

Nov. 15, 1949

W. MYERS

2,488,095

SPIRAL STITCHING SEWING MACHINE

Filed Oct. 29, 1945

5 Sheets--Sheet 1

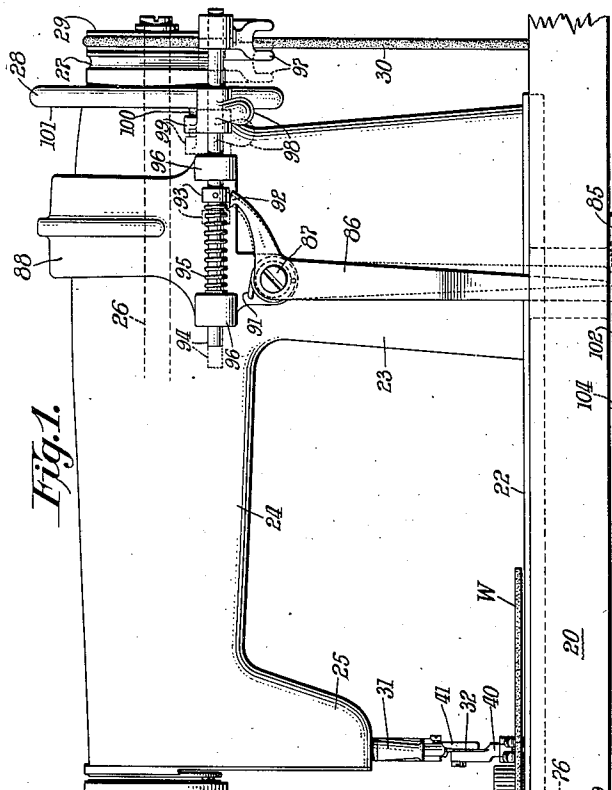


Fig. 1.

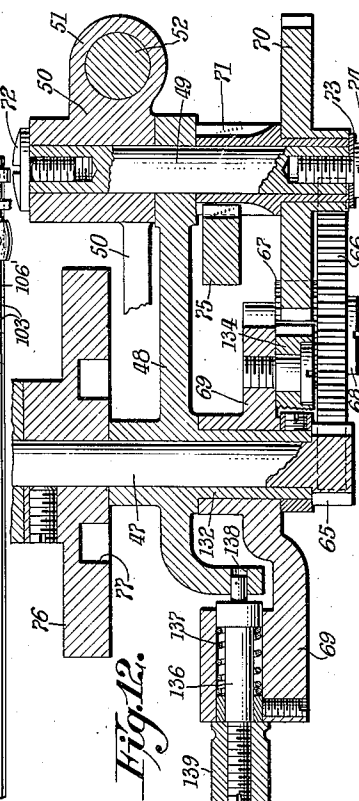


Fig. 12.

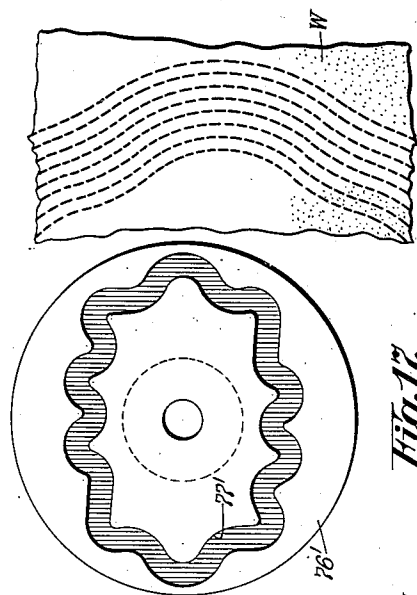


Fig. 12.

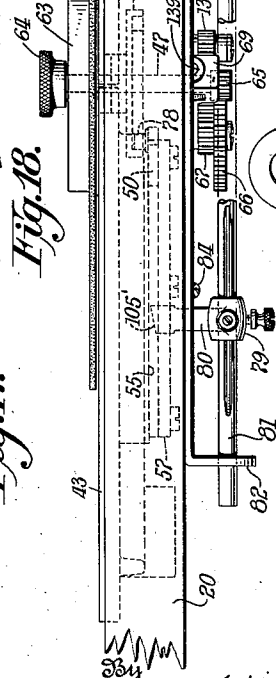


Fig. 18.

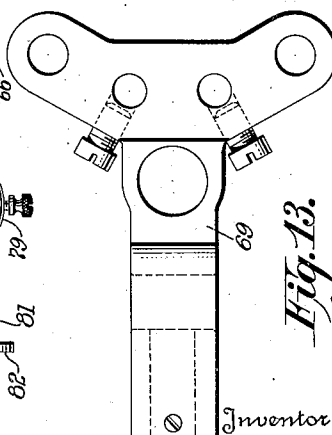


Fig. 13.

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5 Sheets-Sheet 2

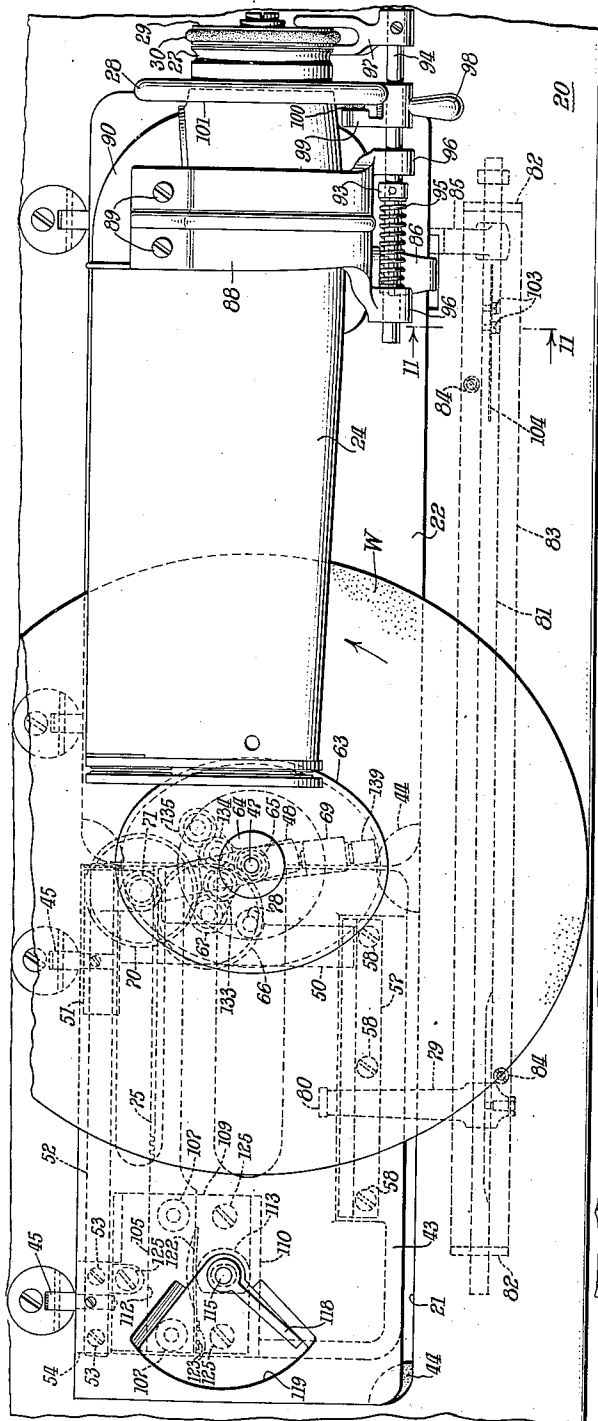


Fig. 2.

