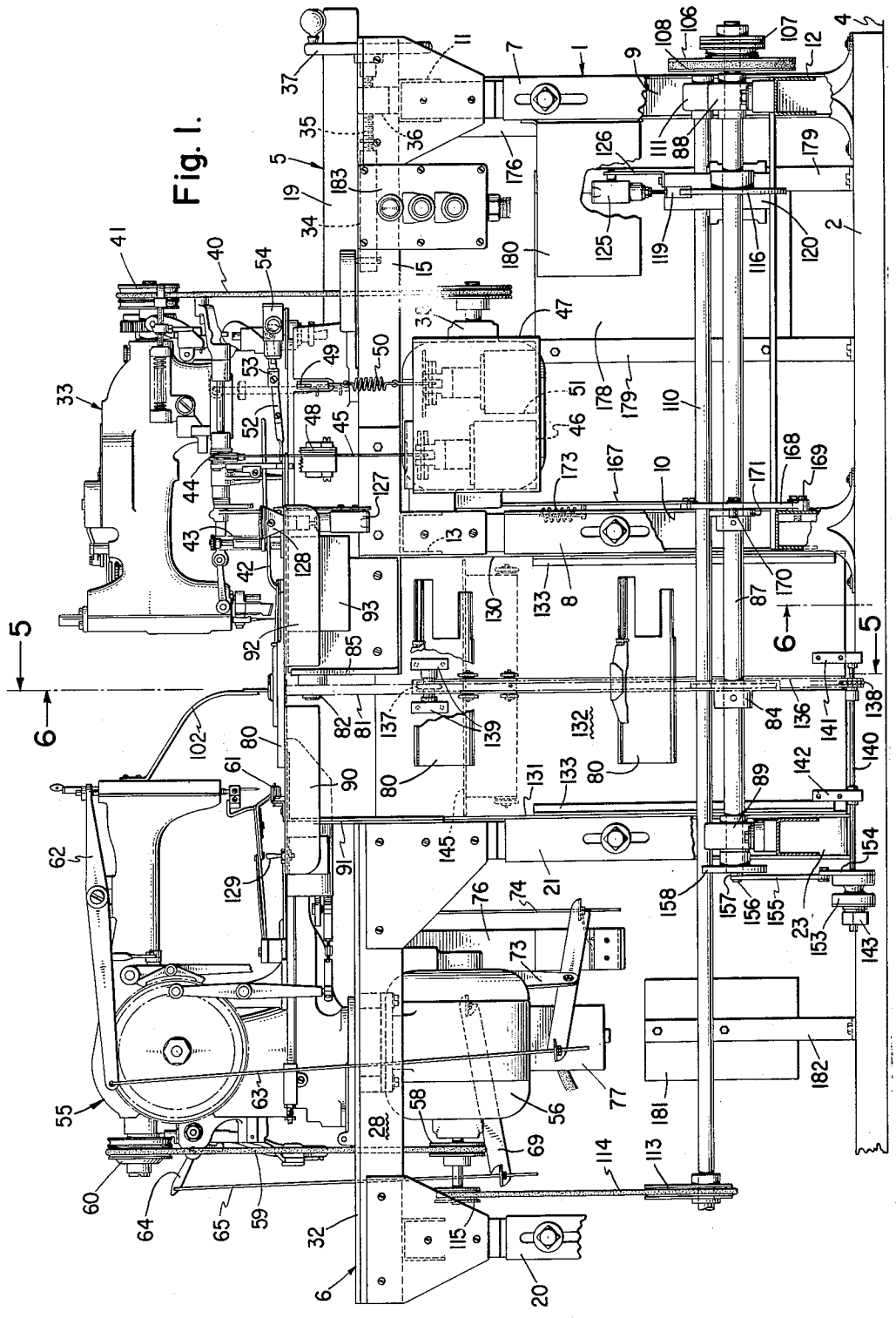
May 23, 1961 G. J. ABEL ET AL 2,985,122

AUTOMATIC SEWING MACHINES

Filed Nov. 25, 1957 8 Sheets-Sheet 1

Fig. 1.



