 16 and has a pulley 34 connected by a belt 35 with a pulley 36 carried by the main shaft 16, the pulleys 34 and 36 being of the same size whereby the shafts 16 and 32 rotate one-to-one.

The work is advanced by a reversible compound feeding mechanism including the needle 22 and a drop-feed feed-dog 37 provided with a needle aperture 38. The feed-dog 37 is disposed at the free end portion of the work-arm 11 and operates through suitable feed-slots provided in a throat-plate 39 at the upper side of the work-arm 11. The shank of the feed-dog 37 is recessed in a side face thereof to receive a lengthwise vertically disposed supporting-rib 40 provided upon one side face of a feed-lift carrier-block 41. The shank of the feed-dog 37 has a vertically elongated slot 42 through which passes a feed-dog securing screw 43 threaded into the carrier 41, the described arrangement providing for vertical adjustment of the feed-dog. The feed-dog carrier-block 41 has a forwardly open fork 44 at the lower end thereof, said fork including a horizontally flattened lower face 46 of the carrier-block and an opposed flattened face 45 of a curved arm depending from said carrier-block. Engaged by the opposed faces of the carrier-block fork is a feed-lift eccentric 47 carried by the actuating shaft 32 at the free end of the work-arm 11.

The feed-lift eccentric 47 has a flange 48 at one end thereof and separating the circumferential face of the eccentric 47 from a guide-sleeve 49 concentric with the shaft 32. The sleeve 49

is preferably integral with the eccentric-flange 43 and also with a collar 50 secured upon the shaft 32 by a screw 51. The guide-sleeve 49 is slidably engaged at the lower side thereof by the horizontally flattened upper face 52 of the forwardly extending portion of an arm 53 depending from the rearward side of a vertically disposed feed-plate 54. The feed-plate 54 has a horizontally flattened lower face 55 opposed to the face 52 of the arm 53 and engaging the upper side of the guide-sleeve 49; it being understood that the described arrangement provides a forwardly open fork upon the feed-plate 54, which fork is slidably mounted upon the guide-sleeve 49.

In the side face thereof proximate to the feed-lift carrier block 41, the feed-advance plate 54 has a recess 56 terminating at one side thereof in a vertical undercut guide-edge 57. Opposed to the guide-edge 57 is beveled edge 58 of a gib 59 secured by screws 60 to the feed-plate 54, thereby providing a vertical guideway upon the feed-plate. Confined to vertical sliding movement in said guideway are horizontally spaced beveled ribs 61 formed upon the carrier-block 41 at the side thereof opposite to the rib 40. The feed-plate 54 has a forwardly extending and apertured ear 62 pivotally connected by the screw 63 to a crank-arm 64 extending upwardly from one end of a feed-advance rock-shaft 65.

From the foregoing description, it will be understood that upon actuation of the rock-shaft 65, the feed-advance plate 54 will be reciprocated substantially horizontally upon the guide-sleeve 49, which latter is free to rotate with the shaft 32 in the fork of said plate 54 and confines the guide-plate against bodily vertical movement. At the same time, the feed-lift eccentric 47 acts to raise and lower the carrier-block 41 upon and in timed relation to the movements of the feed-plate 54 to complete the four-motion movements imparted to said feed-dog 37. As the carrier-block 41 is confined against lateral movement relatively to the feed-plate 54, the fork 44 of said carrier-block slides rearwardly and forwardly upon the eccentric 47 with the feed-plate 54. The flange 48 of the feed-lift eccentric serves to separate and guide the carrier-block 41 and feed-plate 54, the latter being confined by said flange 48 and the collar 50 against movement lengthwise of the shaft 32.

The feed-advance rock-shaft 65 is disposed in front of and substantially parallel to the actuating shaft 32, said rock-shaft extending lengthwise of and having one end journaled in the bearing-lug 33 of the work-arm. The other end of the rock-shaft 65 extends into the frame-base 10, and another bearing for said rock-shaft is provided by a bushing 66 suitably secured in a lug 67 disposed at the juncture of the frame-base 10 and work-arm 11.

