Nov. 6, 1934. H. PERLESZ 1,980,001

AUTOMATIC SEWING MACHINE

Filed Oct. 5, 1932 7 Sheets-Sheet 1

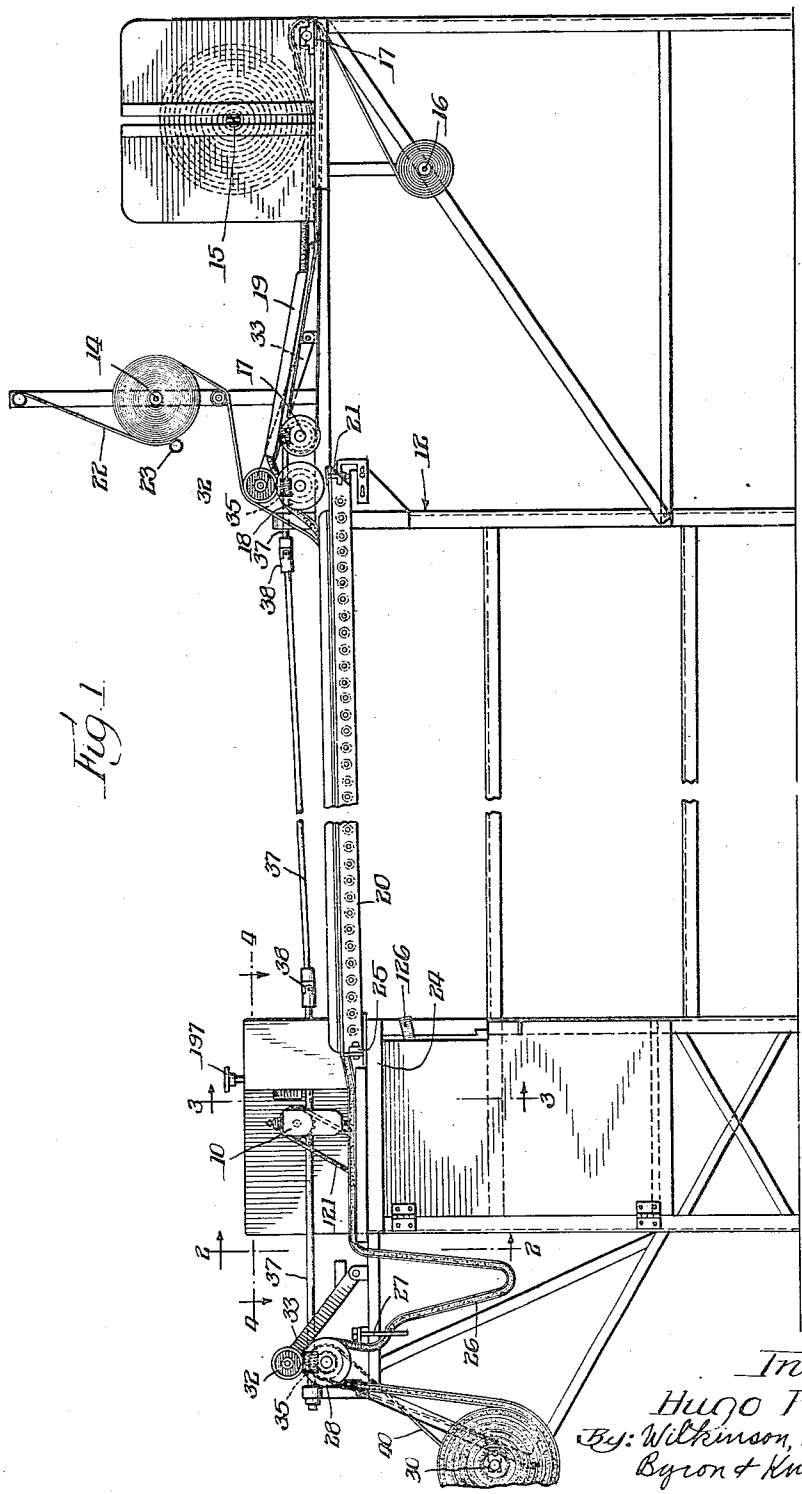

Fig. 1

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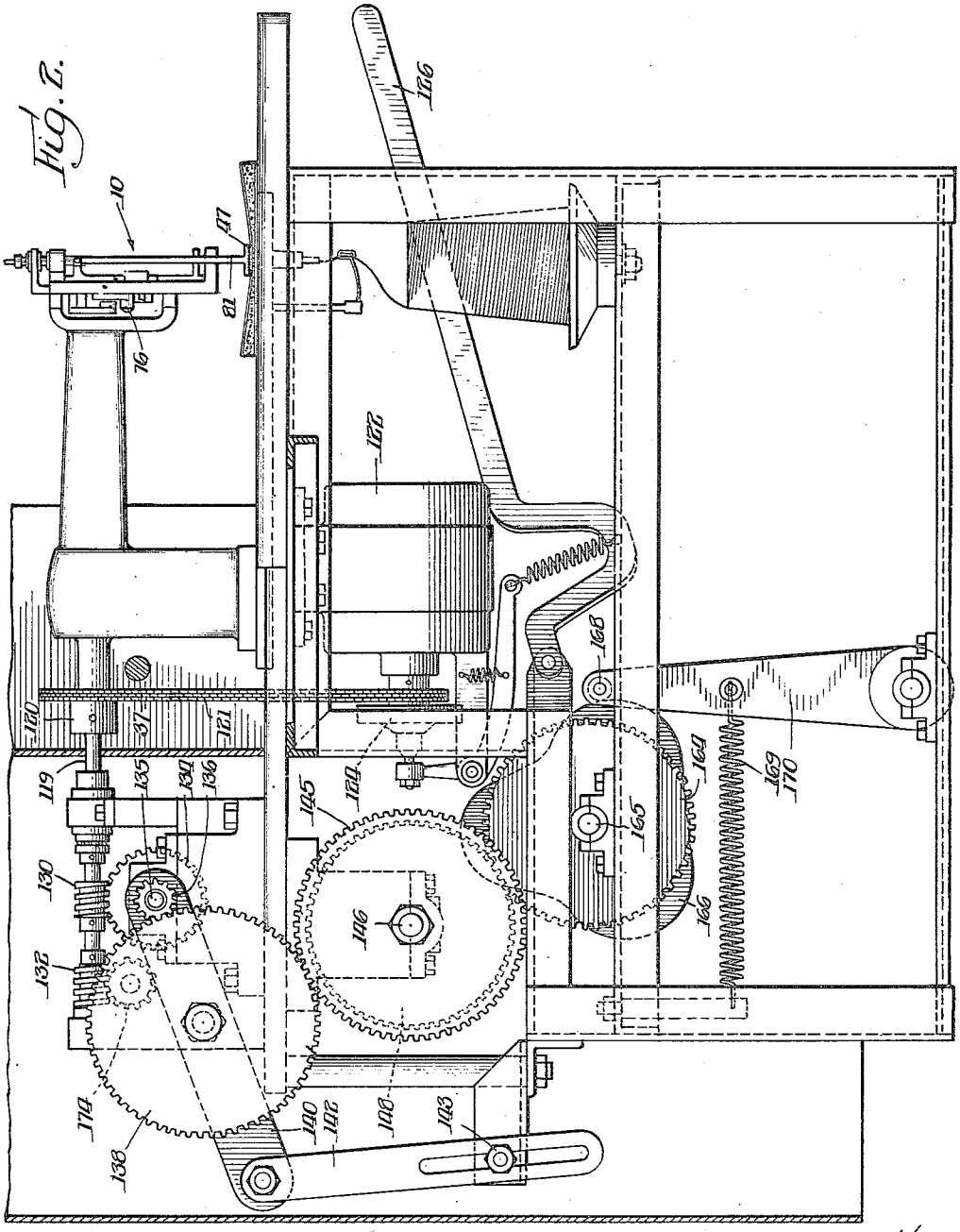
Fig. 2.



