March 23, 1926. 1,577,640

C. M. HORTON

MACHINE FOR SEWING BUFFING PADS

Filed Sept. 16, 1922 5 Sheets-Sheet 1

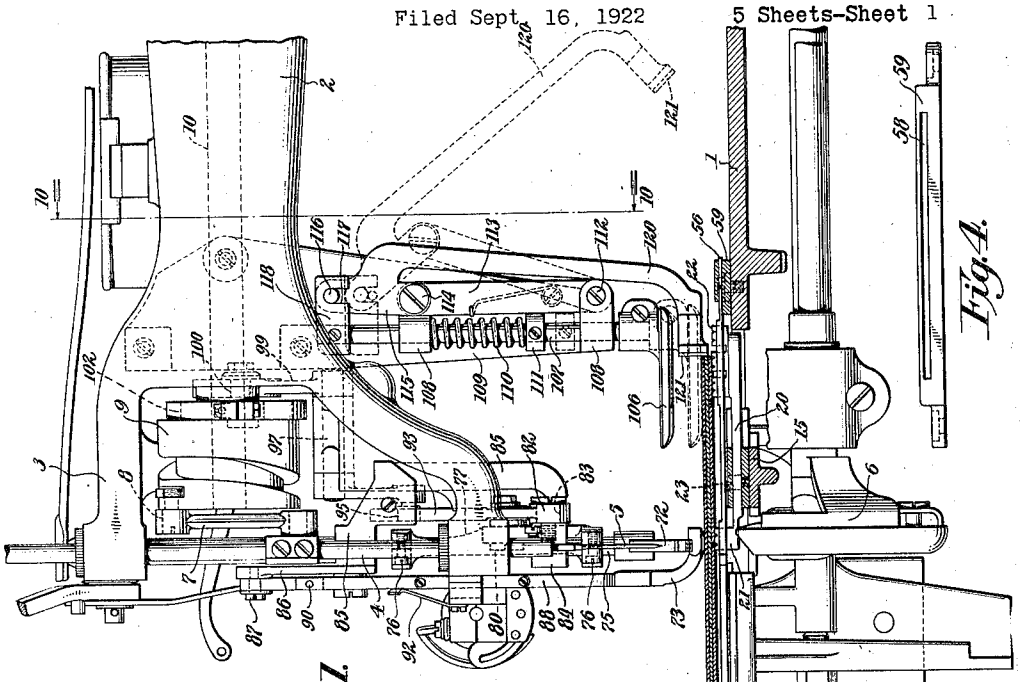


Fig. 1.

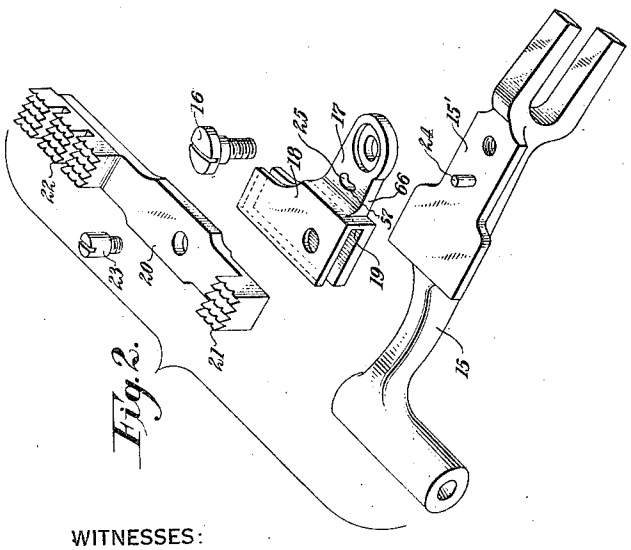


Fig. 2.

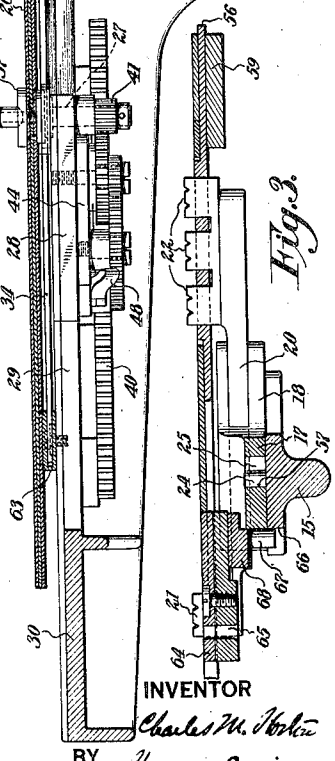


Fig. 3.

Fig. 4.

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March 23, 1926. 1,577,640

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MACHINE FOR SEWING BUFFING PADS