Clamped upon the end of the rock-shaft 65 within the frame-base 10 is a crank-arm 68 connected by a pivot-bolt 69 to the lower end of a radius-bar 70 extending upwardly from the crank-arm 68 into the bracket-arm standard 13. The forked upper end of the radius-bar 70 is pivotally provided with a slide-member 71, said slide-member being slidably disposed upon a guideway which in the present case is in the form of a substantially straight guide-bar 72. The guide-bar 72 is secured at its opposite ends in parallel lugs 73 extending from one side of a motion-reversing rocker 74; said lugs functioning as stops limiting sliding movement in oppo-

site directions of the slide-member 71 upon the guide-bar 72. Extending from the opposite side of the rocker 74 and substantially medianly of the length of the guide-bar 72 is a fulcrum-shaft 75 for said rocker. The fulcrum-shaft 75 is disposed substantially parallel to the main shaft 16 and is journaled in a bearing-bushing 76 secured by a screw 77 in a horizontal aperture provided in the bracket-arm standard 13.

The motion-reversing rocker 74 is connected, at one side of the fulcrum-axis thereof and by a pivot-bolt 78, to the lower end of a pitman 79, said pitman having at its upper end a strap embracing an eccentric 80 carried by the main shaft 16. The eccentric 80 is preferably adjustable as to eccentricity, and the adjustment thereof may be effected in any usual or suitable manner.

Clamped upon the feed-advance rock-shaft 65, adjacent the bearing-bushing 66, is another crank-arm 81 connected by a pivot-bolt 82 to the lower end of a link 83 extending upwardly into the bracket-arm standard 13. The upper end of the link 83 is pivotally connected to a crank-arm 84 carried by one end of a needle-feed rock-shaft 85. The needle-feed rock-shaft 85 is journaled in the bracket-arm 14 below and in parallelism with the main-shaft 16, and the other end of said rockshaft 85 carries a bent crank-arm 86 operatively connected to the needle-bar frame 23 for imparting swinging movements to said frame. The described connections between the needle-feed rock-shaft 85 and the feed-advance rock-shaft 65 are such as to impart unison work-advancing and return movements to the needle 22 and feed-dog 37; the needle-reciprocating and the needle-bar frame swinging movements being correspondingly timed so that the needle 22 is disposed in the feed-dog aperture 38 during the work-advancing movements of said needle and feed-dog. The feed-dog 37 is opposed by the usual spring-depressed presser-foot 87 which is suitably slotted to permit of work-feeding movements of the needle 22.

Extending lengthwise of and disposed slightly below the bracket-arm 14, in parallelism with the main shaft 16, is a feed-reversing shaft 88; said shaft 88 having one end thereof journaled in a bracket 89 attached to the under side of the bracket-arm 14, and having its other end journaled in a suitable bearing-aperture provided in the arm-standard 13. Carried by the shaft 88, adjacent the bracket-arm head 15, is a depending hand-lever 90 having at its free end a laterally offset finger-piece 91 disposed for convenient manual manipulation to rock the shaft 88.

The other end of the rock-shaft 88, within the arm-standard 13, has a forwardly extending and downwardly bent arm 92, provided with two ears 93 and 94 spaced lengthwise of the arm 92 and disposed at opposite sides of the radius-bar 70 which connects the feed-reversing rocker 74 to the feed rock-shaft 65. Pivotally connected to the ear 93 of the arm 92, by a screw 95, is one end of a link-member 96. The opposite end of the link-member 96 is provided with a slot 97 elongated lengthwise of the link-member; and extending through the link-slot 97, in a direction normal to the length of the link-member 96, is a connector-pin 98 secured by a set-screw 99 in a horizontally apertured boss 100 extending from one side of the radius-bar 70. Similarly, the other ear 94 of the arm 92 is pivotally connected by a screw 101 to one end of a link-member 102, opposed to the link-member 96. The link-member 102 has its other end disposed adjacent the

slotted end of the link-member 95 and provided with a longitudinal slot 103 through which the connector-pin 98 also extends. The pivot-screws 95 and 101 are preferably radially equi-distant from the rock-shaft 88, and the link-members 96 and 102 are so disposed with respect to each other and to the radius-bar 70 that, in either of the forward and reverse feed positions of the slide-member 71 upon the guide-bar 72, the connector-pin 98 is positioned in the adjacent link-member slots 97, 103 to permit of limited lateral movement of the radius-bar 70 without transmitting that movement to the hand-controlled rock-shaft 88 through the link-members 96, 102. In other words, each of the link-members 96, 102 has a lost motion connection with the radius-bar 70.