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AUTOMATIC SEWING MACHINE

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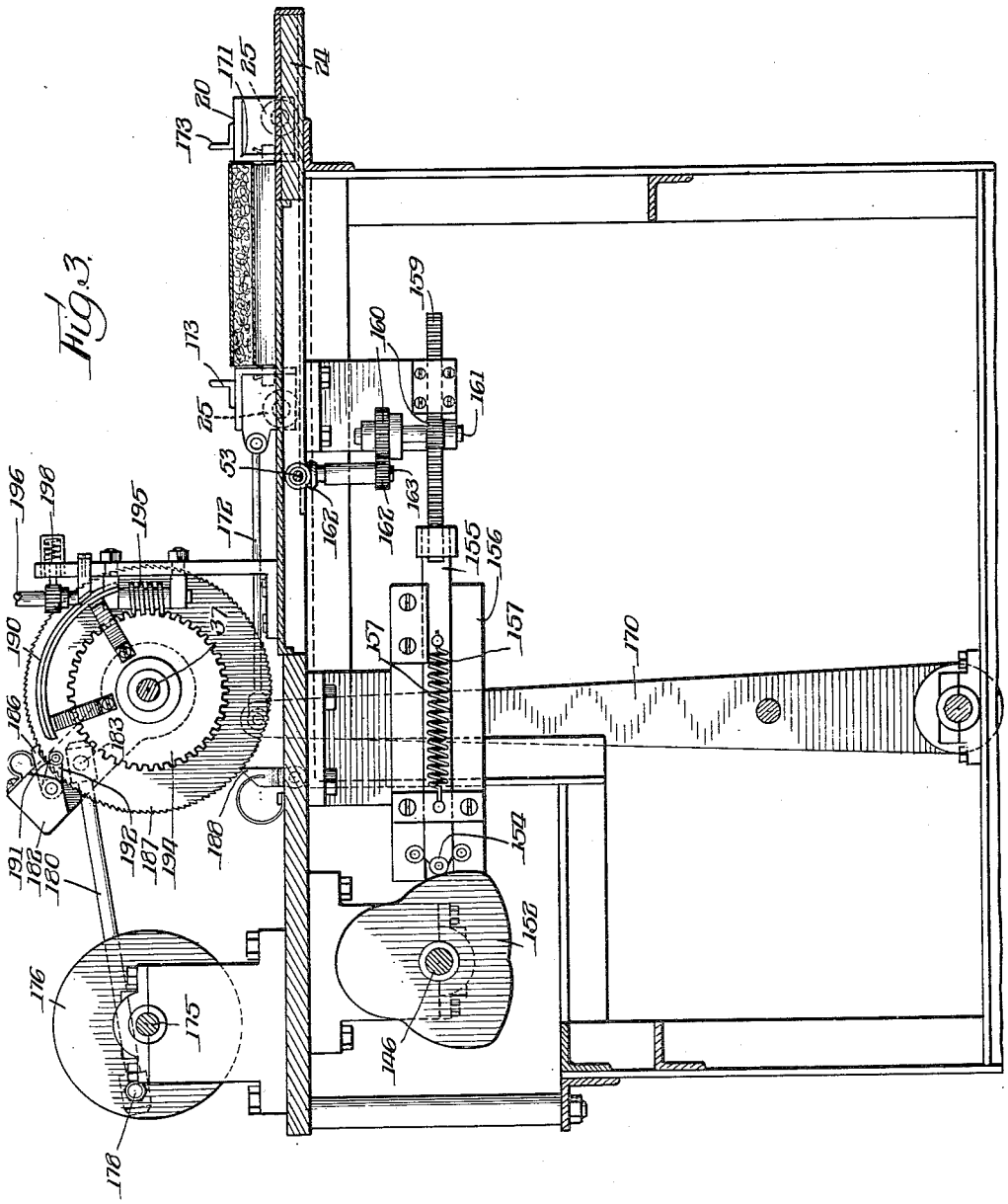
Fig. 3.



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AUTOMATIC SEWING MACHINE

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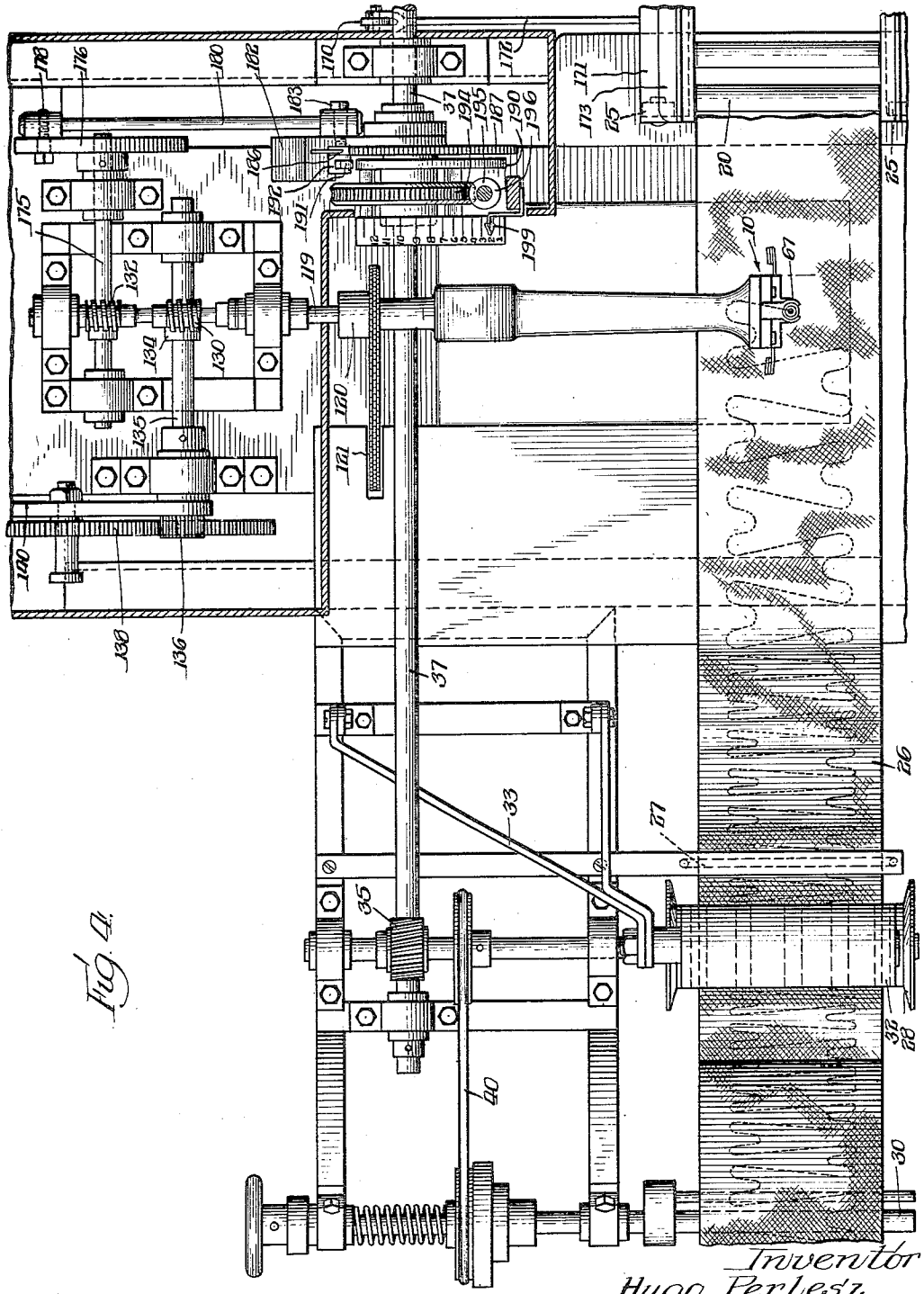

Fig. 4.