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AUTOMATIC SEWING MACHINES

Filed Nov. 25, 1957 8 Sheets-Sheet 2

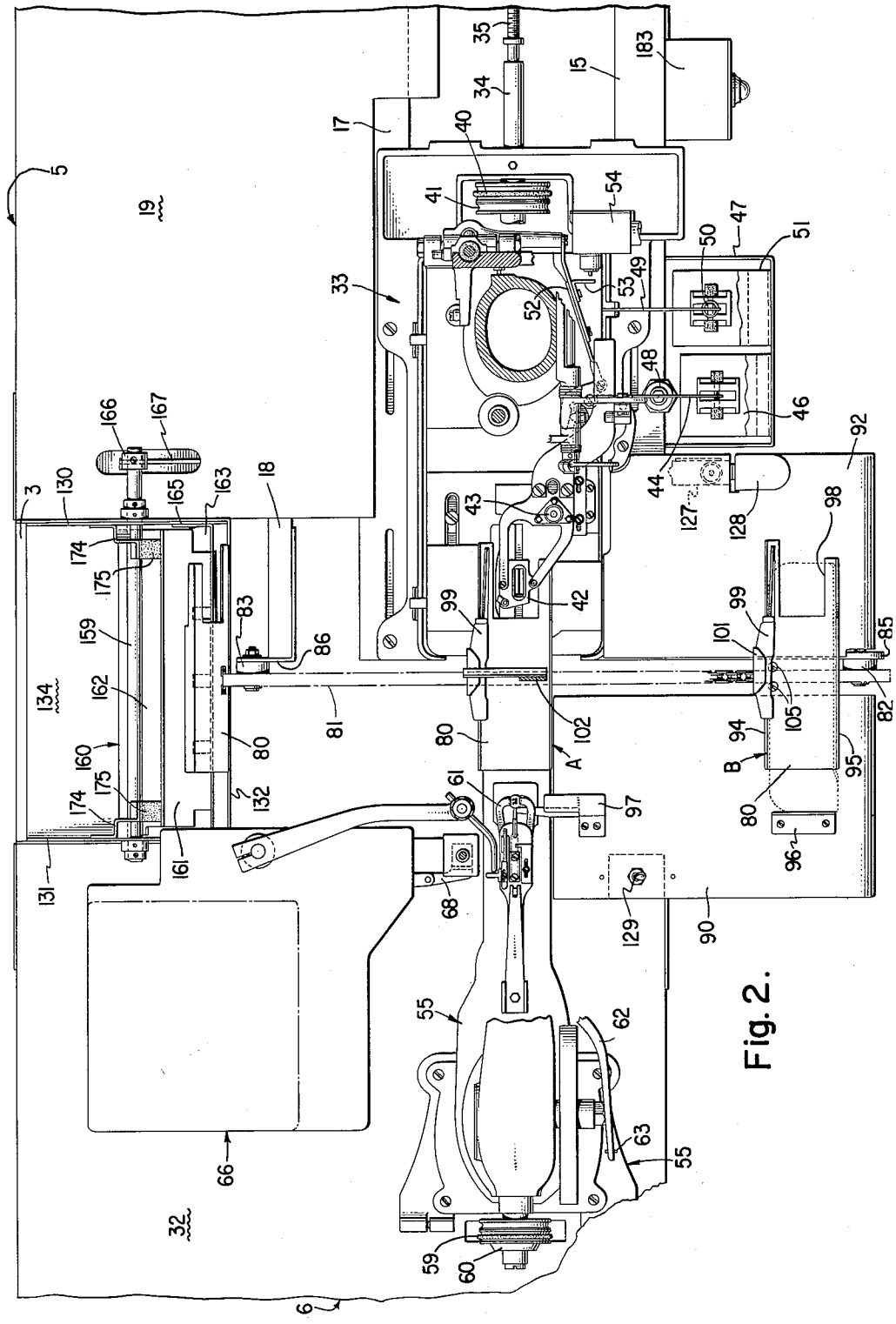

Fig. 2.