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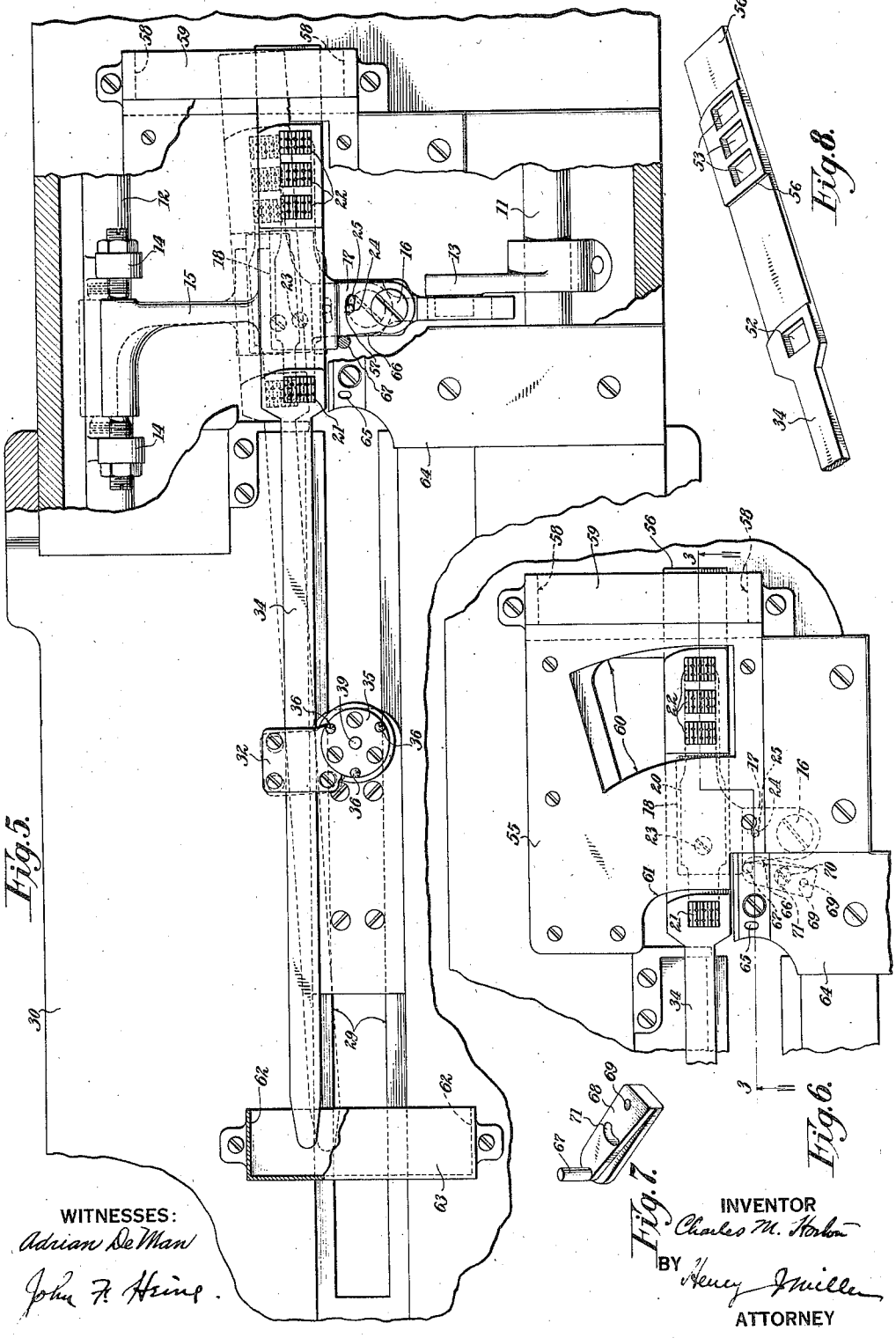


Fig. 5.

Fig. 8.

Fig. 6.

Fig. 7.

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MACHINE FOR SEWING BUFFING PADS

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Fig. 9.

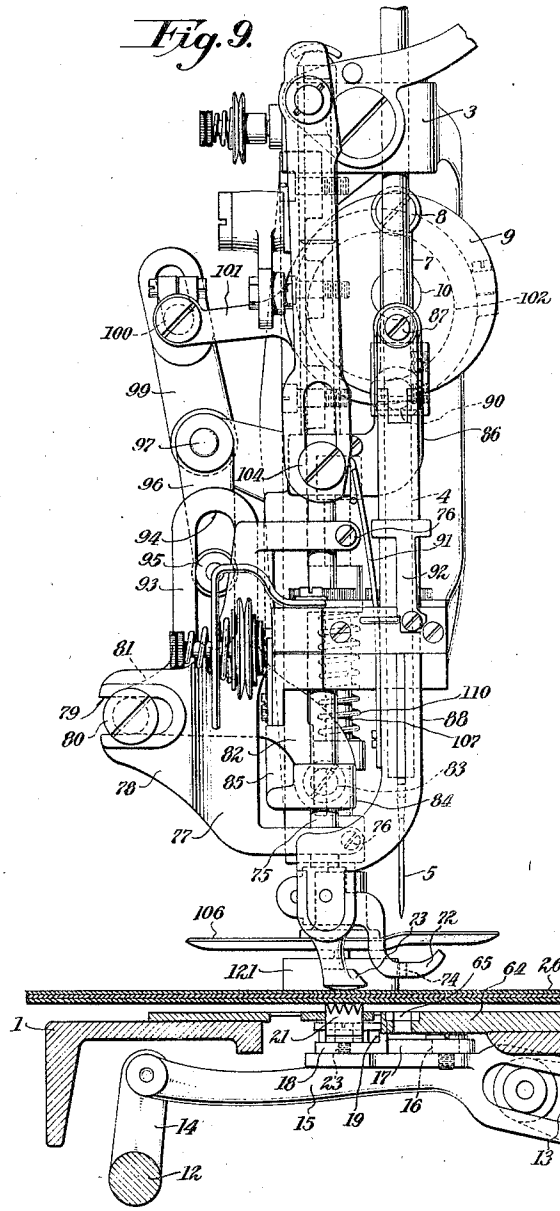
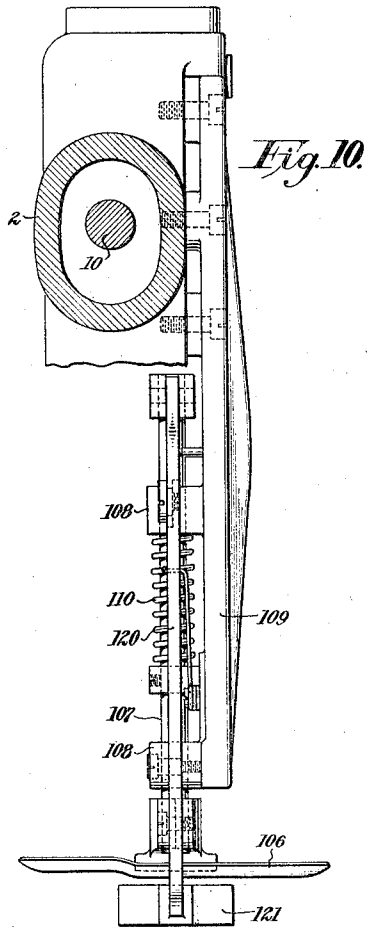