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AUTOMATIC SEWING MACHINE

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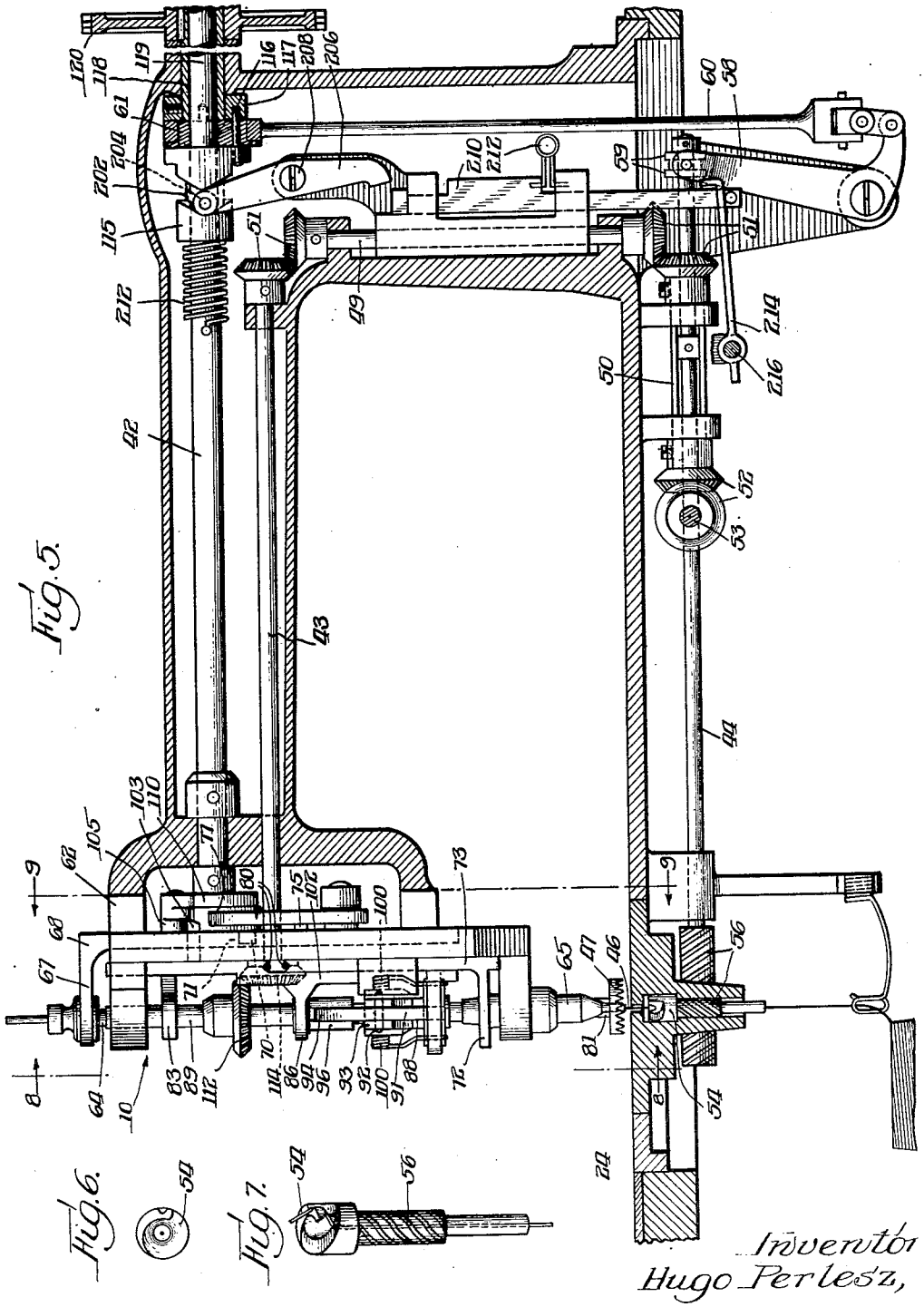

Fig. 5.

Fig. 6.

Fig. 7.

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AUTOMATIC SEWING MACHINE

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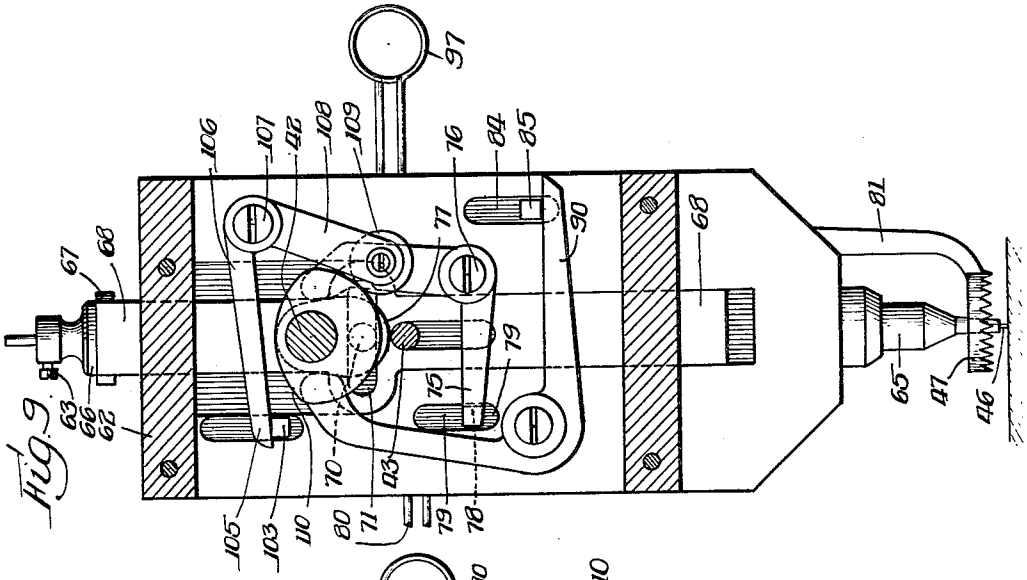

Fig. 9.