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AUTOMATIC SEWING MACHINES

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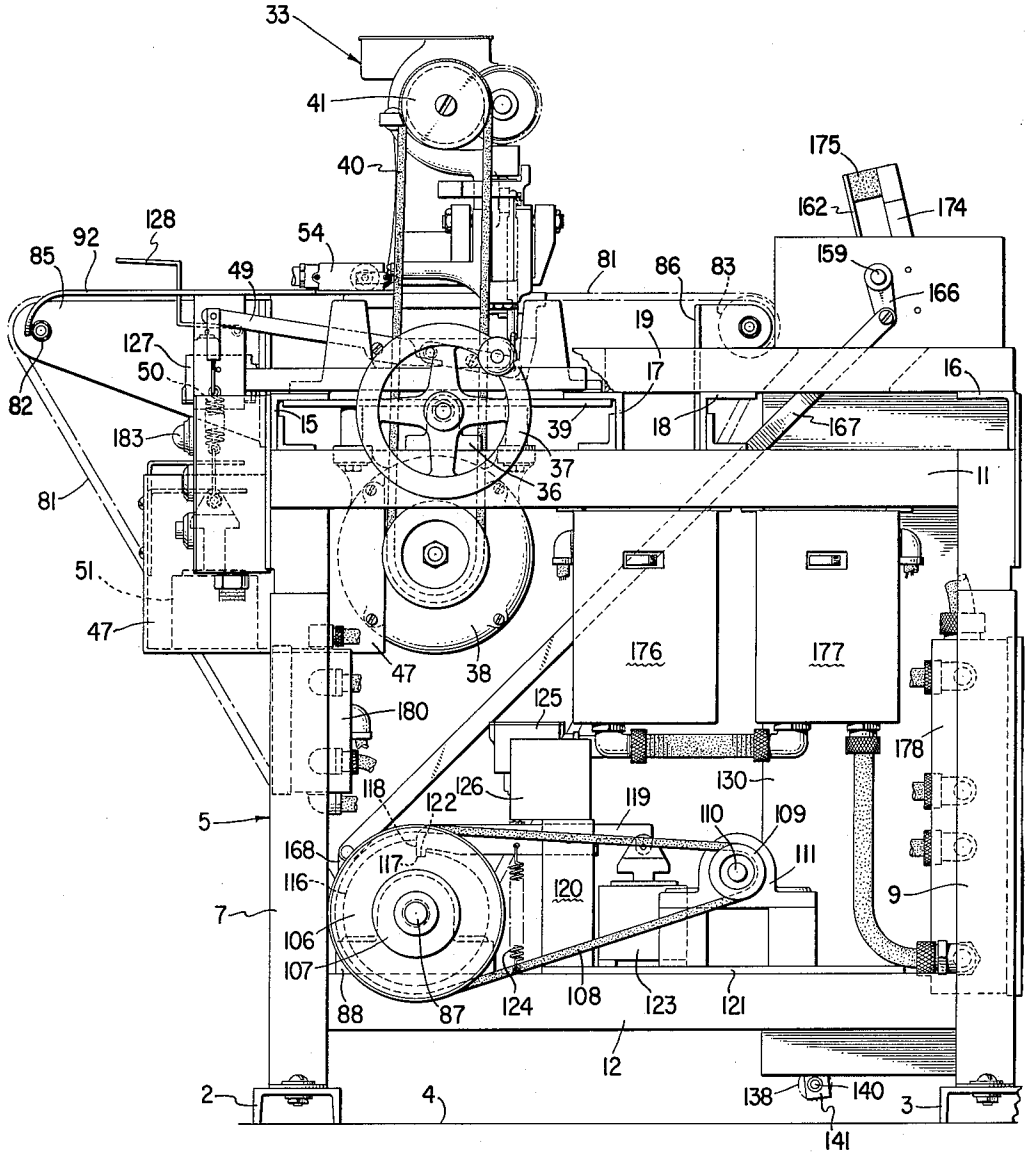