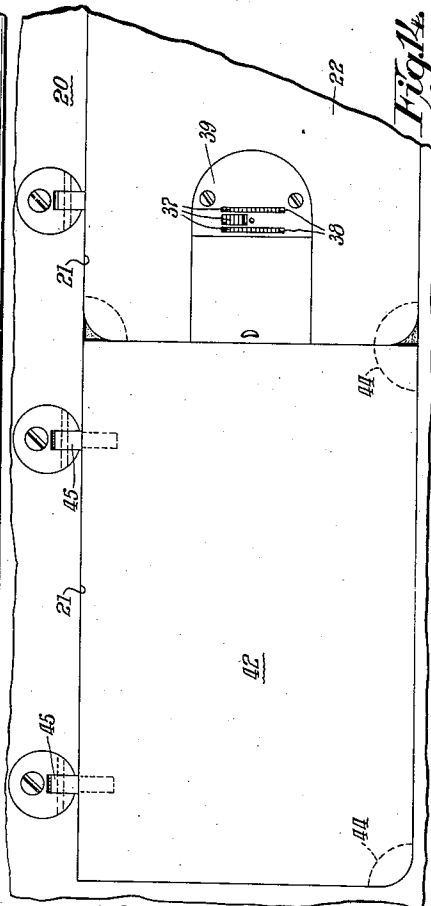


Fig. 14.

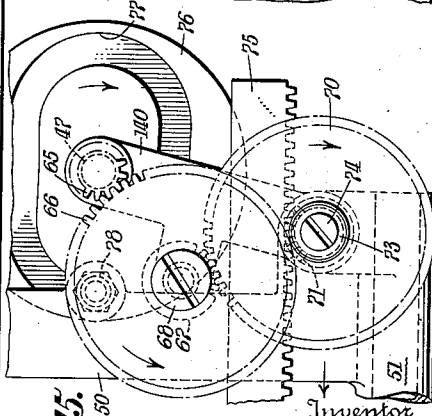


Fig. 15.

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SPIRAL STITCHING SEWING MACHINE

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5 Sheets-Sheet 3

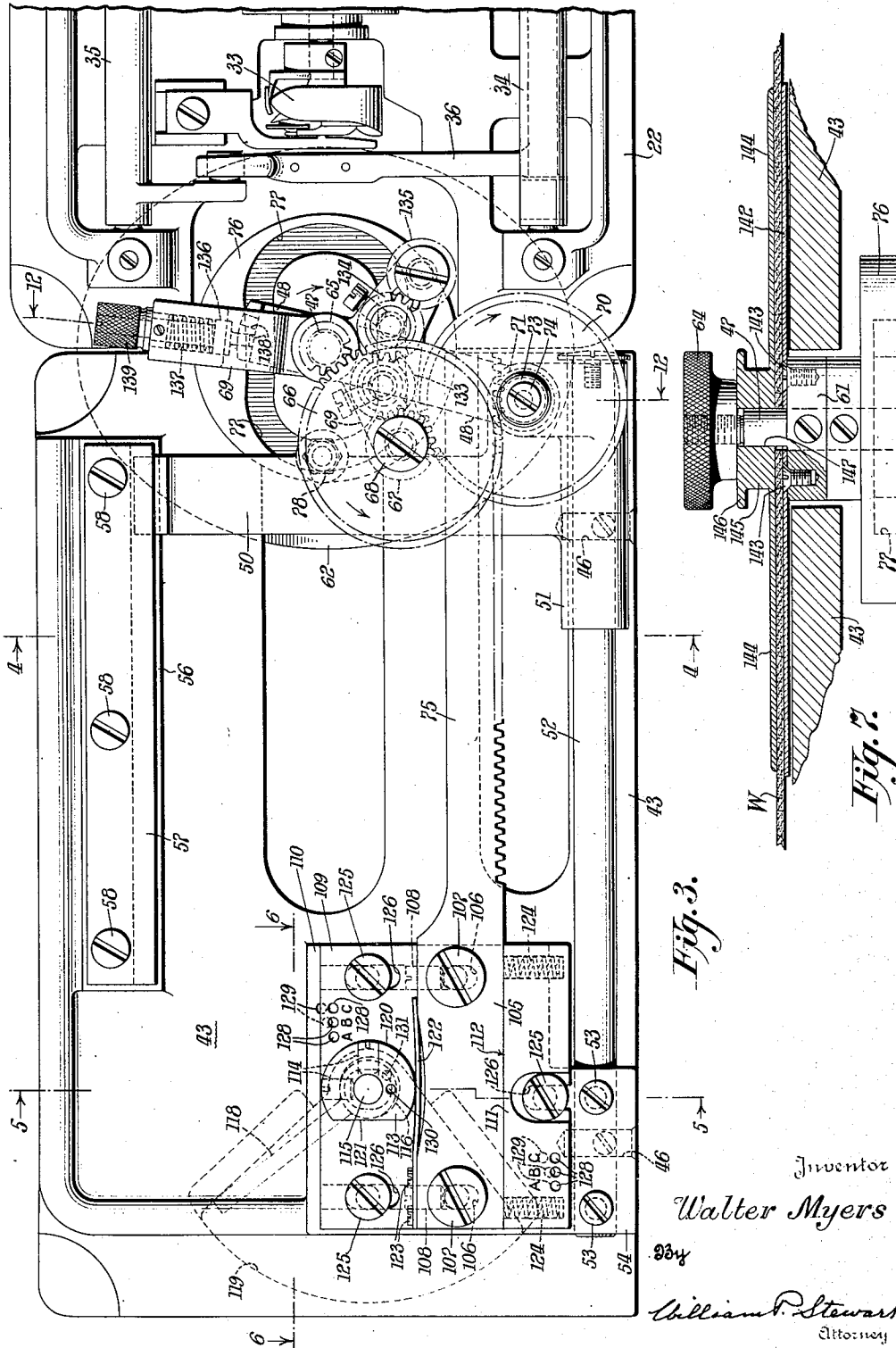


Fig. 3.

Fig. 2.