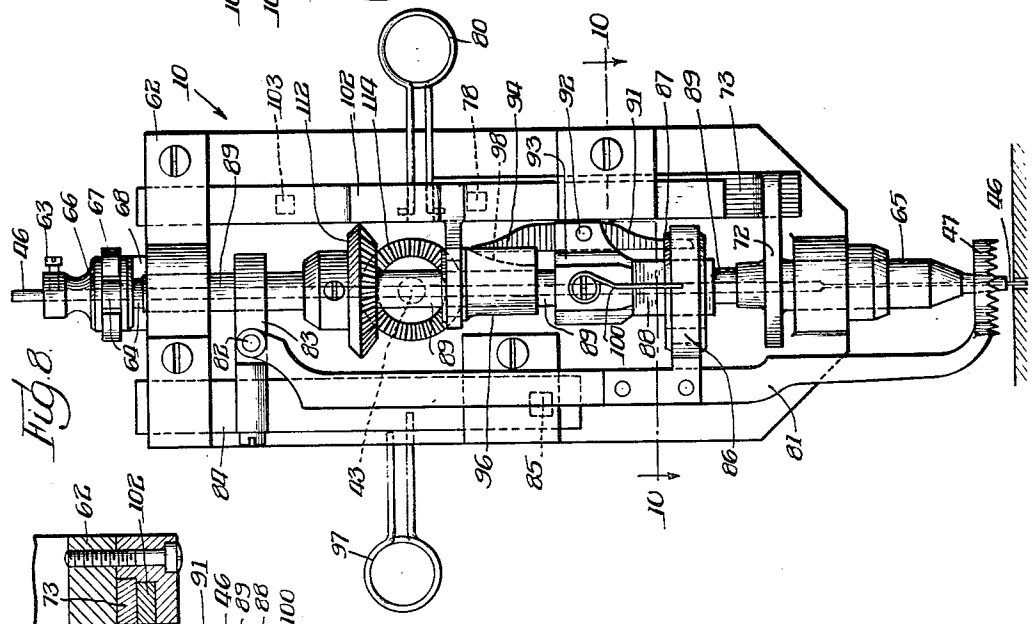

Fig. 8.

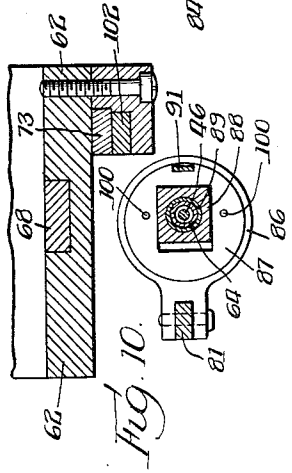

Fig. 10.

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AUTOMATIC SEWING MACHINE

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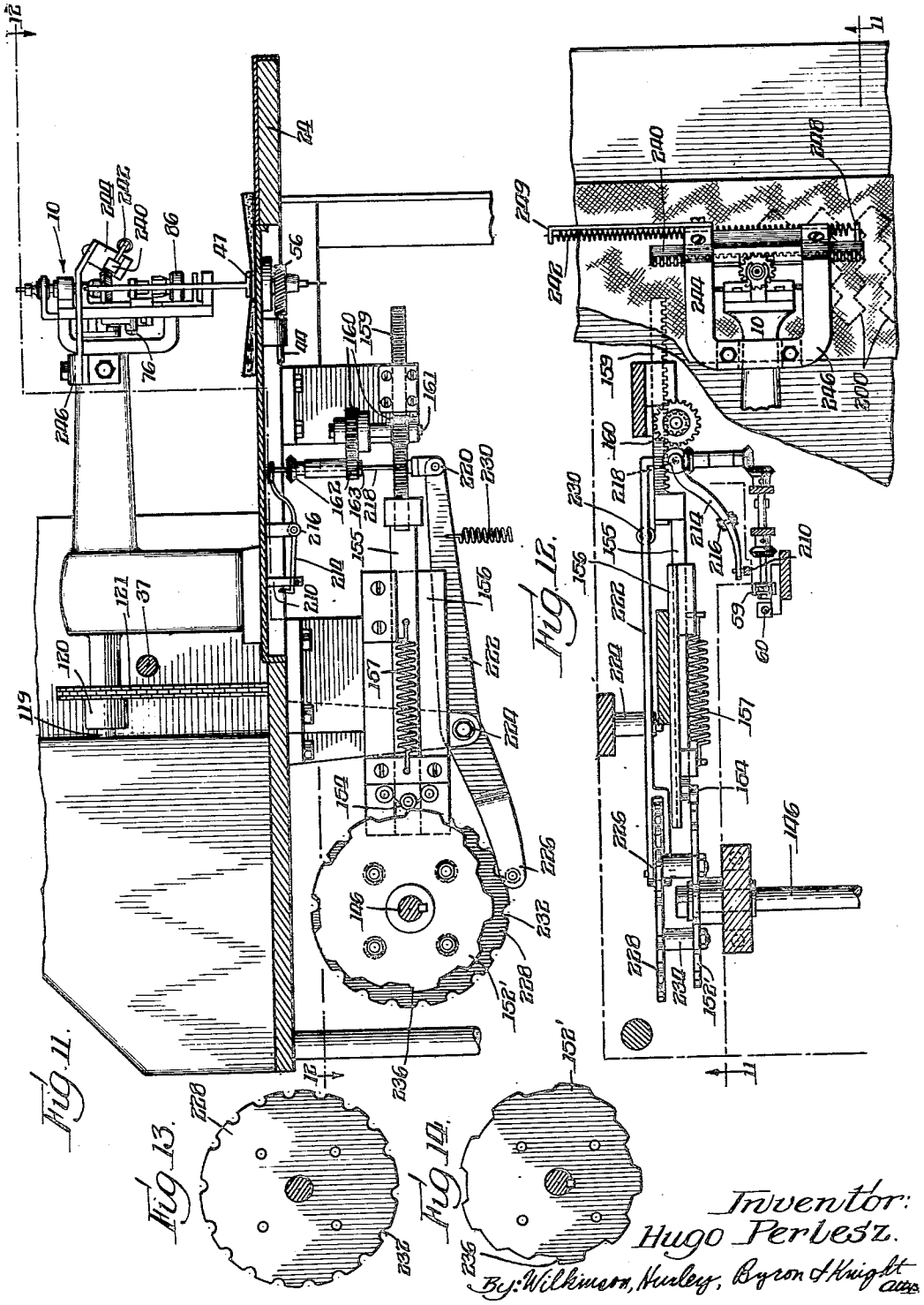

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

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UNITED STATES PATENT OFFICE

1,980,001

AUTOMATIC SEWING MACHINE

Hugo Perlesz, Chicago, Ill., assignor to Burton-Dixie Corporation, Chicago, Ill., a corporation of Delaware

Application October 5, 1932, Serial No. 636,275

15 Claims. (Cl. 112—2)

This invention relates to automatic sewing machines, and has been illustrated in a machine for automatically sewing such material as mattress border ticking and padding, according to a predetermined pattern. Machines similar to the stitching machine used in this invention, considered alone, have long been known and used in the art, but they have been controlled manually both as to their operation and as to the design. Usually it has been necessary to trace the design onto the material to be stitched and then to have an operator turn a handle to guide the stitching machine over the course previously marked. To attain any degree of speed at this work required long practice, during which time the machine being practiced upon was producing only a small portion of its normal output. Even with an experienced and skillful operator, the operation of the machine was costly, due to many interruptions necessary, and due to the high salary of the specially trained operator. Even with the best operators, mistakes were frequently made which either ruined or impaired the value of the product. Even small errors would leave visible the marking which had been applied to guide the operator.

The principal object of this invention has been to provide automatic means for performing such sewing operations, and thereby to eliminate the difficulties above discussed. Other objects of the invention have been to overcome various difficulties encountered in attaining this main object. For the purpose of overcoming these difficulties, the invention includes various special features, one of which is the means for feeding the material approximately as desired to the stitching apparatus, which apparatus includes means for exactly feeding the material to the needle, but which cannot function properly unless the approximate feeding means are provided. This approximate feeding means comprises means for feeding the material both longitudinally and laterally, and for varying the feeding in accordance with the particular requirements.