Fig. 10.



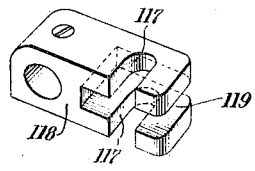


Fig. 11.

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MACHINE FOR SEWING BUFFING PADS

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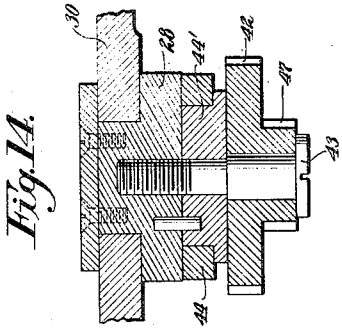


Fig. 14.

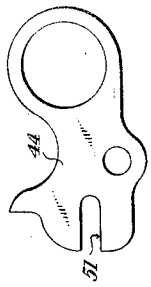


Fig. 16.

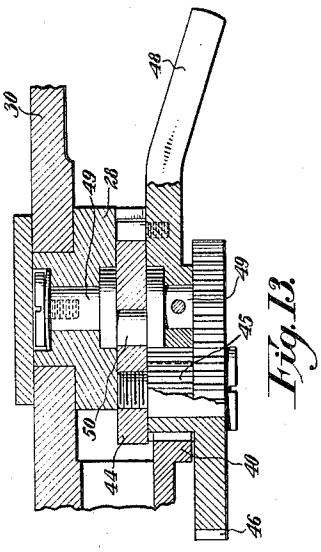


Fig. 13.

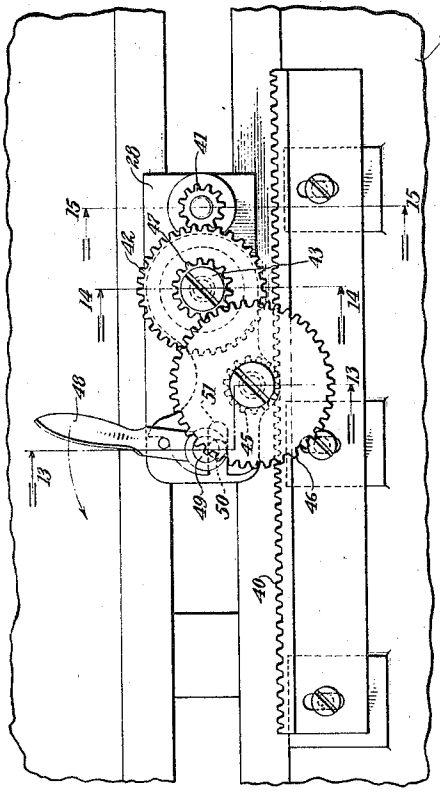


Fig. 12.

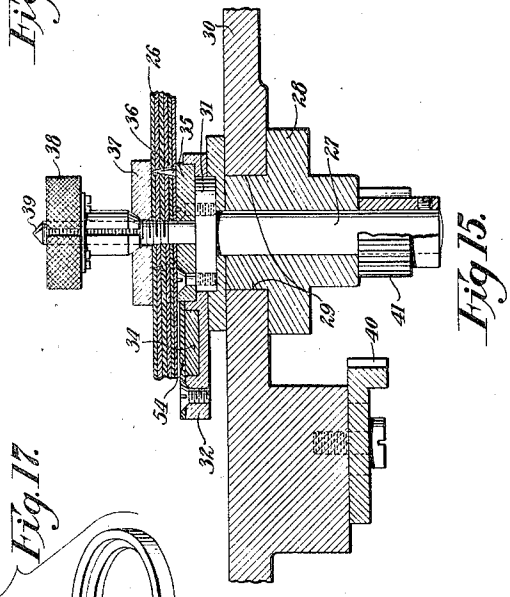


Fig. 15.

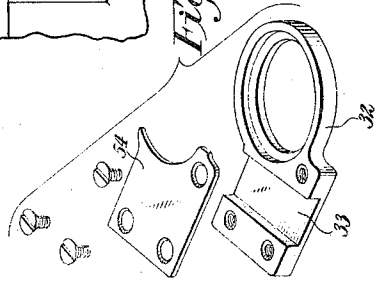


Fig. 17.