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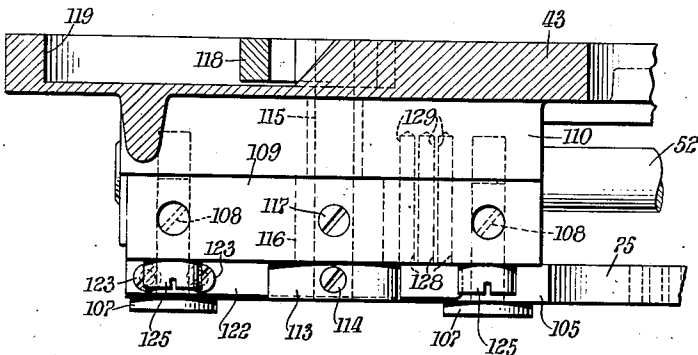
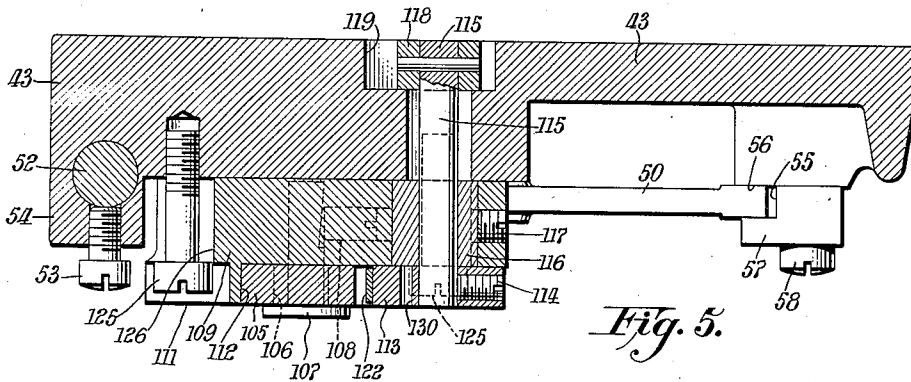
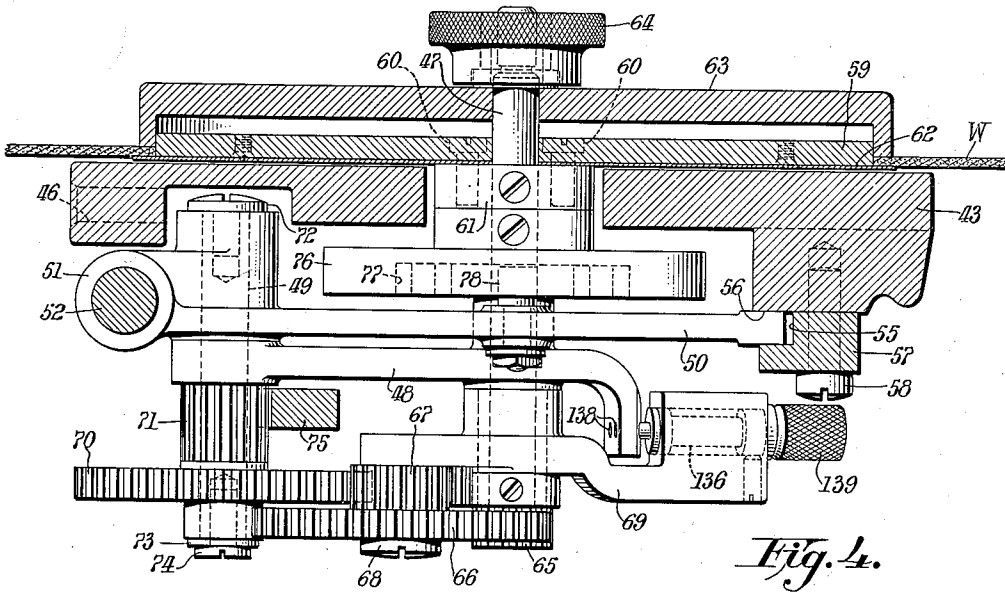
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SPIRAL STITCHING SEWING MACHINE

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Fig. 6.

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SPIRAL STITCHING SEWING MACHINE

Filed Oct. 29, 1945

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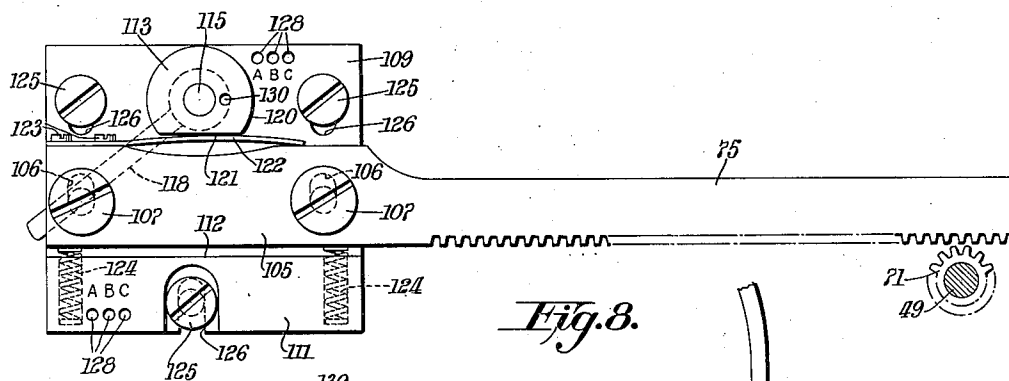


Fig. 8.

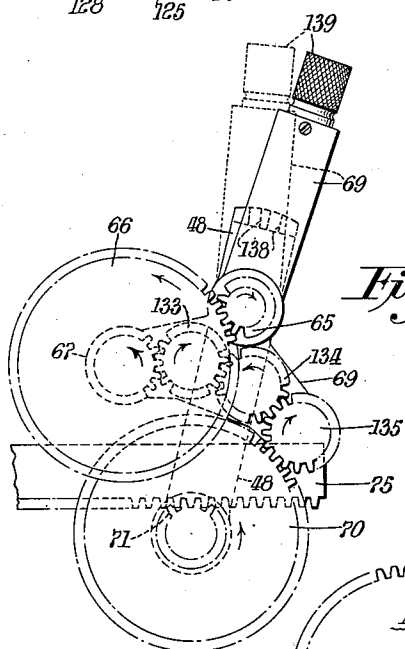


Fig.9.

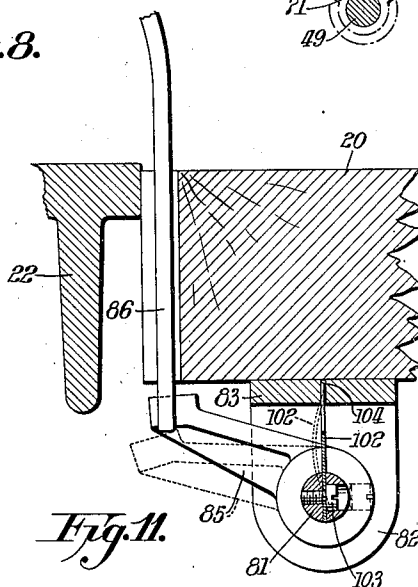


Fig. 11.

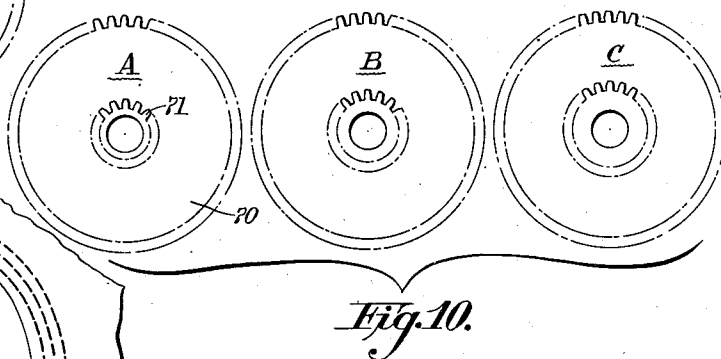


Fig. 10.

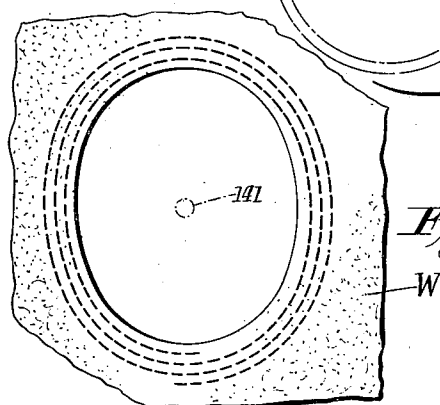


Fig. 16.

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UNITED STATES PATENT OFFICE

2,488,095

SPIRAL STITCHING SEWING MACHINE

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Application October 29, 1945, Serial No. 625,380

17 Claims. (Cl. 112—13)

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This invention relates to sewing machines and more particularly to sewing machines of the type adapted for effecting the production of spiral stitching.

In the manufacture of hats, for example, this type of machine is used extensively in stitching together the plurality of plies of material which together form the hat-brim. The various plies of material comprising the hat-brim are superposed upon each other and then sewed together throughout the entire area of the brim by uniformly spaced stitches arranged, preferably, in an elliptical spiral form.