Fig. 3.

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AUTOMATIC SEWING MACHINES

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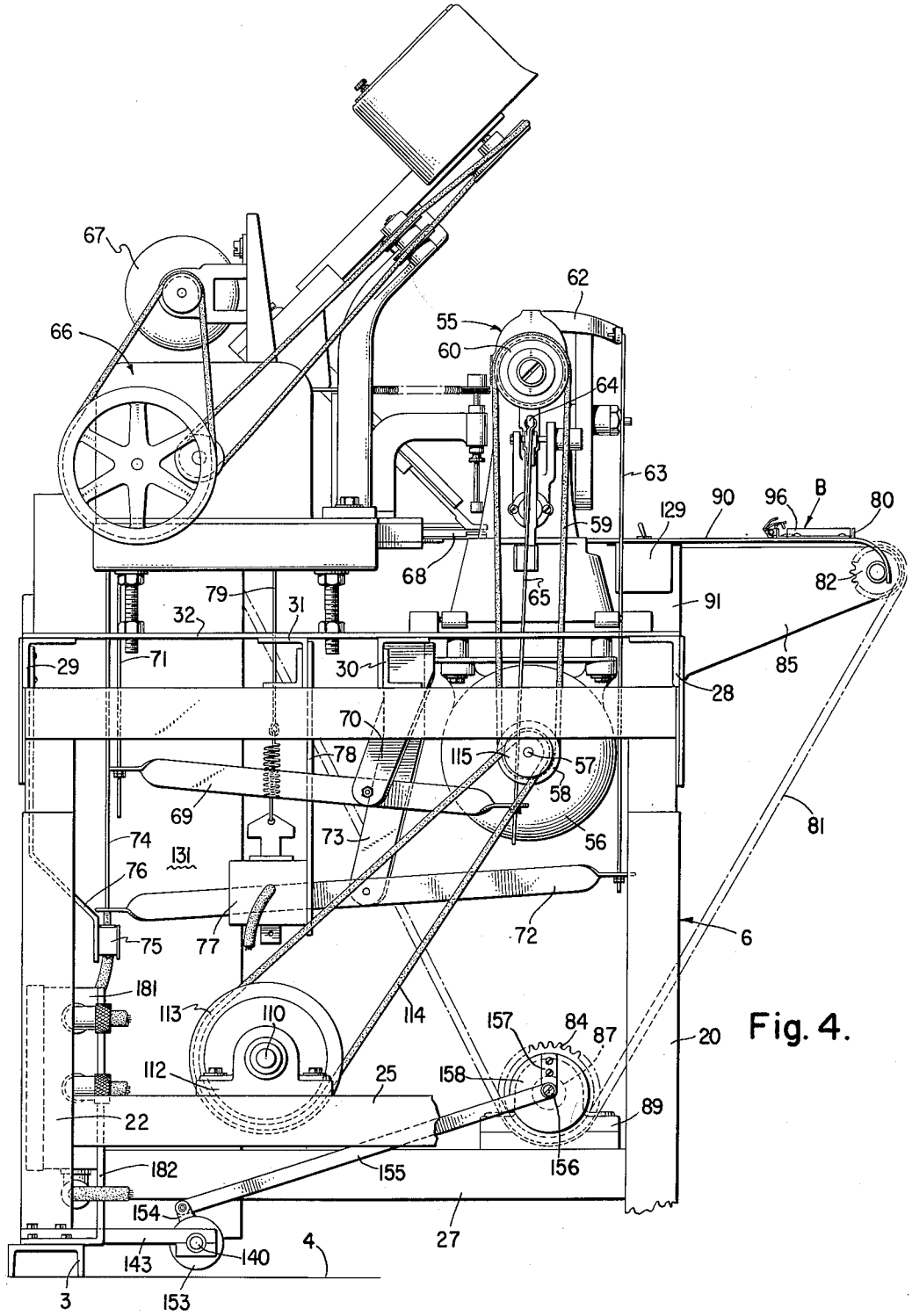

Fig. 4.