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March 23, 1926. 1,577,640

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MACHINE FOR SEWING BUFFING PADS

Filed Sept. 16, 1922 5 Sheets-Sheet 5

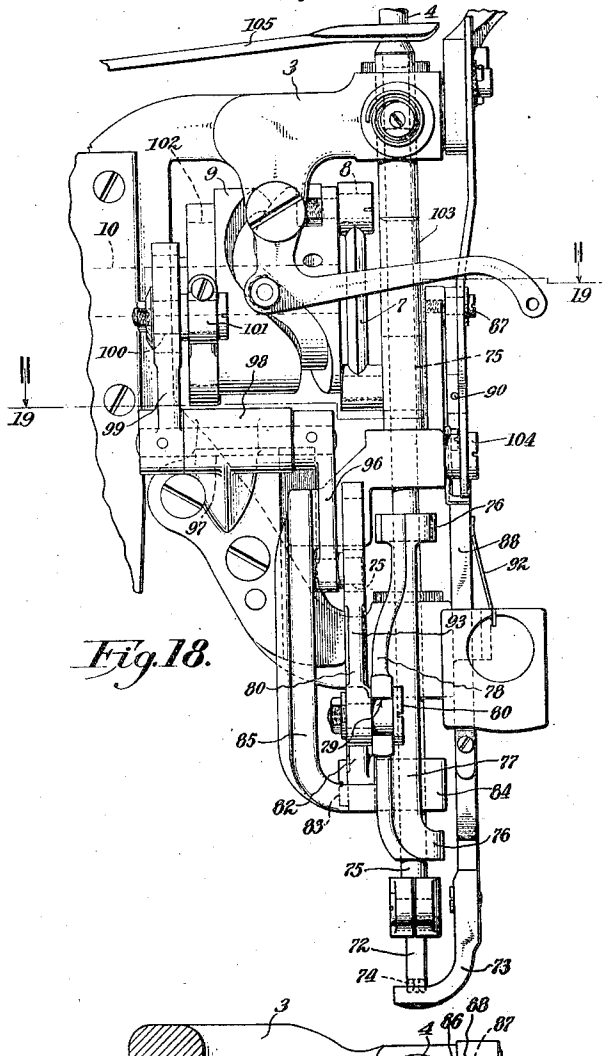


Fig. 18.

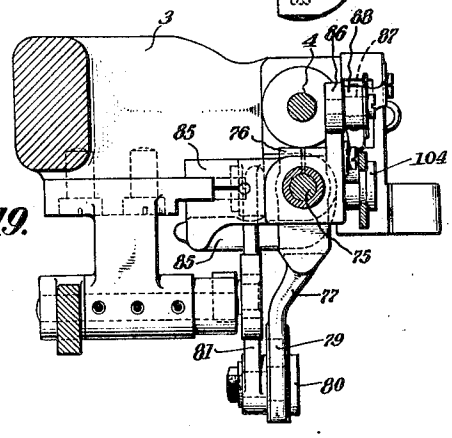


Fig. 19.

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UNITED STATES PATENT OFFICE.

CHARLES M. HORTON, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER MANUFACTURING COMPANY, OF ELIZABETH, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MACHINE FOR SEWING BUFFING PADS.

Application filed September 16, 1922. Serial No. 588,553.

To all whom it may concern:

Be it known that I, CHARLES M. HORTON, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Machines for Sewing Buffing Pads, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates generally to sewing machines and more particularly to sewing machines of the type adapted for spirally stitching circular buffing pads. Sewing machines of this type commonly comprise a reciprocating needle, a four-motion feed-dog, a presser-foot and a work-holder having a pivot about which the pad may turn, as such pivot is slowly shifted toward the needle. The stitching is started at the periphery of the pad and progresses spirally toward the center of the pad. With prior machines of this character no particular difficulty is experienced in sewing the outer zone of the pad, where a given length of sewing deviates least from a straight line, but as the inner zones are reached it becomes more and more difficult for the feed-dog to shift the work. This is partially due to the decreasing distance of the feed-dog from the center of the pad which necessitates the application of an increased force to overcome the inertia of the pad.

Further, in prior machines of the type under consideration, the feed-dog can not turn with the work about the pivot of the work-support as a center. There is, consequently, a relative slippage of a twisting character between the pad and the feed-dog, which becomes more and more pronounced as the stitching nears the center of the pad and deviates more and more sharply from a straight line. These constructive features of prior machines cause the feed-dog to dig into and damage the under surface of the pad and result in uneven sewing.

The present invention has for an object to provide a buffing pad sewing machine with auxiliary feeding mechanism which will automatically come into action and assist the primary feed as the stitching progresses toward the center of the pad.

Another object of the invention is to so mount and operate the feed-dog or dogs that it or they will turn with the work without twisting relative to the work during the feeding stroke.

A more general object of the invention is to provide a work-controlled auxiliary feed for sewing machines.

Further objects of the invention will appear from the following description and claims.

To the attainment of the ends in view, the invention is, by way of illustration, embodied in a buffing pad sewing machine having a pivotal work-support with automatically operated means for moving said support toward the sewing point to accomplish a spiral seam. The usual feed-bar of the machine has been utilized by mounting thereon spaced primary and auxiliary feeding sections in such a manner that they are free to move angularly with the buffing pad about the pivot of the work-support as a center. To insure that the feeding sections will not have differential angular speeds relative to the center of the work-support, but will have coincident angular speeds, an equalizer connection between such sections and the work-supporting center is provided. This connection is preferably in the form of a radius-bar having a sliding connection with a guide pivoted concentrically with the work-supporting center.