Heretofore, such a pattern of stitching has been attained mechanically by employing a sewing machine having a reciprocatory needle and a complemental loop-taker, a four-motion feed-dog, a presser-foot and a work-holder including a pivot about which the hat-brim may turn as such pivot is slowly shifted relative to the needle by operating mechanism including a lead-screw; which operating mechanism is directly connected to the actuating mechanism of the sewing machine, or to a separate source of power such as an individual electric motor. The salient defect of this machine has been that when the work-advancing movement of the sewing machine feed-dog is adjusted to a different stitch length, a lead-screw having a pitch suitable for the adjusted stitch-length must be substituted in the operating mechanism. In other words, a different lead-screw must be provided for each stitch-length to which the sewing machine feeding mechanism may be adjusted.

In addition to the above, the trade has used sewing machines equipped with a work-guiding attachment in which the hat-brim, having been precut to substantially its final shape, is manually manipulated with the aid of the attachment relative to the needle of the sewing machine so as to effect the proper shape and distribution of the stitching. The disadvantage of this method resides in the fact that the work is, of necessity, under the constant control of the operator and therefore the quality of the product depends upon the efficiency of the operator. Inasmuch as the operator must manually manipulate the hat-brim in its passage to the sewing machine needle, the concentration required in observing and directing the formation of the elliptical spiral seam is fatiguing and to the extent that as the seam progresses it becomes more difficult to manually maintain the spacing uniform between the convolutions of the spiral seam. Non-uniformity in such spacing results in an inferior

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product. Also, since the operator must handle the hat-brim during the entire stitching operation, there must be one operator for each machine in use.

It is the principal object of the present invention to provide a sewing machine of the type in question having mechanism entirely controlled by the action of the sewing machine feed on the work for shifting the axis about which the work is turned relative to the needle and for, at the same time, vibrating said axis to effect the production of a spiral seam of non-circular pattern.

Another object of the present invention is to provide a machine of the type in question which will automatically function to properly direct the work to the needle and which will automatically come to rest at the end of the sewing operation.

A still further object of the present invention is to provide a conventional sewing machine with a work-feeding attachment designed to be rendered effective solely by the action of the sewing machine feed on the work for shifting the work relative to the needle thereby to effect the production of a spiral seam.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the accompanying drawings, Fig. 1 is a front elevational view of a conventional sewing machine equipped with the preferred embodiment of the invention.

Fig. 2 is a top plan view of the mechanism shown in Fig. 1, with a hat-brim clamped in proper position preparatory to the beginning of the stitching operation.

Fig. 3 is a bottom plan view of a portion of the machine and attachment shown in Fig. 1.

Fig. 4 represents a transverse vertical sectional view taken substantially along the line 4—4, Fig. 3.

Fig. 5 represents a transverse vertical sectional view taken substantially along the line 5—5, Fig. 3.

Fig. 6 represents a longitudinal vertical sectional view taken substantially along the line 6—6, Fig. 3.

Fig. 7 is a view in elevation and partly in section, showing one form of means for clamping the hat-brim to the work-pivot spindle, so that

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the action of the regular sewing machine feed on the hat-brim will effect a rotation of the pivot-spindle.

Fig. 8 represents a bottom plan view, partly in section, of the rack in its retracted position.

Fig. 9 represents a bottom plan view of the pivot-feeding gearing, with the shifting lever thereof in a position such that the elliptical spiral stitching is applied from the rim of the hat-brim toward the center thereof.

Fig. 10 represents three change gears the substitution in the gear train of any one of which will effect the spacing between the convolutions of the spiral seam.

Fig. 11 represents a fragmentary vertical sectional view taken substantially along the line 11—11, Fig. 2, showing, in full lines, the normal relative positions of the parts of the stop-motion mechanism to effect the tripping of the sewing machine drive and, in dotted lines, the deflecting of certain of the stop-motion components by the sewing machine when the latter is lowered to its normal operating position after the sewing machine has been tilted back to replenish the bobbin or the like.

Fig. 12 represents a vertical sectional view taken substantially along the line 12—12, Fig. 3.

Fig. 13 represents a bottom plan view of the gear-shifting lever.

Fig. 14 is a fragmentary top plan view similar to Fig. 2, but with the elliptical spiral stitching attachment removed from its cut-out in the table-top and an insert substituted therefor, whereby the apparatus is converted into a conventional straightaway sewing machine.

Fig. 15 represents a bottom plan view of a simplified gear-train which is adapted to feed the pivot-spindle in one direction only.

Fig. 16 represents a fragmentary view of the work, showing the elliptical form of the spiral seam.

Fig. 17 represents a substitute form of cam which can be used in the attachment when it is desired to obtain an ornamental effect.

Fig. 18 represents a fragmentary view of the work obtained when the cam as shown in Fig. 17 is employed in the attachment.

Referring in detail to the drawings, the invention is disclosed as embodied in an attachment adapted for use with a conventional sewing apparatus including a table structure 20 provided with an opening 21 adapted to receive the bed 22 of a conventional lock-stitch sewing machine. Since the sewing machine shown is of conventional form, only such reference will be made to its construction as will give a clear understanding of the present invention. Rising from the bed 22 of the sewing machine is a standard 23 of an overhanging bracket-arm 24 terminating in a head 25. Journaled in the bracket-arm is the regular main-shaft 26 having secured to the standard-end thereof a pulley assembly including a fast pulley 27 integral with the usual balance-wheel 28 and a loose pulley 29 freely journaled upon a reduced hub-extension (not shown) of the balance-wheel 28, in a manner fully disclosed in my pending application Serial No. 598,949, filed June 12, 1945, now Patent No. 2,454,710 dated November 23, 1948. Power is applied to the main-shaft 26 by a belt 30 which may be driven by any suitable form of power-transmitter (not shown) preferably secured beneath the table top.

At the head-end of the bracket-arm 24, the main-shaft is suitably connected to endwise reciprocate a needle-bar 31 carrying at its lower end

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the thread-carrying eye-pointed needle 32. Located beneath the bed 22 in position to cooperate with the needle 32 in the formation of lock-stitches, is a rotary loop-taker 33 (Fig. 3). Stitching is produced in work W adapted to be fed past the stitching instrumentalities by means of the usual four-motion feeding mechanism disposed within the bed 22 of the sewing machine. The feeding mechanism includes a feed-advance and -return rock-shaft 34 and a feed-lift rock-shaft 35 (Fig. 3), both of the rock-shafts 34 and 35 being operatively connected to a transverse feed-bar 36 to which is secured a common form of feed-dog 37 (Fig. 14) disposed to operate through feed-dog slots 38 in the throat-plate 39. Opposed to the feed-dog 37 is the usual pressure-foot 40 (Fig. 1) which is carried by the lower end of a spring-depressed presser-bar 41 endwise slidable in the head 25. The feeding mechanism and the means for operating the same are well known in the art, one form being disclosed, for example, in the patent to J. H. Stearns, No. 2,029,278, of Jan. 28, 1936. It may be mentioned as characteristic of feeding mechanisms of this type, that the actuating connections for the feed-advance and -return rock-shaft 34 include a feed-regulating device by which the length of the feeding stroke can be varied.