Another special feature comprises means for automatically stopping the stitching apparatus while the direction of movement of the exact feeding means is being altered. Still another special feature is found in the slack take-up mechanism for permitting the precise control of the exact feeding means.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings, which illustrate an embodiment of the device, and wherein like reference characters are used to designate like parts,

Figure 1 is an elevation of the apparatus giving special attention to the feeding devices;

Figure 2 is an elevation of the operating mechanism partly in section, taken through the line 2—2 of Figure 1;

Figure 3 is a similar view of other apparatus which is hidden by the apparatus shown in Figure 2 and taken through the line 3—3 of Figure 1;

Figure 4 is a plan view of a major portion of the apparatus;

Figure 5 is a sectional view taken through the sewing unit;

Figures 6 and 7 are plan and perspective views, respectively, of the looper;

Figure 8 is a front elevation of the sewing end of the sewing unit;

Figure 9 is a partly sectional rear elevation of the front end of the sewing unit; and

Figure 10 is a section through the line 10—10 of Figure 8; and

Figures 11, 12, 13 and 14 are views showing certain slight modifications of the apparatus, Figure 11 being a side elevation; Figure 12 a plan view, and Figures 13 and 14 being detail elevations.

In its illustrated form, the apparatus includes the stitching unit 10, and apparatus for feeding the material to be sewn to this stitching unit at the proper varying rates of speed. The feeding apparatus includes in addition to the operating mechanism which will be described below, the general frame 12 on which are supported spindles 14, 15 and 16 which carry the outer ticking, the padding and the inner ticking, respectively. These materials are fed by means of suitable rolls 17, feed roll 18 and the trough 19 into the proper relation with one another, and onto the guide conveyor 20 which is pivoted with the pivot 21, all substantially as shown. Wherever necessary a friction band 22 with the weight 23 attached thereto may be used for preventing any free running of the material, and thereby preventing the appearance of slack. The roller feeder 20, which will hereinafter be called the guide conveyor is supported on the sewing table 24, by means of rollers 25, so that that end of the guide conveyor may be shifted to properly feed the material to the needle as will be described. The sewn border is allowed to hang down in a loop 26 to prevent any distortion on the cloth from that end, and

is then fed through a wire guide 27 which is closed on all four sides, over the feed roller 28, from which it is wound on the shaft 30, a suitable spool being provided if desired. Above each of the feed rolls 18 and 28 are located pressure rolls 32, each of which rotates freely on a pivoted support bar 33. The two feed rolls 18 and 28 are rotated in unison, as by suitable worm gearing 35 for each roll, the worms being connected by shaft 37, which, if necessary, may be divided by universal joints 38. By thus turning the feed rolls 18 and 28 in unison, the material is fed at the same rate as the finished border is withdrawn, whereby the loop 26 is maintained at substantially the same size. In order to rotate the shaft 30 at a proper winding speed in spite of the increasing size of the roll, this shaft 30 is driven by the friction belt 40 at a sufficient speed to properly wind the material, when the roll is small, the belt 40 being loose enough to slip when the roll is large.

Stitching unit

As the scroll sewing unit, aside from the automatic control therefor, is already known and may be bought on the open market, no disclosure of this unit is necessary in this application except for the purpose of illustrating the co-action between the automatic control features and said unit. For that reason, the scroll sewing unit may not be shown as exactly as would otherwise be desirable. A general view of the sewing unit is found in Figure 5, and from this figure it is seen that there are three control shafts 42, 43 and 44. The shaft 42 is the primary operating shaft, rotated in a manner to be described, and operating both the needle 46 and the presser foot 47 for the purpose of stitching. The shaft 43 rotates the presser foot mechanism of the needle so as to vary its direction of movement, as will be described. Shaft 43 is driven through shaft 49 and sleeve 50 by suitable gearing 51, the sleeve 50 being rotated through suitable gearing 52 by shaft 53 in a manner to be described. As the sleeve 50 rotates the presser feed mechanism and needle through the shaft 43, it also rotates shaft 44 and through it the looper 54, the connection between the looper 54 and shaft 44 comprising the spiral gears 56. In this manner the presser foot needle and looper are all maintained properly aligned. It may be mentioned at this time that the looper 54 is given the necessary amount of rotation for each stitch by movement of the rod 44 and the resulting action between spiral gears 56. The longitudinal motion of shaft 44 is imparted to it by means of the bell crank 58 having a freely pivotal and rotatable connection with the shaft 44 at 59. This bell crank 58 is operated by the rod 60 which is vertically reciprocated by means of an eccentric 61 which rotates with the shaft 42. It follows, therefore, that the looper is rotated in both directions for each revolution of the shaft 42 and as will be seen also for each complete cycle of the needle 46.

The needle 46 extends entirely through the height of the head frame 62 shown in Figure 8, and is fastened in position by the set screw 63. This needle is carried in a hollow rod 64 which reciprocates and rotates with the needle. For the lower end of the needle there is provided a reciprocating guard 65, the action of which will subsequently be described. The hollow rod 64 is reciprocated by means of a collar 66 secured thereto, which freely rotates in the fork 67. As best shown in Figures 5 and 9, the fork 67 forms the upper end of a sliding bar 68 which will hereinafter be called the needle bar. This needle bar 68 is reciprocated by means of the main shaft 42 through an eccentrically mounted peg 70 which operates in a horizontal slot 71 in the needle bar 68.

The needle guard 65 is slidably mounted in the frame 62 and is vertically reciprocated through the collar 72 and the sliding bar 73, which will hereinafter be called the guard bar. This guard bar 73 is reciprocated by the bell crank 75 pivotally mounted on the frame 62 as at 76 and operated by the cam 77 which carries the above mentioned peg 70 and is keyed to the main shaft 42. The bell crank 75 has at its end a forwardly turned peg 78 which fits into a corresponding hole in the guard bar 73. As illustrated in Figure 9, a suitable slot 79 is provided in the back of frame 62 for the reciprocation of this peg. The guard bar 73 is normally pressed downwardly by means of a spring 80 so as to press the bell crank 75 against the cam. The needle guard 65 insures the proper drawing of each loop through the preceding loop.

The presser foot 47 is toothed and circular, as shown, so that it may move the cloth in any direction. It is supported by a presser lever 81 which is pivoted as at 82 to a pivoted bracket 83 which is pivoted in sliding bar 84 about an axis at right angles to that of the axis of the pivot 82. This double pivoting of course permits movement of the presser foot 47 in any direction. The presser lever 81 is shifted laterally in any direction by means of the collar 86 rigidly secured thereto, and which, as shown in Figure 8, is generally concentric with the needle 46. Rotatably mounted in this collar 86 is a feeder disk 87 which is laterally slidable on a guide block 88. The block 88 is rigidly mounted on a sleeve 89 which sleeve is rigidly secured to bevel gear 112 and suitably journaled in frame 62. The feeder disk 87 slides with the collar 86 and is provided with a slot therein into which fits the shift lever 91. The shift lever 91 is pivoted by a pin 92 to lugs on the collar 93 which collar is fixed on the rotatable sleeve 89. The other end 94 of the shift lever 91 is in the nature of a cam follower riding in a slot in the cam sleeve 96, which sleeve is keyed to the sleeve 89 for vertical reciprocation therein. The inner surface of said slot is shaped to form a cam 98 which as it is pressed down presses the end 94 of lever 91 outwardly, thereby pressing the other end inwardly, so that the shift disk 87 is shifted to the left with the parts in the position shown in Figures 8 and 9. The shift disk and associated parts are normally pressed in the opposite direction by the wire springs 100. The vertical movement of the cam sleeve 96 which causes this shifting is secured by means of the sliding bar 102 which hereinafter will be called the cam sliding bar. This cam sliding bar is vertically reciprocated in the frame 62 by the peg 103 which is outstanding therefrom and which is depressed by the arm 105 of the bell crank 106, which is pivoted about the pivot 107 to the frame 62. The other arm 108 carries a cam following roller 109 which rides on the cam 110 keyed to the main shaft 42.