The primary feed is preferably disposed closely adjacent the needle so as to operate alone on the buffing pad during the first part of the sewing operation or while the outer zone of the pad is being stitched. The auxiliary feed is preferably disposed at the side of the primary feed remote from the work-support center and includes a work-controlled connection which automatically renders the auxiliary feed effective when the sewing has progressed a predetermined distance toward the center of the pad. The auxiliary feed operates on the outer zone of the pad where the applied force necessary to

overcome the inertia of the pad is least. The auxiliary feed therefore assists the primary feed which is operating relatively close to the center of the pad and, hence, at a disadvantage.

Any sewing machine feed embodying the usual cooperative feeding and presser elements may be rendered effective or ineffective by shifting either of such elements into or out of cooperative relation with the other element. In the present instance it is preferred to control the auxiliary feed by controlling the position of the presser-element of such feed. During the sewing of the outer zone of the pad the auxiliary feed is maintained in an ineffective condition by mechanism operating to hold its presser element in an elevated position. This mechanism preferably includes a work-controlled trip which automatically initiates the lowering of the auxiliary presser-element into cooperative relation with its feeding element at a predetermined time. This work-controlled trip is preferably in the form of a toggle device one link of which is connected to a feeler-arm disposed in the path of the work and hence in position to be displaced by the work and "break" the toggle when the stitching has progressed to the extent that the assistance of an auxiliary feed becomes desirable.

It is to be understood, however, that the specific character of the auxiliary feed or the automatic means for controlling its action is immaterial to the invention in its broader aspects.

In the accompanying drawings, Fig. 1 is a fragmentary side elevation, partly in section, of a buffing pad sewing machine embodying the invention. Fig. 2 is a disassembled perspective view of the feed-bar and feeding sections of the machine. Fig. 3 is an enlarged section of the parts shown adjacent the sewing point in Fig. 1. Fig. 4 is a detail elevation showing a guide-element for the feed-controlling equalizer-bar of the machine. Fig. 5 is a plan view of the sewing machine bed, parts of which are broken away to show the feeding mechanism. Fig. 6 is a view similar to Fig. 5 but with certain work-supporting parts in assembled position. Fig. 7 is a perspective view of a stop-element shown in dotted lines in Fig. 6. Fig. 8 is a perspective view of the outer end of the equalizer-bar, shown in Fig. 5. Fig. 9 is a transverse vertical section through the sewing machine bed, with the sewing machine presser and needle in elevation. Fig. 10 is a vertical section through the sewing machine bracket-arm on the line 10, 10 of Fig. 1. Fig. 11 is a perspective view of a connection-block at the top of the auxiliary presser-bar. Fig. 12 is a bottom plan view of the work-holder shifting mechanism. Figs. 13, 14 and 15 are respectively sections on the lines 13—13, 14—14 and 15—15, Fig. 12. Fig. 16 is a detail plan view of the gear supporting shift plate shown in Fig 12. Fig. 17 is a disassembled perspective view of the guiding connection between the work-holder and feed-equalizer bar. Fig. 18 is a rear elevation of the alternating needle- and feed-presser mechanism shown in Fig. 9, and Fig. 19 is a horizontal section on the line 19—19, Fig. 18.

For the purposes of the present disclosure, the invention will be described as embodied in a sewing machine of the well known Singer class 7 type which comprises a bed 1 and bracket-arm 2 terminating in the head 3 which supports the reciprocating needle-bar 4 carrying the eye-pointed needle 5. The needle 5 co-operates with the usual shuttle mechanism 6 below the bed 1 and is operated by means of the link connection 7 between the needle-bar 4 and the crank-pin 8 on the take-up barrel-cam 9 carried by the needle-bar operating shaft 10.

Below the bed 1 are mounted the usual feed-lifting and feed-advancing rock-shafts 11 and 12 having the crank-arms 13, 14 connected to the feed-bar 15. These connections and the means for operating the rock-shafts 11 and 12 are old and well known in the art, being disclosed, for example, in the patent to Miller et al., No. 229,629, of July 6, 1880. It may be mentioned as characteristic of feeding mechanism of this type, that the adjustable feed-regulating means varies the length of the feeding stroke of the feed-bar without varying the position at which the feed-bar begins its feeding stroke.

In the particular embodiment of the invention illustrated, the feed-bar 15 has pivotally mounted on its upper surface 15′, Fig. 2, by means of a screw 16, a feed-dog carrier 17 the head 18 of which is slotted at 19 to receive the bar 20 rigidly connected to spaced primary and auxiliary feeding sections 21 and 22, respectively. The bar 20 is pivoted to the feed-dog carrier 17 by means of the pivot-screw 23. A pin 24 carried by the feed-bar 15 enters a curved slot 25 in the carrier 17 concentric with the pivot-screw 16. The bar 20 and feed-dogs 22, are thus free to turn about the pivot 23 relative to the carrier 17, and the feed-dogs and their carrier are free to turn about pivot-screw 16 as a center, thus permitting the feed-dogs to partake of movements both of translation and rotation during the feed- and-return movements of the feed-bar. The feed-dogs may thus follow the curvilinear movements of the engaged area of the buffing pad, while the feed-bar 15 partakes only of a rectilinear feeding movement.