It will be observed from Fig. 9 that, at one of the limits of movement of the motion-reversing rocker 74, the connector-pin 98 is disposed in the end portion of the link-member slot 97 remote from the pivotal connection 95 of said link-member 96 with the rock-shaft arm 92, and that said connector-pin 98 is disposed in the end portion of the link-member slot 103 proximate to the pivotal connection 101 of the link-member 102 with the rock-shaft arm 92.

Upon rearward movement of the hand-lever 90 to shift the slide-member 71 from reverse to forward feed positions thereof, i. e., to shift the slide-member 71 to the right in Fig. 9 of the drawings, the resulting movement of the rock-shaft arm 92 initially has no effect to shift the radius-bar 70 laterally, as the motion of said arm 92 is initially taken up by the link-member slots 97, 103. As soon as either one or both of the links 96 and 102 have been shifted sufficiently to take up the lost motion afforded by the slots 97, 103 thereof, the radius-bar 70 will be shifted to the right until the slide-member 71 reaches its opposite limit of movement, illustrated in Fig. 10 of the drawings. It will be observed that the position of the connector-pin 98 in the link-member slots 97, 103 is now the reverse of that shown in Fig. 9. Consequently, the radius-bar 70 is again free to vibrate laterally, responsively to rocking movements of the motion-reversing rocker 74, without transmitting its movement to the hand-controlled rock-shaft 88.

In order yieldingly and automatically to maintain the slide-member 71 in either its forward or reverse feed positions upon the guide-bar 72, a bent link 104 has one end thereof pivotally connected by a screw 105 to the rock-shaft arm 92. The other end of the link 104 is connected by a coil-spring 106 to an anchor-post 107 comprising a screw adjustably threaded into the bracket-arm standard 13. In the reverse and forward feed positions of the slide-member 71 upon the guide-bar 72, illustrated diagrammatically in Figs. 9 and 10, respectively, a straight line representing the line of force of the spring 106 and connecting the pivot-screw 105 of the link 104 and the anchor-post 107 is disposed at opposite sides, respectively, of the rocking axis of the arm 92. Consequently, the pivotal arm 92, the link 104 and the spring 105 together function as toggle-switch means urging the slide-member 71 yieldingly toward the stop-lugs 73 when the slide-member is shifted across the fulcrum-axis 75 of the rocker 74.

It will be observed from Fig. 9 of the drawings that, in the reverse feed position of the slide-member 71 upon the motion-reversing rocker 74, the spring 106 acts upon the rock-shaft arm 92

in a direction to urge the link 102 endwise to engage the connector-pin 98 of the radius-bar 70 from the right hand side of said radius-bar 70. In other words, the pivotal axis 75 of the rocker 74 and the pivotal axis 101 of the link 102 are disposed at the same side of the radius-bar 70. The effective length of the link 102 is substantially parallel to and of substantially the same length as the effective arm of the rocker 74 comprising that portion of said rocker extending from the fulcrum-axis 75 to the slide-member 71. The parallel motion effect of the described arm of the rocker and the link 102 reduces to a minimum and renders negligible from a practical standpoint any tendency to transmit the slight lateral motion of the radius-bar 70 to the hand-lever 90.

A similar condition prevails when the slide-member 71 is shifted across its fulcrum 75 to the forward feeding position thereof illustrated in Fig. 10 of the drawings, inasmuch as the link 96 which under the action of the spring 106 now assumes control of the radius-bar 70 is disposed at the opposite side of said radius-bar 70 from the link 102 and is substantially parallel to and of a length substantially equal to the length of the effective arm of the rocker 74. The provision of the oppositely directed links for shifting the slide-member 71 thus creates a condition peculiarly favorable to manual control of the feed-reversing mechanism.