To convert the sewing machine from a conventional straight stitching machine into one specially adapted for spiral stitching, such as shown for example in Figs. 16 and 18, a suitable insert 42 (Fig. 14) which normally is disposed in that portion of the opening 21 in the table-top to the left of the sewing machine bed 22, is removed and there is substituted therefor a unitary attachment which forms the basis of the present invention. The attachment comprises a rectangularly shaped bed 43 having a flat upper work-supporting surface substantially level with the top surface of the table 20. The bed 43 is supported at its front edge in the table-top opening 21 by the pads 44 and at its rear edge by the hinge-elements 45 adjustably received in suitable apertures 46 (Fig. 3) formed in the bed 43.

The work W to be stitched is supported to turn about a shifting center represented by the axis of a vertically disposed pivot-spindle 47. The pivot-spindle 47 is journaled in one end of a vibratory arm 48 freely fulcrumed at its other end on a vertical shaft 49 carried by a horizontally disposed supporting slide-frame 50 extending transversely of the bed 43. The slide-frame 50 at its rear end is preferably formed with an extended boss 51 bored to slidably embrace a longitudinally disposed guide-rod 52 clamped by two set-screws 53 (Figs. 3 and 5) in a lug 54 depending from the bed 43. At its front end, the slide-frame 50 is shaped to enter a guideway 55 defined by a machined surface 56 on the bed 43 and a gib 57 attached to the bed 43 by screws 58. While I have illustrated the slide-frame 50 as being supported at one end by a guide-rod 52 and at its other end by a slideway 55, it will be appreciated that other means may be utilized to sustain the slide-frame, as for example by two slide-rods, one supporting each end of the slide-frame.

The work or hat-brim W to be stitched is suitably apertured, as shown in the full line in Fig. 16, snugly to embrace the periphery of a turn-table in the form of a work-positioning block 59 (Fig. 4) secured by screws 60 upon a collar 61 fast on the pivot-spindle 47. Attached to the under side of the block 59 is a plate 62 extending beyond the block. The inner marginal edge of the

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hat-brim W is clamped on the plate 62 by an inverted cup-shaped upper clamp-element 63 forced into work-clamping cooperation with the plate 62 by a thumb-nut 64 threaded on the pivot-spindle 47. With the work W clamped, as above described, to the pivot-spindle 47 and with the parts positioned as illustrated in Fig. 2, the feeding mechanism of the sewing machine as it acts upon the hat-brim W will effect a turning of the pivot-spindle 47. The pivot-spindle, through suitable speed-reducing gearing, will cause the slide-frame 50 to shift along the guide-rod 52 away from the sewing machine. The speed-reducing gearing for effecting the shifting or translating movement of the slide-frame 50 comprises a spur gear 65 integral with the lower end of the pivot-spindle 47, which spur gear 65 meshes with a gear 66 press-fitted upon the reduced hub of a pinion 67, the gear and pinion assembly 66, 67 being freely journaled on a shouldered stud 68 threaded into one limb of a substantially Y-shaped gear-shifting lever 69. With the gear-shifting lever 69 positioned as shown in Fig. 3, the pinion 67 meshes with a gear 70 (Fig. 12) press-fitted on the reduced hub of a pinion 71, the gear and pinion assembly 70, 71 being freely journaled upon the shaft 49 which is carried by the slide-frame 50. The shaft 49 is maintained in the slide-frame 50 by the cap-screw 72 which is threaded into the upper end of the shaft. The gear and pinion assembly 70, 71 is held on the shaft 49 by a washer 73 and a screw 74. To effect shifting of the slide-frame 50, the pinion 71 meshes with a rack 75 which is normally locked at one end to the bed 43. Through the system of reduction gearing just described, it will be understood that a slow displacement relative to said needle of a uniformly varying extent is imparted to the slide-frame 50 in a direction to the left as viewed in Fig. 3, and that the actuation of the reduction gearing is effected by the action of the sewing machine feed on the hat-brim. It will be understood that if the vibratory arm 48 is maintained in a fixed position with respect to the slide-frame 50 as illustrated in Fig. 3, the rotation of the pivot-spindle 47 by the action of the sewing machine feeding mechanism on the hat-brim will result in a slow uniform travel of the slide-frame 50 along the guide-rod 52 and away from the sewing machine, resulting in the production of a spiral seam of uniformly increasing radius, which I prefer to identify as a regular spiral seam.

In order to produce the desired irregular spiral seam, it is necessary simultaneously bodily to move or vibrate the progressively shifting axis about which the work turns. To maintain the successive convolutions of the irregular spiral seam equally spaced from each other, the bodily displacement of the shifting axis relative to the slide-frame 50 must be cyclic. To this end, the pivot-spindle 47 has secured thereon a cam-element 76 having formed in its bottom face a suitably shaped cam-groove 77 into which projects a follower-stud 78 (Figs. 3 and 4) secured on the slide-frame 50. It will be understood that as the pivot-spindle 47 is progressively shifted relative to the sewing machine stitching devices when the pivot-spindle is rotated by the action of the sewing machine feeding mechanism on the work W, the cam-element 76 will likewise rotate and, through the cam-groove 77 and follower-stud 78, will simultaneously cause the vibratory arm 48, which carries the pivot-spindle 47, to swing about the shaft 49. As the pivot-spindle 47 is vibrated toward and away from the sewing machine stitch-

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ing mechanism by the forced swinging of the arm 48, the work which is clamped to the pivot-spindle 47 is also shifted relative to the stitching mechanism and in timed relation with the progressive shift of the work caused by the rotation of the work effected by the sewing machine feed. The cam-groove 77 shown in Fig. 3 is such as will vibrate the axis about which the work turns to produce the elliptical spiral seam illustrated in Fig. 16. Obviously, by substituting cam-elements having the required shapes of cam-grooves, many desired utilitarian or ornamental patterns of stitching can be produced. For example, Fig. 17 illustrates a cam-element 76' cut with a sinuous cam-groove 77' and when this cam-element is used in the mechanism, an ornamental seam such as shown in Fig. 18 is obtained.

It may be said that the character of the cyclically varying displacement of the pivot-spindle 47 relative to the slide-frame 50 determines the shape of the seam-pattern (circle, ellipse, etc.) and that the uniformly varying displacement of the slide-frame 50 relative to the stitching mechanism determines that the seam-pattern is open, as a spiral, and not closed, as a circle. Thus, if the cyclically varying displacement of the pivot-spindle 47 relative to the slide-frame 50 is eliminated, as would be the case if the cam 76 were cut with a concentric cam-groove 77, the pivot-spindle 47 would move relatively to the stitching mechanism at a uniformly varying displacement and the resultant seam-pattern produced would be a regular spiral. Moreover, if the progressive shift of the slide-frame 50 is eliminated, as by removing one of the gears in the gear-train and holding the slide-frame 50 stationary, a closed seam-pattern will be developed, the character or shape of which will be dictated by the shape of the cam-groove 77. In the present case, the closed stitch-pattern would be substantially an ellipse.