The work or buffing pad 26 is confined to turn about a shifting center represented by

the center of the vertical shaft 27, Fig. 15, journaled in the slide-block 28 which is fitted to a slide-way 29 in an extension 30 of the machine bed. The shaft 27 has an enlarged cylindrical head 31 to which is fitted the apertured guide-plate 32, Fig. 17, formed with a guideway 33 for an equalizer or radius-bar 34 to be described. The guide-plate 32 is held in working position by means of the circular work-supporting plate 35 which is slightly larger than the head 31 of the shaft 27 and is partially let into the guide-plate 32. The work-supporting plate 35 carries impaling pins 36 and the work is clamped upon the plate 35 by means of an upper plate 37 and thumbscrew 38 which embraces the reduced and threaded upward extension 39 of the shaft 27. The shift of the center of the work-support toward the needle 5, during the sewing, is secured by gearing the shaft 27 to a stationary rack 40 mounted beneath the bed-extension 30. To this end the shaft 27 has fixed to its lower end a pinion 41 which meshes with the gear 42 mounted on the screw-pin 43 threaded into the slide-block 28 and also serving to secure to the latter a pivotal retainer 44′ for the shift plate 44 pivotally carrying the connected pinion and gear elements 45 and 46 respectively. The pinion 45 meshes with the rack 40 while the gear 46 meshes with a pinion 47 concentrically connected to the gear 42. A system of reduction gearing is thus provided for imparting a slow motion to the slide-block 28. When the sewing of a pad is completed the pinion 45 may be disconnected from the rack 40 by swinging the shift-plate 44 about its pivotal support 44′, for return of the work-holder to initial position. This disconnection is accomplished by shifting a finger-lever 48 in the direction of the curved arrow, Fig. 12. The lever 48 is connected to a pivot-shaft 49, Fig. 13, journaled in the slide-block 28 and having a crank-element 50 passing through a slot 51 in the shift-plate 44.

As the feeding sections or dogs 21, 22 both engage the circular moving work 26, and as any relative twisting or turning movement of the feed-dogs relative to the work during the feeding stroke is disadvantageous, mechanism is provided to equalize or prevent differentiation of the angular speeds of the feed-dogs 21 and 22. This mechanism preferably comprises the equalizer or radius-bar 34 above referred to which, at its inner end, is apertured at 52, 53 to embrace the respective feed-dog sections 21, 22. The bar 34 is retained at the slideway 33 of the guide-plate 32 by means of the retainer plate 54 secured in position by suitable screws. The bar 34 is reduced in thickness between the apertures 52, 53 to afford clearance for the cover-plate 55 and is further reduced at its extremity 56 to provide clearance for said plate 55; the extremity 56 being received within the slot 58 in the guide-plate 59. The cover-plate 55 is cut away at 60, 61, Fig. 6, to permit the equalizer-bar and feed-dogs to move in a curved path of any radius within the limits provided. The outer end of the radius-bar, that is, the left-hand end, Fig. 5, is received within the slot 62 in the member 63 screwed to the bed-extension 30 and bridging the guideway 29.

The machine bed is provided with a throat-plate 64 having a needle-aperture 65 in the path of the needle 5 which is in front of the primary feeding section 21.

It will be noted that the construction of the feed-dogs, their carrier and equalizer, is such as to permit of a limited end-play of the equalizer 34 or movement of the feed-dogs radially of the work-support center. This end-play is a minimum or is substantially zero when the feed-dogs are at the beginning point of their feeding stroke, as shown in Fig. 6; such end-play being limited in one direction by the engagement of the pin 24 with the left hand end 57 of the slot 25 in the feed-dog carrier 17. Movement of the feed-dogs toward the work-support center is limited by engagement of the edge 66 of the feed-dog carrier 17 with a stop-pin 67 carried by a plate 68 adjustable about a pivotal connection 69 with the throat-plate 64 and held in adjusted position by means of the screw 70 which passes through a slot 71 in the plate 68 concentric with the pivot 69. The edge 66 of the feed-dog carrier 17 is so shaped as to permit the feed-dogs to follow the pad without slippage relative to the latter when the work-support occupies its extreme innermost position closely adjacent the needle. The end-play limiting means above described thus operate to insure the repeated return of the feed-dogs to respective fixed and invariable beginning points laterally of the direction of feed, throughout the sewing operation; the feed-dogs being free to follow the curvilinear motion of the engaged portions of the pad to various ending points determined by the length of the feeding stroke and the position of the work-support center relative to the needle. The equalizer connection 34, however, constrains the feeding elements 21, 22 to move with equal angular speeds about the work-support center and insures that each feeding element will assume its proper share of the load and will not slip relative to the work in the direction of its feeding stroke. In the present embodiment of the invention, the equalizer bar and connections operate automatically to vary the curvature of the path of movement of the feeding elements progressively, that is, from one limit toward another or, say, from a cur-

vature of large radius toward a curvature of small radius.

The machine is preferably equipped with an alternating presser mechanism for cooperation with the needle and primary feeding element. This mechanism comprises the needle-presser 72 and feed-presser 73. The needle-presser 72 is apertured at 74 to clear the needle and is clamped to the lower end of the presser-bar 75 to which is also clamped the split lugs 76 of the lifting frame 77 having a rearward extension 78 which is formed with a horizontal slot 79 for the fulcrum-screw 80 which is carried by the rearwardly extending arm 81 of the presser-lifting lever having its forwardly extending arm 82 pivotally connected at 83 to the lug 84 of a guide-frame 85 slidable upon and relative to the presser-bar 75 and having an upwardly projecting extension 86 to which is pivotally connected at 87 the upper end of the feed-presser bar 88 carrying at its lower end the feed-presser foot 73 having a smooth rounded work-engaging surface. The feed-presser bar is hinged intermediate its ends at 90 so that the foot 73 may be free to follow the work in a curved path. The springs 91 and 92 insure the return of the feed-presser 73 to a fixed initial position when such foot is lifted clear of the work.