The various presser-foot-shifting parts, namely the collar 93, cam sleeve 96, the guide block 88, and associated members, are keyed to the sleeve 89 so as to rotate therewith, and the sleeve 89 is keyed to the bevel gear 112. This bevel gear is rotated by the bevel gear 114 which is mounted on the shaft 43. The rotation of these parts changes the direction of movement of the presser

foot, and likewise changes the direction of the stitching.

Vertical movement of the presser foot is attained through raising the slide bar 84 by means of a lug 85 thereon and the bell crank 90 contacting said lug. This bell crank 90 is pivoted to the frame 62 and is operated by cam 77 as shown in Figure 9. The presser foot is normally pressed downwardly by spring 97. Of course, the usual manual means for raising the presser foot are provided, though they have not been shown. Shaft 42 is driven by a clutch cam sleeve 115 which is driven through the pin 116 carried thereby. This pin passes through eccentric 61 to drive the same and normally into a hole in the clutch collar 117 which is keyed to a sleeve 118, which is keyed to a shaft 119.

The shaft 119 and sleeve 118 are driven by the sprocket wheel 120 carried thereby, which as seen in Figure 2 is in turn driven by chain 121, which latter is driven by the motor 122 through a clutch 124 which is operated by the handle 126, as illustrated best in Figure 2.

Presser foot feed control

The shaft 119 also carries worm gears 130 and 132. The worm gear 130 through a worm wheel 134 drives the shaft 135 which drives the spur gear 136. The spur gear 136 meshes, as shown in Figure 2 with a spur gear 138 which latter is carried by a bar 140 pivoted about the shaft 135 and adjustable in any position by a suitable bracket 142 and securing nut 143. Gear 138 meshes with a similar gear 145, which latter is mounted on a shaft 146. Gears 138 and 145 are readily removable and may be replaced with gears of different ratios for reasons to be hereinafter described. Also keyed to the shaft 146 so as to turn with gear wheel 145 is another gear wheel 148, the purpose of which will later be described. As seen in Figure 3, a cam 152 is also secured to shaft 146, and it is preferably readily replaceable for reasons to be described. Cam 152 is provided with a cam follower 154 which is mounted at the end of a plunger 155. This plunger slides in a suitable guide-way 156 being urged toward the cam by spring 157. At the other end of the plunger 155 is a rack bar 159 which through suitable gears 160 on shaft 161 and gears 162 on shaft 163 turns the shaft 53 formerly described and shown in Figure 5. As this shaft 53 controls the direction of feeding of the presser foot, it is seen that cam 152 also controls said direction of feeding.

Guide conveyor shifting apparatus

As mentioned above, the shaft 146 carries a gear wheel 148. Meshing with this gear is a gear 164 keyed to the shaft 165 to which is also keyed a cam 166 (see Figure 2). A cam follower 168 rides on this cam, being drawn in contact therewith by spring 169. Through a suitable system of levers 170 and the connecting rod 172 (see Figure 3), the cam 166 and its follower 168 shift the guide conveyor 20 laterally. As above stated, the moving end of the guide conveyor is carried by rollers 25 for the purpose of facilitating its movement. The cam 166 is readily replaceable and is given a shape corresponding with the cam 152 so as to move the guide conveyor 20 substantially in accordance with the lateral movement of the work by the presser foot 47. In this manner excess lateral tension of the presser foot on the work is avoided. To keep the material properly aligned, the conveyor 20 may be provided with guards 171 and 173, the latter of which is preferably adjustable, and both of which may be if desired.

Approximate feeding mechanism

As previously stated, the worm 132 is carried on the shaft 42. Driven by the worm 132 through a suitable worm gear 174 (Figure 2 and Figure 4) is a shaft 175 to which is keyed the crank disk 176 (Figure 3). Suitably pivoted to the crank disk 176 at the point 178 is a connecting rod 180 which is also pivoted to the pawl head 182 by a suitable pivot 183. The pawl head is journaled on the shaft 37. Carried by the pawl head 182 is a suitable spring pressed pawl 186 which engages the ratchet wheel 187, reverse movement of which is prevented by suitable pawl mechanism 188. The ratchet wheel 187 is keyed to the shaft 37 which, as previously stated drives the feed rolls 18 and 29. If delicate adjustment is desired, each of the pawls 186 and 188 may comprise a series of separate pawls of slightly varying lengths.

With the apparatus thus far described under this heading, the forward feeding of the work would be constant, since each revolution of the crank disk 176 would turn the ratchet 187 a full stroke and therefore would turn the shaft 37 a corresponding amount. It is obvious, however, that when the pattern being stitched by the stitching machine is a wide pattern such as those shown in Figures 4 and 12, the forward movement of the work would be comparatively slow. It is therefore necessary to provide means to regulate the speed of the forward feeding of the work. This means is found in the pawl release segment 190 together with its means of adjustment and the follower roll 191. This follower roll is journaled in an arm 192 which is rigidly connected with the pawl 186 so that a raising of the follower roll 191 raises the pawl 186. During the active stroke of the pawl head 182 the follower roll 191 comes into engagement with the release segment 190 and is raised thereby to release the pawl 186 from the ratchet wheel 187. The remainder of the stroke of the pawl head 182 is therefore ineffective, the pawl 186 being held released by the release segment 190. In order to adjust the position of the release segment 190 it is mounted on a worm gear 194 which is freely carried by shaft 37 and may be turned by the worm 195. The worm 195 is in turn operated by the shaft 196 and handle 197. A spring detent mechanism 198 may be provided for facilitating and maintaining adjustment of the shaft 196. As a further aid in this adjustment the release cam 190 is calibrated, as shown in Figure 4, and a stationary index pointer 199 is provided.

When it is desired to change the pattern being sewn, it is ordinarily only necessary to change the cam wheel 152 and possibly also the cam wheel 166 and gear 145, and to adjust the segment 190. However, if it is desired to sew an angular pattern, such as that shown at 200 in Figure 12, certain other provisions may be necessary. Even without special provision, the pattern could be approximated fairly closely, but the appearance of such an angular pattern can be greatly enhanced by making all of the corners perfectly sharp and regular. When making special provision for such patterns, it is evident that since the machine continues to stitch while the rack 159 is being operated by the cam 152 there must be some stitching during such movement; that is, no matter how steep the cam surface may be, it cannot move the rack 159 instantaneously, and if there are only two

stitches taken during the period of movement of the rack, these two stitches will spoil the sharpness of the angle, since those two stitches together with the adjoining stitches break up the angle into three angles, which is in reality a curve rather than an angle. Another cause of imperfection is not so obvious, but in commercial machines there is a slight amount of play, and therefore when the presser foot control mechanism is turned first in one direction and then in another its positioning may vary slightly in the various instances, unless the play is removed. The means for overcoming these two difficulties are reasonably simple and thoroughly dependable.