With the component parts of the reduction gearing in the positions above described, the slide-frame 50 (Fig. 2) and the pivot-spindle 47 will be moved in a direction to carry the work W to the left. When the stitching is completed at the outer edge of the hat-brim, the machine is automatically stopped. This is accomplished in the apparatus illustrated by providing a stop-motion mechanism (Figs. 1 and 2) comprising a trip-actuating arm 79 having its inner end upturned as at 80 to be contacted by the slide-frame 50 as the latter travels along its guide-rod 52 and away from the sewing machine. The trip-actuating arm 79 at its outer end is adjustably clamped upon a longitudinal rod 81 endwise slidable in bearings provided in the spaced downturned ears 82 of a supporting bracket 83 fastened by screws 84 to the under side of the table-top 20. Secured to that end of the rod 81 adjacent the standard 23 of the sewing machine is a rearwardly extending trip-arm 85 disposed to be moved into engagement with the lower end of one limb of a bell-crank latch-lever 86 pivoted at 87 on a supporting bracket 88. The supporting bracket 88, preferably, is secured by screws 89 (Fig. 2) to a removable cover 90 attached to the back of the sewing machine bracket-arm 24. The latch-lever 86 is biased in a counterclockwise direction, as viewed in Fig. 1, by a spring 91 so that the other limb of the latch-lever, which terminates in a hook-shaped nose 92, may engage a collar 93 fast upon a belt-shipper rod 94 urged by a spring 95 in an endwise direction in spaced bearing lugs 96 on the supporting bracket 88. The belt-shipper rod

94 carries at its free end a bifurcated belt-shipper member 97 of which the spaced limbs straddle the driving belt 30. In order conveniently to shift the belt-shipper rod 94 from its stop position, shown in full lines in Fig. 1, to its machine-running position shown in dotted lines in Fig. 1, there is secured on the rod 94 a hand-operated throw-in member 98. Projecting rearwardly from the member 98 is an arm 99 carrying brake-pads 100 which are adapted to engage the side-wall 101 of the balance-wheel 28, thereby to brake the machine to an early stop when the belt 30 is shifted from the fast pulley 27 to the loose pulley 29.

Referring to Fig. 1, the work W is shown in its proper position to begin the stitching operation and the sewing machine is in its stop-position. To start the stitching operation, the throw-in member 98 is grasped and manually shifted from the full line position to the dotted line position, thus moving the brake-pad 100 away from the balance-wheel and shifting the driving belt 30 from the loose pulley 29 to the fast pulley 28, the belt-shipper rod 94 being shifted endwise sufficiently far to permit the nose 92 of the latch-lever 86 to engage behind the collar 93. As the feeding mechanism of the sewing machine acts on the work which is clamped to the pivot-spindle 47, the spindle is caused to rotate and through the system of reduction gearing advances the slide-frame 50 along the guide-rod 52 and away from the stitching instrumentalities of the sewing machine. As the end of the stitching operation is approached, the slide-frame moves into contact with the trip-actuating arm 79, causing the rod 81 to move to the left in its supporting ears 82. The trip-arm 85 at the other end of the rod 81 engages the latch-lever 86, pivoting it about the stud 87. This releases the belt-shipper rod 94 and permits the spring 95 to snap the belt-shipper rod endwise in its bearings, whereby the driving belt 30 is shifted to the loose pulley 29 and the brake-pad 100 is moved into engagement with the balance-wheel 28 to stop the machine. The presser-foot 40 is then raised in the usual way and the completed work removed by unscrewing the thumb-nut 64 and raising the upper clamping member 63.

It will be understood that when the apparatus is in use it may be necessary, when replenishing the bobbin or making adjustments, to tilt either the sewing machine or the attachment back upon its hinges. When either the sewing machine or the attachment is in its tilted back position, the rod 81 of the stop-motion mechanism may inadvertently be shifted endwise sufficiently far so that the trip-actuating arm 79 directly underlies the slide-frame 50 of the attachment or the trip-arm 85 directly underlies the end of the latch-lever 86 on the sewing machine. I have constructed means which normally prevents the rod 81 from turning in its supporting ears 82, consisting of a flexible leaf-spring member 102 attached by screws 103 to the rod 81 and disposed so that its upper end extends into a guide-slot 104 provided in the supporting bracket 83. As shown in Fig. 11, should the trip-arm 85 directly underlie the latch-lever 86 when the sewing machine is restored from its tilted back position to its normal operating position, the leaf-spring 102 will readily flex from its full line position to its dotted line position, thus permitting the trip-arm 85 to be deflected to an abnormal position without in any way injuring the stop-motion tripping mechanism. It will be appreciated that the leaf-spring 102 would similarly flex if the slide-frame 50

would be accidentally lowered upon the upturned end 80 of the trip-actuating arm 79. To minimize the possibility of an alinement of the parts such that flexing of the leaf-spring 102 occurs, the upturned end 80 of the trip-actuating arm 79 and the lower end of the latch-lever 86 are inclined as at 105' and 106' respectively (Fig. 1). It will be understood that while the leaf-spring 102 is capable of flexing it is sufficiently stiff to preclude turning of the rod 81 in its bearings during normal operation of the mechanism.

Means have been provided whereby, when the stitching operation has been completed and the work removed from the pivot-spindle 47, the rack 75 can be laterally shifted out of mesh with the pinion 71 so that the pivot-spindle and its associated slide-frame 50 and reduction gearing system can be readily returned to a position adjacent the sewing machine preparatory to the stitching of another hat-brim. To that end, the rack 75 is formed with a shank 105 (Figs. 3, 5, 6 and 8) provided transversely thereof with two slots 106 through which extend two guide-screws 107 clamped by set-screws 108 in a vise-block 109 adjustably secured to the under side of a lug 110 cast integral with the bed 43. The vise-block 109 is provided with a depending jaw 111 having a vertical rack-positioning face 112 against which the shank 105 of the rack 75 is urged by a locking disk 113. As clearly shown in Fig. 5, the locking disk 113 is secured by a set-screw 114 to the lower end of a vertical rock-shaft 115 journaled in an eccentric bushing 116 clamped in the vise-block 109 by a set-screw 117. Pinned to the upper end of the rock-shaft 115 is a hand-lever 118 disposed to operate in a recess or cut-out 119 in the upper face of the bed 43. The locking disk 113 is preferably formed with a concentric periphery 120 of which a portion thereof is flattened as at 121. Interposed between the periphery of the locking disk 113 and the rack 75 is a relatively stiff spring-plate 122 secured by screws 123 to the shank 105 of the rack 75. Referring to Fig. 3 it will be seen that the shank 105 of the rack 75 is maintained in engagement with the face 112 of the vise-jaw 111 by the locking disk 113 through the engagement of its concentric periphery 120 with the spring-plate 122. When it is desired to laterally shift the rack 75 out of mesh with the pinion 71, see Fig. 8, the hand-lever 118, which is conveniently accessible from the top of the bed 43, is moved from the position shown in Fig. 3 to the position shown in Fig. 8. This movement of the hand-lever 118 turns the locking disk 113 so that its flattened portion 121 opposes the spring-plate 122, thus releasing the rack 75 to the extent that two-coil-springs 124, acting between the shank 105 of the rack and the vise-jaw 111, urge the rack 75 away from the jaw-face 112 a distance sufficient to completely separate the teeth of the rack from those of the pinion 71. When this condition exists, the slide-frame 50 is completely free and may be easily slid to a position near the sewing machine head. To remesh the rack 75 with the pinion 71, it is only necessary to swing the hand-lever 118 from the position shown in Fig. 8 to the position shown in Fig. 3. In reconnecting the rack 75 with the pinion 71, it will be understood that a tooth on the pinion and a tooth on the rack may be relatively disposed so that the tops of the respective teeth oppose or abut one another. This does not prove serious because, while the free end of the rack 75 is held away from its normal meshing relation with the pinion

71 by the abutting teeth, the hand-lever 118 may be swung to the position shown in Fig. 3, thus causing the locking disk 113 to bend the spring-plate 122 slightly more than it ordinarily would if the rack and pinion were in proper mesh. With the teeth in abutting relation, the initial turning of the pivot-spindle 47 by the action of the sewing machine feeding mechanism on the work will cause the pinion 71 to turn and thereby move its tooth relative to the tooth on the rack 75. When the pinion has turned the necessary amount so that the two teeth are no longer in abutting relation, the spring-plate 122 will snap the rack 75 into its normal position determined by the vertical face 112 of the vise-jaw 111.