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AUTOMATIC SEWING MACHINES

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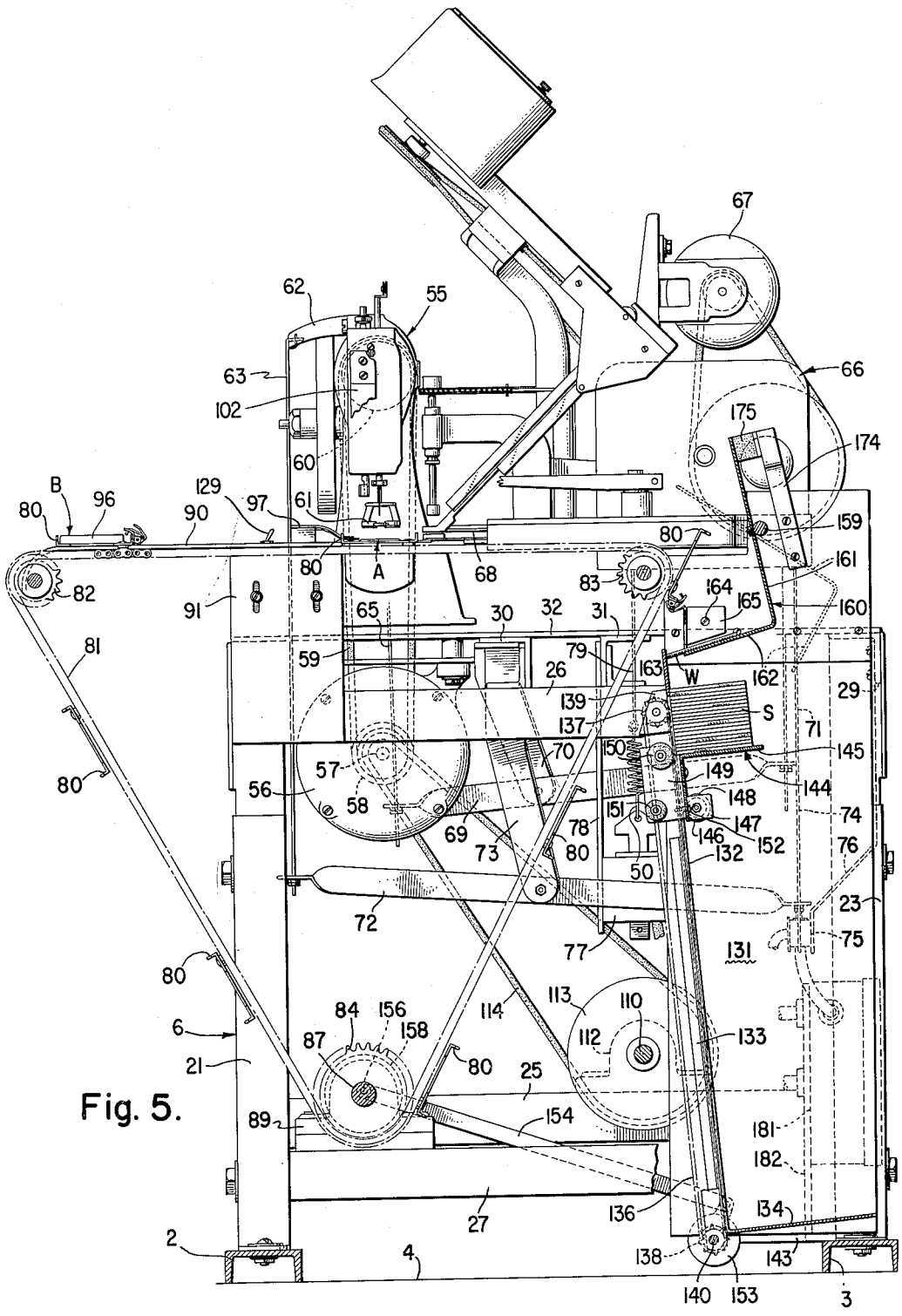
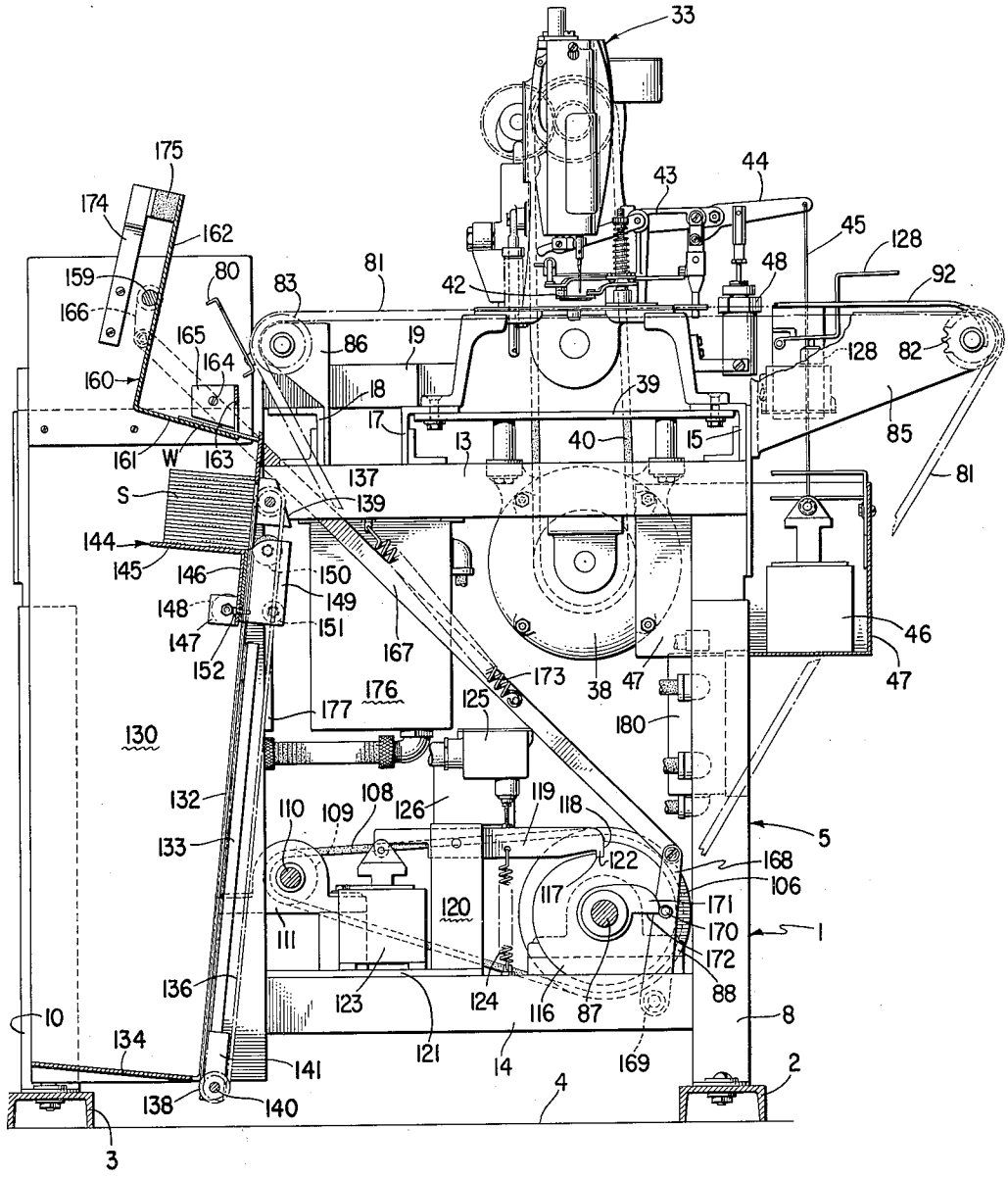