The difficulty due to lack of sharpness of the angles is overcome by stopping the operation of the stitcher while the presser foot control mechanism is being turned for a new direction. On the hand operated machines already known, a clutch has been provided, and so this clutch may be shown somewhat diagrammatically. In Figure 5 it is seen that with the machine in its normal running condition the clutch pin 116 engages the clutch collar 117 in any one of a number of circumferential holes provided in the collar 117. This pin is carried by the cam sleeve 115 which is slidably keyed to the shaft 42. The pin also passes through the eccentric 61, so that both the eccentric 61 and the shaft 42 are driven by the collar 117. Riding in the cam groove 202 in the sleeve 115, is the cam follower 204 mounted on the upper end of the clutch finger 206, which is pivoted at its midpoint to the screw 208. During normal operation of the machine, the clutch finger 206 is constantly oscillated by the cam sleeve 115 having no effect at such time. However, when it is desired to operate the clutch to stop the machine, the sliding clutch bar 210 may be raised by the spring 212 to block the movement of the lower end of the clutch finger 206. When the movement of the clutch and finger is thus stopped, the reaction between the cam groove 202 and the cam follower 204 is now immovable and has the effect of sliding the cam sleeve 115 to the left. This drives the clutch pin 116 out from its hole in the clutch collar 117, permitting the shaft 42 and the eccentric 116 to stop. Although the stitching mechanism comes to a standstill the shaft 119 continues to rotate. When the clutch bar 210 is again lowered, the clutch finger 206 is released, with the result that the cam sleeve 115 is shifted inwardly by the spring 212 until the pin 116 again engages a hole in the clutch collar 117, at which time the normal operation of the stitching mechanism is resumed.

The clutch rod 210 may be drawn down to its inactive position by means of the lever 214, which is pivoted to the machine frame in any suitable manner, at 216. The control of the lever 214 is best shown in Figures 11 and 12. It may be explained at this point that although all the figures illustrate a single machine (except for the changed cams and the like) the special features of Figures 11 and 12 have been omitted from most of the other figures for the sake of clarity. The shaft 163 previously mentioned is hollow and a push rod 218 is slidably mounted therein. The upper end of this push rod engages the extremity of the lever 214, as shown best in Figure 11. The lower end of the push rod 216 is mounted on the stirrup 220, which is pivoted to the lever 222, which latter is pivoted at its midpoint by a suitable pin 224, and at its opposite end carries a cam follower roller 226. This cam follower roller 226 engages a cam 228 which is mounted on shaft 146, being pressed against this cam by a suitable spring 230. It is therefore seen that when the cam 228 shifts the cam follower 226 downwardly, this raises the rod 218 and lowers the bar 210, causing the engagement of the clutch and the operation of the stitching mechanism. On the other hand, when the cam follower 226 is pressed into a notch 232 under the influence of the spring 230, the spring 212 is rendered effective for raising the clutch bar 210 and causing disengagement of the clutch and thereby stopping the stitching mechanism.

The cam 228 is a companion cam for a cam 152' which is substituted for the cam 152 when the pattern shown in Figure 12 is desired. As shown in Figures 11 and 12 these two cams may be joined together by bolts or other suitable means, being properly spaced by spacers 234. This permits a more ready substitution of cams 152' and 228 for cam 152. The relation of the cams 228 and 152' with respect to their followers 226 and 154 is such that the follower 154 is only operated during such time as the follower 226 is pressed into one of the notches 232. In other words, the cam 152' changes the direction of movement of the presser foot only when the stitching mechanism of the presser foot is stationary.

The sequence of operations of this feature may be briefly stated to make the structure more clear. While the cam follower 226 rides in its outer position, the stitching apparatus operates, moving the material to sew in a given line. As this line is completed, the cam 228 turns to a position such that the follower 226 rides into the notch 232, stopping the machine by permitting the slide bar 210 to raise into engagement with the clutch finger 206. While the stitching mechanism and presser foot are thus stopped, the cams 228 and 152' continue to rotate, since the shaft 119 is not stopped. Immediately after the follower 226 rides into the notch 232 the follower 154 will strike one of the inclined surfaces 236, which through the rack 159, gears 160, shaft 53, gears 52, and other structure shown in Figure 5, including the shaft 43, turns the guide block 88 and associated structure to a new position. As the cam 228 continues to rotate, the follower 226 rides out of the notch 232 permitting the clutch pin 116 to again engage 117, whereby the stitching mechanism and the presser foot are again operated. Since the guide block 88 has been turned to a new position, the presser foot now moves the material in a new direction at a sharp angle with respect to its old direction. The term sharp angle is used not in the sense of meaning acute, but in the sense of meaning a clean angle, as distinguished from a curve or a series of irregular angles.

To secure further regularity in the angular patterns, a slack take-up structure is provided. This structure is shown best in Figures 11 and 12, being omitted from the other figures for the sake of clarity. As previously described, the presser foot directional structure is directly controlled by the bevel gear 112. Due to the fact that all of the directional control means are controlled from this gear by snug sliding joints, the play between this gear and the directional control means is negligible, if not non-existent. Therefore, when the slack which is accumulated from the cam 152' to the gear 112 is taken up there will be no trouble from this source.

This is done by providing a rack 240 arranged to mesh with the gear 112 and constantly drawn in a given direction by a spring 242. The rack

240 is of course slidably supported in a suitable guide-way 244 which may be secured to the stitching machine frame by suitable arms 246, as shown. The spring 242 may be drawn between a peg 248 on the sliding rack 240 and the arm 249, extending from the arm 246. The teeth on the rack 240 may be quite loosely cut with respect to the teeth on the bevel gear 112, in order to make this gearing operative, and, if desired, may mesh with the bevel gear only in a narrow zone. Of course, if desired, an extra gear or special teeth may be provided on the bevel gear more suitable for meshing with a straight rack. The effect of this rack and spring is obviously to tend to rotate the bevel gear in one direction, taking up the slack in that direction, so that the bevel gear exactly follows the control imposed upon it by the cam 152'. It follows that the guide block 88 and therefore the direction of movement of the presser foot would likewise be truly and exactly controlled by the cam 152'.

Operation

The machine is prepared for use by drawing the material from the rolls on the shafts 14, 15 and 16 between the feed roll 18 and pressure roll 32, as shown, and on to the guide conveyor 20. When the machine has been prepared in the usual way by drawing the thread from the spool, as diagrammatically shown at the bottom of Figure 5, through the looper 54, to provide a loose end above the table 24, the work may be placed under the presser foot, which, in the meantime may have been held in a raised position by suitable mechanism, not shown. The motor is then started and the clutch 124 engaged by operation of the handle 126. The motor 122 then drives shaft 119, which operates the sewing mechanism and the feeder mechanism in the following manner:

Through the mechanism shown in Figures 5 to 8, the shaft 119 reciprocates the needle 46 and also actuates the presser foot 47 with a feeding movement, the direction of feeding depending on the position of the guide block 88, the lever 91, cam sleeve 96, and associated mechanism. The position of this mechanism is determined by the shaft 43, which is operated through the shafts 49, 50 and 53 and through the rack 159 and slide bar 155 by the cam 152. Accuracy of control is obtained through the use of the slack take-up mechanism comprising sliding rack 240 and spring 242. Also operated by the shaft 42 is the needle guard 65 and the looper 54 which cooperate with the needle to produce stitching in any well known manner. When it is desired to sew a pattern with sharp angles, the clutch (see 116—Figure 5) between shafts 119 and 42 is disengaged under the control of an extra cam 228 during changes of direction at the angles to stop the stitching mechanism. When a pattern is not angular, and no cam such as 228 is provided, suitable means may be provided for maintaining the clutch in its engaged position, or the clutch releasing mechanism may be disconnected.