As shown in Figs. 3 and 5, the vise-block 109 is clamped on the lug 110 for limited transverse adjustment by three fastening screws 125 which extend through slots 126 in the vise-block 109 and are threaded into the bed 43. The limited adjustment provided by this mounting accommodates variations in production and also permits the substitution for the gear and pinion assembly 70, 71 of various other similar change-gear assemblies indicated generally as A, B and C in Fig. 10. In the three substitute change-gear assemblies disclosed, the large gears are identical with each other, but the pinions differ from each other as to the number of teeth. The effect of substituting one gear assembly for another gear assembly is a change in the over-all gear ratio of the reduction gearing system and this results in an increase or decrease in the distance between the convolutions of the spiral seam. To facilitate adjusting the vise-block 109 to accommodate any one of the gear assemblies A, B and C, I have formed in the vise-block 109, adjacent each of two sides thereof, three holes 128 and have marked them as A, B and C. The lug 110 of the bed 43 is also provided with two sets of three holes 129 (Figs. 3 and 6), each set arranged at an inclination. When it is desired to use gear assembly A, a pin inserted in each of the holes marked A in the vise-block 109 and extending into the registering holes in the lug 110 will properly position the vise-block 109 so that the teeth on the rack 75 will mesh with the teeth on the pinion 71. Tightening of the fastening screws 125 will secure the vise-block in its proper adjusted position. If it is desired to use gear assembly B, the fastening screws 125 are loosened and the vise-block 109 is laterally shifted until the two pins, now in holes 128 marked B, will slide into the registering holes 129 in the lug 110 of the bed 43. Tightening of the fastening screws 125 will again secure the vise-block 109 in a position such that the teeth of the rack 75 will mesh properly with the teeth on the pinion of gear assembly B. To provide for regulating the pressure with which the shank 105 of the rack 75 is held against the face 112 of the vise-jaw 111, I have provided means for turning the eccentric bushing 116 in the vise-block 109. This means comprises a hole 130 drilled in the locking disk 113 and a second hole 131 (Fig. 3) drilled in the bushing 116. By turning the hand-lever 118 until the hole 130 in the locking disk 113 registers with the hole 131 in the eccentric bushing 116, then inserting a locking-pin into the aligned holes, the bushing 116 is locked to the disk 113. If the set-screw 117 is then unscrewed, the eccentric bushing 116 can be turned in the vise-block 109 by merely turning the hand-lever 118. When the bushing 116 is sufficiently turned to effect the desired change in the pressure of the

locking disk 113 against the spring-plate 122, the set-screw 117 can be tightened to lock the bushing 116 in its adjusted position, after which the locking-pin is removed.

The reduction gearing system as above described is adapted to cause the slide-frame 50 to move from a position close to the sewing machine to a position remote from the sewing machine. When moving in this direction, the stitching is started adjacent the inner margin of the hat-brim and is terminated at the outer margin of the hat-brim. It may be desirable to reverse this so that the stitching is started at the outer margin of the work and is ended at the inner margin. To effect this reversal of the direction of feed of the slide-frame 50, I have fulcrumed the Y-shaped gear-shifting lever 69 on the reduced hub 132 (Fig. 12) of the vibratory arm 48. Carried on the gear-shifting lever 69 are three intermeshing idler pinions 133, 134 and 135. The pinion 133 is in constant mesh with the pinion 67 and, since the three pinions 133, 134 and 135 are also in constant meshing relation, rotation imparted to the pinion 67 by the rotating pivot-spindle is transmitted to the pinion 135 by the pinions 133 and 134 but in a reverse direction, as indicated by the arrows in Fig. 9. Provided on the gear-shifting lever 69 is a tractable detent in the form of a plunger 136 biased by a coil-spring 137 to enter a selected one of two locating apertures 138 provided in the vibratory arm 48. When it is desired to start the stitching at the outer margin of the work, instead of at the inner margin as would be the case with the gear-shifting lever 69 in the position shown in Fig. 3, it is necessary to grasp the knurled head 139 on the plunger 136 and withdraw the same from the locating aperture 138 in the vibratory arm 48. This releases the gear-shifting lever 69 and permits the same to be swung in a clockwise direction from the position shown in Fig. 3 to the position shown in full lines in Fig. 9. This swinging of the gear-shifting lever 69 moves the pinion 67 out of driving relation with the gear 70 and at the same time moves the pinion 135 into driving relation with the gear 70. The rotation of the pivot-spindle 47 is then transmitted through the gears 65, 66, 67, 133, 134, 135, 70, 71 and rack 75. When the gear-shifting lever 69 is in the position shown in Fig. 3, the rotation of the pivot-spindle 47 is transmitted through the gears 65, 66, 67, 70, 71 and rack 75; the gears 133, 134 and 135 rotating idly without being effective in the gear-train. The stop-motion device with which the sewing machine is fitted is adapted to be automatically operated by the slide-frame 50 when the latter is moving in a direction away from the sewing machine needle 32. When the direction of movement of the slide-frame is reversed, it is necessary to operate the stop-motion device by manually tripping the bell-crank latch-lever 86. Figure 15 discloses a simplified form of reduction gearing system which is non-reversible and which is designed to feed the slide-frame 50 in a direction away from the sewing machine. In this modification, there is employed a simplified form of vibratory arm 140 journaled on the shaft 49 of the slide-frame 50 and carrying the gear-assembly 66, 67.

Figure 7 illustrates a second form of work-clamping means employed for fastening the work W to the rotary pivot-spindle 47. This type of work-clamping means is preferred when the hat-brim, instead of being formed with a large po-

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sitioning opening, is provided with only a small center aperture 141 shown in dot-and-dash lines in Fig. 16. The clamping means illustrated in Fig. 7 includes a lower work-supporting plate 142 secured by screws 143 to the collar 61 fast on the pivot-spindle 47. The work W is adapted to be clamped upon the plate 142 by an upper clamp-plate 144 adapted to be forced into work-clamping relation with the supporting plate 142 by the thumb-nut 64 threaded on the pivot-spindle 47. To facilitate removal of the upper clamp-plate 144, the latter is preferably formed with a cylindrical finger-piece 145 having at its upper end a peripheral flange 146 which may be conveniently grasped by the operator's fingers. To insure that the upper clamp-plate 144, when it is placed upon the pivot-spindle 47, is in proper register with the lower work-supporting plate 142, the pivot-spindle 47 is formed with a flat 147 and the pivot-spindle receiving hole in the finger-piece 145 of the clamp-plate 144 is appropriately shaped so that it slips on the spindle 47 in one position only.

It will be observed in Fig. 2, that the bed 43 of the spiral stitching attachment is narrower than the width of the opening 21 in the table-top 20. This is desirable for the reason that it permits the attachment to be shifted for a limited extent backwardly or forwardly relatively to the sewing machine. This limited adjustment of the attachment allows the work pivot-spindle 47 to be positioned with respect to the sewing machine needle such that the work will more readily pass beneath the sewing machine presser-foot in a flattened condition. While the sewing machine illustrated in the accompanying drawings is of the conventional lock-stitch type, it is to be understood that the present attachment may be used in combination with any one of the various types of sewing machines regularly used in the trade, such for example as the chain-stitch, zigzag or hemstitch machine.

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

1. The combination with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, of a work-holder having a movable frame and a center movable relative to said frame about which the work may turn, means rendered effective by the action of the sewing machine feeding mechanism on the work for moving said frame relative to said needle, and means including a cam for moving said center relative to said frame to effect the production of a predetermined seam-pattern.