Fig. 5.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3

Fig. 6.

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AUTOMATIC SEWING MACHINES

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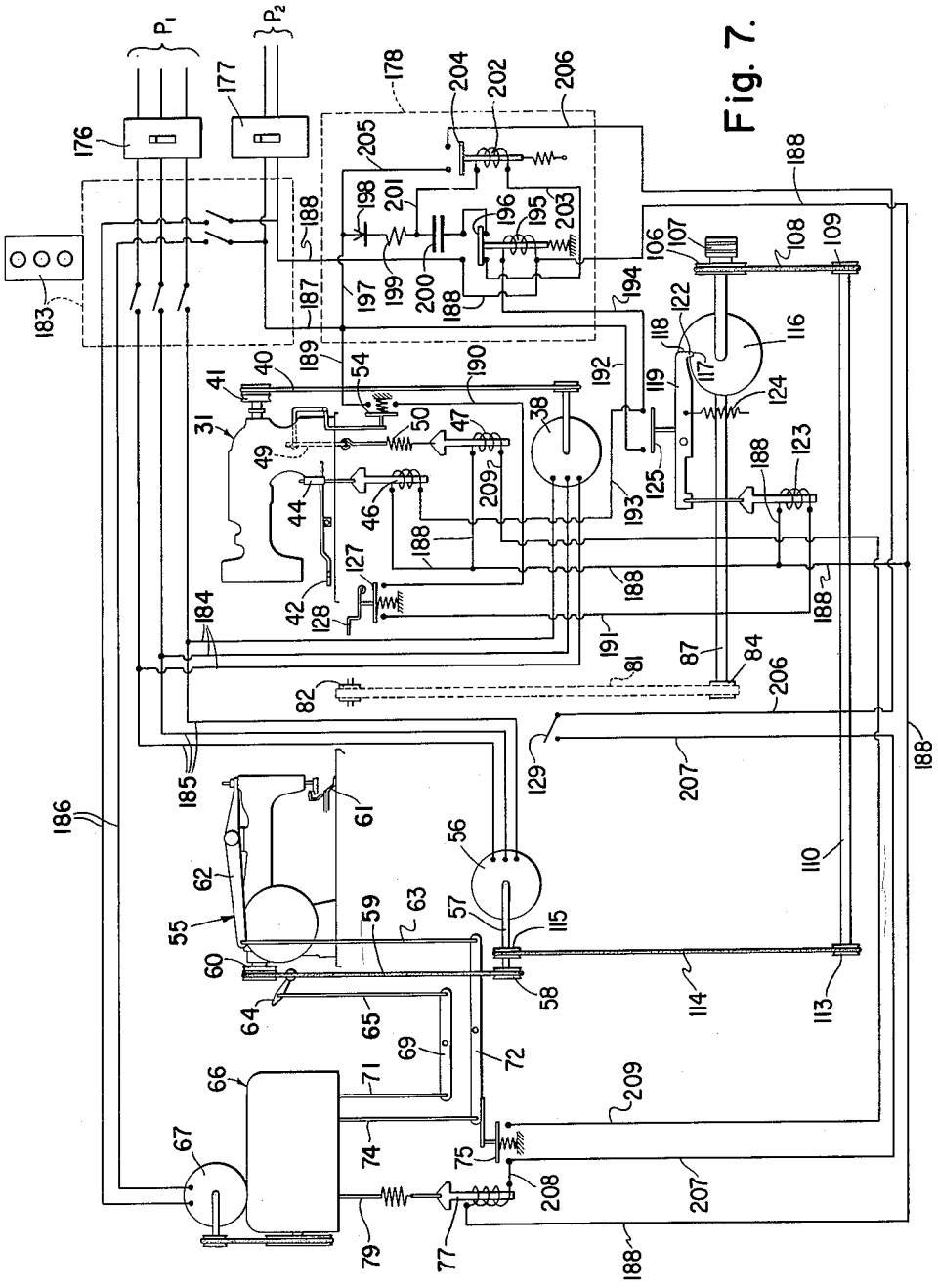
Fig. 7.



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AUTOMATIC SEWING MACHINES

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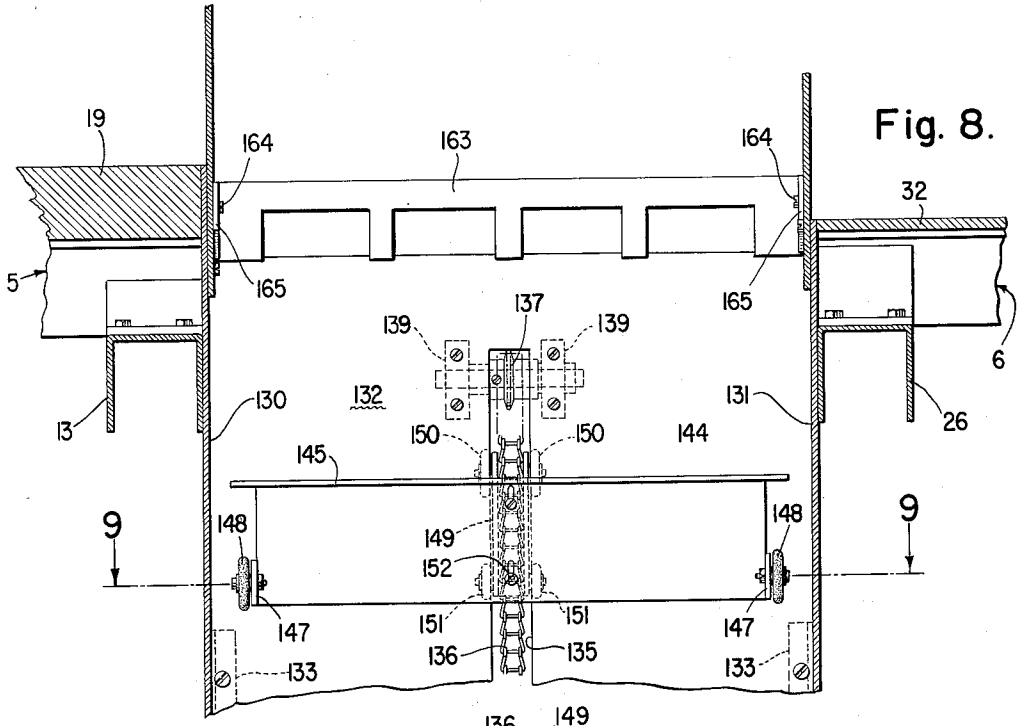

Fig. 8.

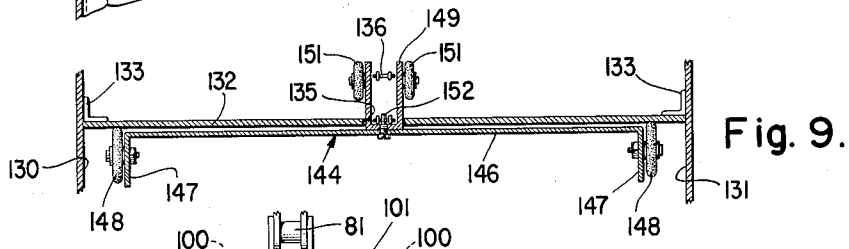

Fig. 9.