The work is supplied to the presser foot through mechanism which may be called "approximate feeding apparatus" and which is also operated by the shaft 119. The worm gear 130 through suitable gearing, turns the cam 166 which through the lever system 170 shifts the conveyor guide 20 laterally in synchronism with the lateral movement of the work by the presser foot 47. The worm drive 132 through the gear ratchet wheel and pawl described, drives the shaft 37 intermittently and at an average speed which may be regulated by turning the handle 197 to feed the material at the average speed with which it is drawn forward by the presser foot 47. After a suitable quantity of the work has been sewn, it may be fed through the guide 27 to feed roll 28, and wound around the winding shaft 30 by which it is wound into a suitable roll.

It is thus seen that not only is the work fed to the needle by the presser foot according to a definite and exact design which may be varied by changing the cam 152', but also the work is synchronously fed to the presser foot by the guide conveyor 20 and the feed rolls 18 and 28, to enable the presser foot to function properly without distortion of the cloth.

This invention has numerous advantages over hand operated stitching machines. Its speed is limited only to the maximum speed of the stitching unit, and it can maintain this maximum speed even though it is quilting as well as merely sewing a design. When the quilting is attempted by hand there must be frequent delay to arrange the padding. The centering of the padding by hand is extremely slow when the padding is not as wide as the outer ticking, but presents no difficulties to the machine of this invention. This machine secures perfect uniformity of design without the use of a stencil, and consequently without the accompanying difficulties of centering the stencil. The exact centering of both the design and the padding is essential, because the edges of the border strip are used to form rolls around the periphery of the mattress.

It is to be understood that many other embodiments of the invention, including some in improved form, will be apparent, and in the course of time more will be devised by those skilled in the art. It is not desired that this invention be limited to the details described, for its scope includes all such forms or improvements as come within the spirit of the following claims, construed as broadly as the prior art will permit.

What is claimed is:

1. The combination of a sewing machine including a presser foot for feeding the work to the needle exactly as required, means for automatically altering the direction of feeding of the presser foot, and auxiliary feed means acting contemporaneously with the presser foot but independently of its contact with the cloth for automatically supplying the material to said presser foot approximately as required to maintain it free from tension or distortion.

2. The combination of a sewing machine including a presser foot for feeding the work to the needle exactly as required, means for altering the direction of feeding of the presser foot, means to supply a long strip of material to said presser foot, and auxiliary feed means acting independently of the contact of said presser foot with the material to shift the portion of the material adjacent said presser foot laterally substantially in synchronism with the lateral feeding movement of said presser foot.

3. The combination of a sewing machine including a presser foot for feeding the work to the needle exactly as required, means for altering the direction of feeding of the presser foot, adjustable means for feeding the material forwardly to said presser foot, and means for shifting said material laterally in synchronism with the feeding movement of said presser foot.

4. The combination of a sewing machine including a stitching mechanism, presser foot mech-

anism for feeding material to said mechanism, and means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing mechanism, and auxiliary feed means acting independently of the contact of said presser foot with the material for bodily shifting the portion of the material being sewn which substantially surrounds the presser foot to supply said material to said presser foot without tension or distortion.

5. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, and means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, control mechanism driven synchronously with said sewing machine, said control mechanism including a cam, a cam follower, a rack operated by said cam follower, gearing driven by said rack for operating said direction shifting mechanism, and auxiliary feed means acting independently of the contact of said presser foot with the material for bodily shifting the portion of the material being sewn which substantially surrounds the presser foot to supply said material to said presser foot substantially without tension or distortion.

6. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, and means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, a control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing means, means for forwardly feeding material to said presser foot, and means for laterally guiding said material in synchronism with the lateral feeding of said presser foot.

7. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, and means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, a control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing means, means for forwardly feeding material to said presser foot, means for laterally guiding said material in substantial synchronism with the lateral feeding of said presser foot, said means for forward feeding including a ratchet wheel, an oscillating pawl normally engaging said ratchet wheel, and adjustable means for altering the active stroke of said pawl.

8. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, means for changing the direction of the feeding action of said presser foot with means for driving said sewing machine, a control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing means, means for forwardly feeding material to said presser foot, means for laterally guiding said material in substantial synchronism with the lateral feeding of said presser foot, said means for forward feeding including a ratchet wheel, an oscillating pawl having a constant stroke, normally engaging said ratchet wheel, and adjustable means for disengaging said pawl from said ratchet wheel through part of its stroke.

9. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, means for changing the direction of the feeding action of said presser foot with means for driving said sewing machine, a control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing means, means for forwardly feeding material to said presser foot, means for laterally shifting said material in substantial synchronism with the lateral feeding of said presser foot, said means for forward feeding including a ratchet wheel, an oscillating pawl, normally engaging said ratchet wheel, adjustable means for disengaging said pawl from said ratchet wheel through part of its stroke, and two sets of feeding rolls for feeding the material uniformly to and from said presser foot.

10. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, means for changing the direction of the feeding action of said presser foot with means for driving said sewing machine, a control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing means, means for forwardly feeding material to said presser foot, means for laterally guiding said material in substantial synchronism with the lateral feeding of said presser foot, said guide means comprising a laterally shiftable conveyor over which the material is forwardly fed, and cam driven mechanism for shifting said conveyor.

11. The combination of a sewing machine including a presser foot for feeding the work to the needle exactly as required, means for automatically altering the direction of feeding of the presser foot, auxiliary feed means acting contemporaneously with the presser foot but independently of its contact with the cloth for automatically supplying the material to said presser foot approximately as required to maintain it free from tension or distortion, and means for automatically stopping the feeding operation of the presser foot during operation of said direction altering means.

12. The combination of a sewing machine including a presser foot for feeding the work to the needle exactly as required, means for automatically altering the direction of feeding of the presser foot, auxiliary feed means acting contemporaneously with the presser foot but independently of its contact with the cloth for automatically supplying the material to said presser foot approximately as required to maintain it free from tension or distortion, and means for automatically stopping the operation of the presser foot and of the needle during the operation of said direction altering means.

13. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, and means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing mechanism,

and auxiliary feed means acting independently of the contact of said presser foot with the material for bodily shifting the portion of the material sewn which substantially surrounds the presser foot to supply said material to said presser foot without tension or distortion; said auxiliary feed means comprising measuring feed means for feeding the material toward the presser foot and measuring feed means for drawing the material from the presser foot, and means to drive both said measuring feed means at the same speed so that slack may be maintained between them.

14. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing mechanism, and auxiliary feed means acting independently of the contact of said presser foot with the material for bodily shifting the portion of the material sewn which substantially surrounds the presser foot to supply said material to said presser foot without tension or distortion; said auxiliary feed means comprising measuring feed rollers for feeding the material toward the presser foot, and measuring feed rollers for driving the material from the presser foot, and means to drive both said measuring feed rollers at the same speed so that slack may be maintained between them.

15. The combination of a sewing machine including a stitching mechanism, presser foot mechanism for feeding material to said mechanism, and means for changing the direction of the feeding action of said presser foot, with means for driving said sewing machine, control mechanism driven synchronously with said sewing machine, said control mechanism including means for operating said direction changing mechanism, and auxiliary feed means acting independently of the contact of said presser foot with the material for bodily shifting the portion of the material sewn which substantially surrounds the presser foot to supply said material to said presser foot without tension or distortion; said auxiliary feed means comprising measuring feed means for feeding the material toward the presser foot and measuring feed means for drawing the material from the presser foot, means to drive both said measuring feed means at the same speed so that slack may be maintained between them, and means for shifting a portion of the material between said measuring feed means and adjacent said presser foot laterally substantially in synchronism with the lateral feeding of said presser foot.

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