2. A work-feeding attachment in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support, an arm movable relative to said frame, a pivot-element journaled in said arm, means for clamping the work to said pivot-element, and means actuated by the turning of said pivot-element for bodily moving the same relative to said sewing machine needle for producing a stitch-pattern having a plurality of spaced continuous convolutions.

3. A work-feeding attachment in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support, first means for moving said frame, an arm movable on said frame, second means for

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moving said arm relatively to said frame, and a pivot-element journaled in said arm and providing a center about which the work turns, said pivot-element being disposed so that the turning thereof actuates said first and second means to effect a bodily displacement of the pivot-element relative to said sewing machine needle.

4. A work-feeding attachment in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support, means operable for moving said frame, an arm movable on said frame, a cam for moving said arm relative to said frame, and a pivot-spindle journaled in said arm and providing a center about which the work turns, said pivot-spindle being disposed so that the turning thereof actuates said means and said cam to effect a bodily displacement of said pivot-spindle relative to said sewing machine needle.

5. A work-feeding attachment in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support, first means including a gear system for moving said frame, an arm movable on said frame, second means effective for moving said arm relative to said frame, and a pivot-spindle journaled in said arm and providing a center about which the work turns, said pivot-spindle being disposed so that the turning thereof actuates said first and second means to effect a displacement of said pivot-spindle relative to said sewing machine needle.

6. A work-feeding attachment in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support, first means including a gear system for moving said frame, an arm movable on said frame, a pivot-spindle journaled in said arm and providing a center about which the work turns, and a cam mounted on said pivot-spindle and effective for moving said arm relative to said frame, said pivot-spindle being connected so that the turning thereof actuates said gear system.

7. A work-feeding attachment in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support and fitted with a cam-follower, means including a gear system acting between said frame and said support for moving said frame, an arm fulcrumed on said frame, a pivot-spindle journaled in said arm and providing a center about which the work turns, and a cam mounted on said pivot-spindle and cooperating with said cam-follower for moving said arm relative to said frame, said pivot-spindle being arranged so that the turning thereof under the rotation of the work actuates said gear system.

8. A work-feeding means in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a support, a frame movable on said support, first means rendered effective by the action of the sewing machine feed on the work for moving said frame relative to said support, means permitting an interruption in the driving relationship of said first means so that said frame

may be manually moved, a center about which the work turns supported by said frame and movable relative thereto, and second means for moving said center relative to said frame to effect the production of a predetermined stitch-pattern. 5

9. A work-feeding means in which the work rotates about a center adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed having an upper work-supporting surface, a frame movable on said bed, first means for moving said frame relative to said bed, manually controlled means accessible from the upper work-supporting surface of said bed for interrupting the driving relationship of said first means so that said frame may be manually moved, a center about which the work turns supported by said frame and movable relative thereto, and second means for moving said center relative to said frame to effect the production of a predetermined stitch-pattern. 10 15 20

10. A work-feeding means adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed having an upper work-supporting surface, a frame movable on said bed, means for moving said frame relative to said bed including a gear system carried by said frame, a rack disposed to mesh with one of the elements of said gear system and supported on said frame with capacity for movement into and out of meshing position, yielding means for urging said rack out of meshing position, and manually controlled means for moving said rack into its meshing position and locking the same in said position. 25 30 35

11. A work-feeding means adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed, a frame movable on said bed, means for moving said frame relative to said bed including a gear system carried by said frame, a rack having an operative position in which it meshes with one of the elements of said gear system and a retracted position in which it is out of mesh with the element of said gear system, means supporting said rack and including a member having a rack-positioning face defining the operative position of said rack, spring means for urging said rack away from said rack-positioning face and into its retracted position, and manually controlled means for moving said rack against the action of said spring means into contact with said rack-positioning face and locking the same against said face. 40 45 50 55

12. A work-feeding means adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed, a frame movable on said bed, means for moving said frame relative to said bed including a gear system carried by said frame, a rack having an operative position in which it meshes with one of the elements of said gear system and a retracted position in which it is out of mesh with the element of said gear system, means supporting said rack and including a member having a rack-positioning face defining the operative position of said rack, first spring means for urging said rack away from said rack-positioning face and into a retracted position, a manually turnable locking disk adapted for moving said rack into contact with said rack-positioning face, and a second spring means stronger than said first spring means interposed between said locking disk and said rack. 60 65 70 75

13. A work-feeding means adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed, a frame movable on said bed, means for moving said frame relative to said bed including a gear system carried by said frame, a rack having an operative position in which it meshes with one of the elements of said gear system and a retracted position in which it is out of mesh with the element of said gear system, means supporting said rack and including a member having a rack-positioning face defining the operative position of said rack, means supporting said member for limited adjustment of said rack-positioning face, spring means for urging said rack away from said rack-positioning face and into its retracted position, and manually controlled means for moving said rack against the action of said spring means into contact with said rack-positioning face and locking the same against said face. 15 20 25 30 35

14. A work-feeding means adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed, a movable work-holder having a center about which the work turns, a rack, means for moving said work-holder relative to said bed including a gear-system carried by said work-holder and meshing with said rack, said gear-system including a member carrying a plurality of gears and having an operating position in which less than all the gears carried by said member are in effective operation and another operating position in which all the gears carried by said member are in effective operation, and means for actuating said gear-system. 40 45 50 55

15. A work-feeding means adapted for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed, a movable work-holder supported by said bed, a pivot-spindle carried by said work-holder and providing a center about which the work turns, a rack, means for moving said work-holder relative to said bed including a gear-system carried by said work-holder and meshing with said rack, said gear-system including a gear fast on said pivot spindle, a member pivotally supported concentrically of the axis of said pivot-spindle and carrying a plurality of intermeshing gears driven by said pivot-spindle gear, said member having one operating position in which all the gears carried thereby are effective to drive said work-holder in one direction and another operating position in which less than all the gears carried thereby are effective to drive said work-holder in another direction, and means for driving said gear-system. 60 65 70 75

16. A work-feeding means in which the work rotates about a center for use with a sewing machine having work-feeding mechanism and stitch-forming devices including a needle, comprising, a bed, a frame movable on said bed, an arm movable on said frame, means for moving said arm relative to said frame, a pivot-spindle journaled in said arm and providing a center about which the work turns, a rack, means for moving said frame relative to said bed including a gear-system carried by said frame and meshing with said rack, said gear-system including a gear carried on said pivot-spindle, a member pivotally supported on said arm concentrically of the axis of said pivot-spindle and carrying a plurality of intermeshing gears driven by said pivot-spindle gear, said member having one operating position 75

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in which all the gears carried thereby are effective to drive said pivot-spindle bodily in one direction and another operating position in which less than all the gears carried thereby are effective to drive said pivot-spindle bodily in another direction, and means for driving said gear-system.

17. A spiral stitching device for sewing machines, comprising, a rotary work-holder, supporting means providing for translatory movement of said rotary work-holder, driving connections including a rack and pinion brought into effective action by rotation of said work-holder for imparting translatory movement to the work-holder, and cam-controlled means also brought into effective action by rotation of said work-holder for modifying the effective action of said driving connections in imparting translatory movement to the work-holder.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

	Number	Name	Date
	331,607	Binns	Dec. 1, 1885
	393,252	Mallet	Nov. 20, 1888
10	1,301,528	Weiss	Apr. 22, 1919
	1,470,932	Perras	Oct. 16, 1923
	1,577,640	Horton	Mar. 23, 1926
	1,588,001	Becker	June 8, 1926
	1,906,317	Grieb	May 2, 1933
	1,946,868	May	Feb. 13, 1934
15	2,236,421	Boettcher	Mar. 25, 1941