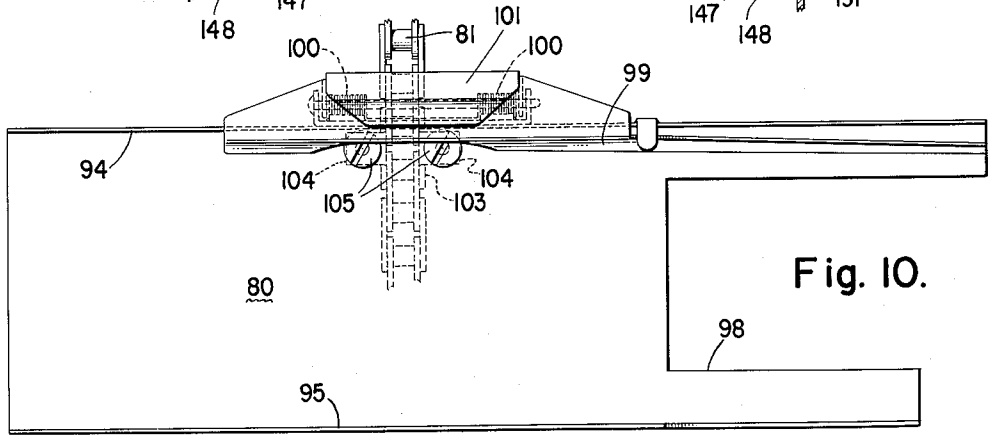

Fig. 10.

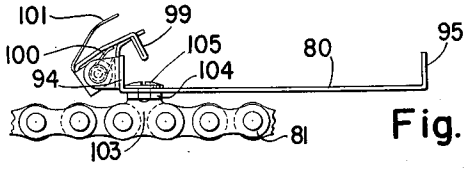

Fig. 11.

United States Patent Office 2,985,122 Patented May 23, 1961

2,985,122

AUTOMATIC SEWING MACHINES

George J. Abel, Plainfield, John A. Herr, Garwood, and Orland B. Reid, Kenilworth, N.J., assignors to The Singer Manufacturing Company, Elizabeth, N.J., a corporation of New Jersey

Filed Nov. 25, 1957, Ser. No. 698,749
13 Claims. (Cl. 112—2)

The present invention relates to sewing machines and more particularly to a sewing machine for automatically performing work such as attaching buttons and making buttonholes in collars, cuffs and the like.

While it is not of course specifically limited thereto, the present invention is hereinafter disclosed as embodied in a machine for making a buttonhole adjacent to one edge of a shirt cuff and attaching a button to the other edge of the cuff. In present day practice, this work is performed in two operations which requires that the cuff be handled once for attaching the button, and once for making the buttonhole, as well as for transporting the work between operations. This method requires highly skilled operators to obtain substantial production, since the work is presented to the machines and positioned by hand.

Accordingly, it is an object of this invention to provide a machine for performing such work as attaching buttons and making button holes in shirt cuffs, wherein both operations are performed automatically and simultaneously, thus reducing the handling, reducing the skill required of the operator, and also increasing production.

At the same time it is an object of this invention to provide a loading mechanism for a sewing machine on which work such as cuffs can be rapidly and accurately placed by a relatively unskilled operator and which is coupled to the sewing mechanism for automatically presenting the work to sewing mechanism.

It is also an object of this invention to provide a stacking mechanism for completed work which is designed to receive the work from the loading mechanism and thereby relieve the operator of the task of handling the completed work.

One of the more specific objects of the invention is to provide an apparatus including a pair of opposed sewing machines and a work handling mechanism together with interconnected actuating and controlling or cycling mechanisms so that an operator need only load the work onto the work handling mechanism at a conveniently accessible point and initiate operation of the apparatus.

A further object of this invention is to provide a machine such as an automatic button attaching and buttonhole making machine for cuffs that is dependable, efficient, economical, and easy to operate so that substantial production can be obtained by a relatively unskilled operator.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiment of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings in which:

Fig. 1 is a front elevational view of a machine embodying the present invention, some of the parts being broken away and in section in order to illustrate the invention more clearly.

Fig. 2 is a top plan view of the machine illustrated in Fig. 1, also with some of the parts broken away and in section.

Fig. 3 is a right end elevational view of the machine illustrated in Fig. 1.

Fig. 4 is a left end elevational view of the machine illustrated in Fig. 1.

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 1.

Fig. 6 is a sectional view taken substantially on the line 6—6 of Fig. 1.

Fig. 7 is a schematic illustration of the control mechanism and wiring of the machine illustrated in Fig. 1.

Fig. 8 is a detail view in section of the work stacking mechanism of the machine illustrated in Fig. 1.

Fig. 9 is a sectional view taken substantially on the line 9—9 of Fig. 8.

Fig. 10 is a detail elevational view of the work supporting trays of the machine illustrated in Fig. 1.