The presser-lifting lever has an upwardly extending arm 93 which is slotted at 94 to receive the pin 95 at the lower end of the arm 96 fixed to one end of the rock-shaft 97 journaled in a frame lug 98. Fixed to the other end of the rock-shaft 97 is an upwardly extending arm 99 having an adjustable pin-and-slot connection 100 with a pitman element 101 embracing the eccentric 102 on the needle-bar operating shaft 10.

It will be evident that the eccentric 102 and connections therewith will operate to lift the needle- and feed-pressers alternately; the timing being such that the needle-presser will be lifted when the work is being fed by the feeding elements 21, 22.

The needle presser-bar 75 is telescopically received within a hollow sleeve or feed-presser bar 103 the lower end of which rests upon the guide-frame 85. The feed-presser bar 103 is urged downwardly by the pressure of the leaf-spring 105 and yieldingly holds the feed-presser upon the work.

The presser mechanism cooperating with the auxiliary feeding section 22 comprises the presser-foot 106 secured to the lower end of the auxiliary presser-bar 107 which is slidably mounted in the lugs 108 of a bracket 109 secured to the bracket-arm 2. The presser-bar 107 is yieldingly urged downwardly by means of a spring 110 located intermediate the uppermost lug 108 and a collar 111 fixed to the presser-bar 107. Pivoted to the lowermost lug 108 at 112 is a link 113 which at its upper end is pivotally connected at 114 to the lower end of a link 115 the upper end of which carries a transverse pin 116 received in the recesses 117 of a block 118 fixed to the upper end of the auxiliary presser-bar 107. The block 118 is slotted at 119, Fig. 11, to receive the portion of the link 115 adjacent the pin 116. The link 115 has a rigid downward extension or feeler-arm 120 the extremity of which is curved beneath the foot 106 and carries a feeler-plate 121 disposed above the auxiliary feeding element 22. The links 113, 115 constitute a toggle-device which, when straightened, holds the foot 106 in elevated or ineffective position, shown in full lines, Fig. 1, with the spring 110 compressed.

When the sewing has progressed to the extent that the edge of the work encounters the feeler-plate 121 the outer zone of the work will lie between the auxiliary feeding and presser-elements, which are ineffective. As the sewing continues the edge of the work will readily displace the feeler-plate 121, thus tripping or "breaking" the toggle device and permitting the spring 110 to press the auxiliary presser into cooperative relation with the auxiliary feeding element 22, thereby rendering the auxiliary feed effective. At the completion of the sewing operation the toggle may be reset by hand, thus lifting the auxiliary presser to ineffective position.

The auxiliary presser-foot 106 extends in advance of the feeder-plate 121, Fig. 9, of the trip to guard the feeler against accidental tripping by the fingers of the operator.

The foregoing disclosure is merely illustrative of one practical embodiment of the invention and is not to be construed as limiting the invention to the specific means shown and described for carrying it into effect, as I believe I am the first to provide a sewing machine with a work-controlled auxiliary feed of any description and I further believe I am the first to provide a sewing machine having a rotary work-support with primary and auxiliary feeds and an equalizer for constraining the feeding elements of such feeds to move with equal angular speeds about the center or axis of the work-support. The scope of the invention is further and more particularly pointed out in the appended claims.

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

1. A sewing machine having, in combination, stitch-forming mechanism including a needle, means having a center about which the work may turn, means for shifting such center relative to the needle-path while the machine is in operation, and feeding mechanism including a work-engaging member with means for rotatively moving it in a curved path substantially concentric with said shifting center.

2. A sewing machine having, in combination, stitch-forming mechanism including a needle, a primary feed, an auxiliary feed comprising cooperative parts one or more of which are movable to inoperative position, and work-controlled means connected to said auxiliary feed to restore the cooperative relation of said parts at a predetermined stage of a sewing operation.

3. A sewing machine having, in combination, stitch-forming mechanism including a needle, a primary feed, a normally ineffective secondary feed, and means including a work-controlled feeler connected to said secondary feed for automatically rendering the latter effective.

4. Feeding mechanism for sewing machines, comprising, a feed-bar, means for imparting rising-and-falling and feed-and-return movements to said feed-bar, a feed-dog mounted on and bodily movable relative to said feed-bar, and means including a pivoted guide connected to said feed-dog for determining its path of movement.

5. Feeding mechanism for sewing machines, comprising, a feed-bar, means for imparting rising-and-falling and feed-and-return movements to said feed-bar, a feed-dog mounted on and bodily movable relative to said feed-bar, means including a pivoted guide connected to said feed-dog for determining its path of movement, and means for shifting the pivot point of such guide.

6. A sewing machine having, in combination, stitch-forming mechanism including a needle, a feed-bar, means for imparting rising-and-falling and feed-and-return movements to said feed-bar, a feed-dog mounted on and movable relative to said bar, means including a pivoted guide connected to said dog for determining its path of movement, and means for shifting the pivot point of such guide without stopping the stitch-forming mechanism.

7. Feeding mechanism for sewing machines comprising, a feed-bar, a feed-dog freely carried by said feed-bar, and means including a pivoted guide apertured to embrace said feed-dog for directing its movement.

8. Feeding mechanism for sewing machines comprising, a feed-bar, a feed-dog freely carried by said feed-bar, means including a pivoted guide apertured to embrace said feed-dog for directing its movement, and means for shifting the pivot point of said guide toward the feed-dog.