It will be understood from the foregoing description that changes in the amplitude of the compound work-advancing movements of the feed-dog 37 and needle 22, in either forward or in reverse directions, are effected by adjustment of the feed-actuating eccentric 29. The direction of feed may be readily reversed by manipulation of the conveniently located hand-lever 90, which lever is unaffected by the feed-actuating mechanism and is therefore normally stationary.

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

1. In a feeding mechanism for sewing machines having a work-engaging element, means for imparting operative work-advancing movements to said work-engaging element including a feed-reversing rocker provided with a guideway extending to opposite sides of the fulcrum-axis of said rocker, a slide-member shiftable disposed upon said guideway, and a manually operable rock-arm operatively connected to shift said slide-member upon said guideway to and from forward and reverse feed positions at opposite sides of the fulcrum-axis of said rocker, the improvement which consists in the provision of a spring connected to said rock-arm and having its lines of force disposed at opposite sides of the fulcrum-axis of said rock-arm in forward and reverse feed positions of said slide-member upon said feed-reversing rocker.

2. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having an arm and a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftable disposed upon said rocker for movement into an effective position upon said arm at one side of said fulcrum-axis of the rocker, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a manually operable arm, and a link-member connecting said arm and said

radius-bar and substantially equal in length to the effective length of the arm of said rocker, said link-member being disposed substantially parallel to and at the same side of said radius-bar as said arm of said rocker.

3. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of means for shifting said slide-member upon said rocker and including link-members operatively connected to and disposed at opposite sides of said radius-bar.

4. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a rock-arm, and link-members pivotally connected to said rock-arm at opposite sides of said radius-bar, said link-members being operatively connected to said radius-bar to effect shifting of said slide-member in opposite directions upon said rocker by movement of said rock-arm.

5. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a rock-arm, link-members pivotally connected to said rock-arm at opposite sides of said radius-bar, the pivotal connections of said link-members with said rock-arm being radially equidistant with respect to the fulcrum-axis of said rock-arm, and operative connections between said link-members and said radius-bar for shifting said slide-member in opposite directions upon said rocker by movement of said rock-arm.

6. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a rock-arm, and lost-motion connections between said radius-bar and said rock-arm extending in opposite directions from said radius-bar.

7. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a rock-arm, and link-members pivotally connected to said rock-arm at opposite sides of said radius-bar, said link-members each having a lost-motion connection with said radius-bar.

8. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a rock-arm, and links operatively connecting said rock-arm to said radius-bar, the respective links having one of the ends thereof pivotally connected to said rock-arm at opposite sides of said radius-bar and having the opposite ends thereof pivotally connected to said radius-bar, one of the pivotal connections of each of said links comprising a lost-motion connection.

9. In a feeding mechanism for sewing machines having a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, and connections for transmitting the endwise movements of said radius-bar to said work-engaging element, the improvement which consists in the provision of a rock-arm, link-members pivotally connected to said rock-arm at opposite sides of said radius-bar, each of said link-members having a slot elongated lengthwise of the link-member, and a connector-pin extending from said radius-bar through the slots of said links.

10. A feeding mechanism for sewing machines comprising, a work-engaging element, a rocker having a fixed fulcrum-axis, means for actuating said rocker, a slide-member shiftably disposed upon said rocker for movement into forward and reverse feeding positions at opposite sides of said fulcrum-axis, a radius-bar operatively connected to said slide-member to derive endwise movement from said rocker, operative connections for transmitting the endwise movements of said radius-bar to said work-engaging element, a rock-shaft provided with a hand-lever, a rock-arm carried by said rock-shaft, link-members operatively connected to said radius-bar and pivotally connected to said rock-arm at opposite sides of said radius-bar, and yielding means urging said slide-member toward said forward and reverse feeding positions thereof upon said rocker.

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