9. Feeding mechanism for sewing machines comprising, in combination, a feed-bar, a feed-dog carrier pivoted on the feed-bar, a feed-dog pivoted on the feed-dog carrier, and means including a guide connected to said feed-dog for controlling its path of movement.

10. Feeding mechanism for sewing machines comprising, in combination, a feed-bar, a feed-dog carrier pivoted on the feed-bar, a feed-dog pivoted on the feed-dog carrier, and means including a pivoted guide connected to said feed-dog for controlling its path of movement.

11. Feeding mechanism for sewing machines comprising, in combination, a feed-bar, a feed-dog carrier pivoted on the feed-bar, a feed-dog pivoted on the feed-dog carrier, and means including a pivoted guide apertured to embrace said feed-dog and control the path of movement of the latter.

12. Feeding mechanism for sewing machines comprising, in combination, a feed-bar having the usual rising-and-falling and feed-and-return movements, a feed-dog mounted on said feed-bar for movements of rotation and translation relative to the latter, and guiding means connected to said dog for determining the resultant movement thereof.

13. Feeding mechanism for sewing machines, comprising, in combination, a feed-bar having the usual rising-and-falling and feed-and-return movements, a feed-dog mounted on said feed-bar for movements of rotation and translation relative to the latter, and a pivotally mounted guide connected to said feed-dog for determining the resultant movement of the latter.

14. Feeding mechanism for sewing machines comprising, in combination, a feed-bar having the usual rising-and-falling and feed-and-return movements, a feed-dog mounted on said feed-bar for movements of rotation and translation relative to the latter, pivoted guiding means connected to said feed-dog for determining the resultant movement of the latter, and means for shifting the pivot point of said guide toward or away from the feed-dog.

15. Feeding mechanism for sewing machines comprising feed-dog sections, separate pressers opposed, respectively to said feed-dog sections, and means including a work-controlled trip for governing the action of one of said pressers.

16. In a sewing machine, the combination with a work-support, a feed dog, and a spring-pressed presser-foot, of mechanism including a work governed trip for holding said presser-foot in elevated or ineffective position.

17. In a sewing machine the combination with a work-support, a feed dog, and a spring-pressed presser-foot, of a work-governed toggle device for holding said presser-foot in elevated or ineffective position.

18. In a sewing machine, the combination with a work-support, a feed dog, and a spring-pressed presser-foot opposed to said work-support, of a toggle device for lifting said presser-foot and holding the

latter in elevated position, and a work-governed trip connected to said toggle device for breaking the latter.

19. In a sewing machine, the combination with a work-support, a feed-dog, and a presser-foot, of a work-engaging feeler and connection for lowering the presser-foot.

20. In a sewing machine, the combination with a work-support, a feed-dog, and a presser-foot, of a work-engaging feeler and connections for lowering the presser-foot, said feeler being disposed beneath the presser-foot so as to be guarded by the latter.

21. In a sewing machine, the combination with the sewing machine bed, of a feed-bar having the usual rising-and-falling and feed-and-return movements, a feed-dog movably mounted on said feed-bar, a guide-bar connected to said feed-dog, a pivoted guide having a sliding connection with said guide-bar, and a support for said pivoted guide shiftable on said bed.

22. Feeding mechanism for sewing machines comprising, in combination, a feed-bar, a feed-dog movable relative to and carried by said feed-bar, a radius bar connected to said feed-dog for controlling the movement of the latter, a fulcrum-support for said radius-bar, and means for shifting said fulcrum-support while the feed-bar is in operation.

23. In a sewing machine, in combination, stitch-forming mechanism including a needle, a work-support including pivotal means about which the work may turn, and feeding mechanism including a work-engaging element and connections for imparting feeding movements to said element and for turning said element about said pivotal means as a center.

24. In a sewing machine, in combination, stitch-forming mechanism including a needle, a work-support including pivotal means about which the work may turn, feeding mechanism including a work-engaging element and connections for imparting feeding movements to said element and for turning said element about said pivotal means as a center, and means for shifting said pivotal means to vary its distance from said needle.

25. In a sewing machine for spiral stitching, the combination with stitch-forming mechanism including a needle, a work-support having a pivot about which the work may turn, means for shifting said pivot toward said needle, a primary feeding element adjacent the needle, and an auxiliary feeding element spaced from said primary feeding element and disposed at the side of the primary feeding element remote from the work-support.

26. In a sewing machine for spiral stitching, the combination with stitch-forming mechanism including a needle, a work-support having a pivot about which the work may turn, means for shifting said pivot toward said needle, a primary feeding element adjacent the needle, an auxiliary feeding element, and feed controlling means including an equalizer-bar connecting said pivot with said feeding elements.

27. In a sewing machine, in combination, stitch-forming mechanism including a reciprocating needle, a work-support having a shifting center with means for confining the work to turn about said shifting center, feeding mechanism including primary and auxiliary feeding sections, and an equalizer-connection between the work-support and said sections whereby the latter are constrained to move with equal angular speeds about said shifting center.

28. A sewing machine having, in combination, stitch-forming mechanism including a reciprocating needle, a rotary work-support, and feeding mechanism including a four-motion feed-dog and means for constraining all parts of said feed-dog to move with equal angular speeds about the axis of rotation of the work-support, thereby avoiding a relative twist between the feed-dog and the work during the feeding stroke.

In testimony whereof, I have signed my name to this specification.

CHARLES M. HORTON.