Fig. 11 is an end elevational view of the work supporting tray illustrated in Fig. 10.

With reference to the drawings there is provided a support 1 including a pair of parallel arranged base members comprising a front base member 2 and a rear base member 3. The base members 2 and 3 are elongated inverted U-shaped channel members with the free edges thereof resting upon the floor 4. There are two separate laterally spaced tables 5 and 6 included in the support 1. The right hand table 5 comprises a pair of front legs 7 and 8 and a pair of rear legs 9 and 10, that are secured to and extend upwardly from the base members 2 and 3 respectively. The legs are connected together by transverse braces, the outer ones 7 and 9 being connected together by an upper cross brace 11 and a lower cross brace 12 and the inner ones 8 and 10 being connected together by an upper cross brace 13 and a lower cross brace 14. The table includes longitudinally extending top braces including a top brace 15 extending between the front legs 7 and 8, a similar top brace 16 extending between the rear legs 9 and 10 and a pair of intermediate top braces 17 and 18 extending between the upper cross braces 11 and 13. A table top 19 is mounted on the rear top brace 16 and the forward intermediate top brace 17 and covers only the space between them while leaving open the space between the intermediate top brace 17 and front top brace 15.

The left table 6 comprises a pair of front legs 20 and 21 and a pair of rear legs 22 and 23 that are secured to and extend upwardly from the base members 2 and 3, respectively. The outer ones 20 and 22 of the legs are connected together by an upper cross brace 24 and a lower cross brace 25 and the inner ones 21 and 23 of the legs are connected together by an upper cross brace 26 and a lower cross brace 27. A top brace 28 extends between the front legs 20 and 21 and a similar top brace 29 extends between the rear legs 22 and 23 while a pair of intermediate top braces 30 and 31 extend between the upper cross braces 24 and 26. A table top 32 is mounted on the top braces 28, 29, 30 and 31.

There is provided a conventional buttonhole sewing machine 33, such as a Singer No. 71–101 machine, which is substantially as disclosed for example in the United States patent of Wood, No. 1,999,986, April 30, 1935. This is an automatic cyclically operated machine having a stop motion mechanism which is released at the beginning of the sewing cycle and is automatically actuated at the end of the cycle to stop the machine. The machine also includes a thread cutter actuated at the end of the sewing cycle.

The machine 33 is mounted on and adjustably secured to the top braces 15 and 17. To provide for accurate adjustment of the machine lengthwise of the top braces 15 and 17, there is provided a stud 34 secured to the bed of the machine and having a threaded end 35 that is threaded through a bushing 36 on the cross brace 11. A

hand wheel 37 is secured to the end of the stud 34 to provide for turning it. The machine 33 is driven by a motor 38 secured to the under side of a plate 39 that is mounted on the top braces 15 and 17 and secured thereto by the same fastening means as secures the machine 33, Fig. 6, so that it will be adjustable with the machine. The motor 38 is connected by a belt 40 with a pulley 41 on the main shaft of the machine, the pulley 41 having both a fast and a loose pulley element between which the belt 40 is shifted simultaneously with actuation and release of the stop motion mechanism to drive the machine and to accommodate the continuous running of the motor when the machine is at rest.

As illustrated in the drawings, the machine 33 has a work clamp 42 that is biased downwardly by a spring 43 and is adapted to be lifted by a lever 44 pivoted intermediate its ends on a horizontal axis parallel to the main axis of the machine. The free end of the lever 44 is connected by a chain 45 with a solenoid 46 carried by a bracket 47, Fig. 6, that is in turn mounted on the motor 38 to provide for adjustment of the bracket with the motor and the machine.. A dashpot 48 is connected to the lever 44 to dampen the pivotal movement thereof under the action of the solenoid. There is also provided a lever 49 which is pivoted intermediate its ends on a horizontal axis parallel to the main axis of the machine. The lever 49 is connected at one end to the stop motion mechanism of the machine to release the same and thereby initiate operation of the machine upon actuation of the lever. The free end of the lever 49 is connected through a spring 50 to a solenoid 51 also mounted in the bracket 47. To prevent lifting the work clamp during the cycling of the machine which would spoil the work being sewed in the machine at the time, there is an interlock between the stop motion mechanism and the clamp lifter including a link 52, Figs. 1 and 2. In accordance with the present invention there is provided an ear 53 on the link 52 that cooperates with a safety switch 54 mounted on the frame of the machine 33.

Mounted upon the table 6 is a conventional button attaching machine 55, such as a Singer No. 114–30 machine, which is substantially as disclosed for example in the United States patent of Fifield No. 1,549,248, August 11, 1925. This is also an automatic cyclically operated machine having a stop motion mechanism that is released at the beginning of the sewing cycle and is automatically actuated at the end of the sewing cycle to stop the machine, and a thread cutter actuated at the end of the sewing cycle to trim the sewing threads close to the work. The machine 55 is mounted on the table top 32 and is driven by en electric motor 56 mounted on the under side of the top 32, and having a drive shaft 57 on which is mounted a pulley 58 that is connected by a belt 59 to a pulley 60 on the main shaft of the machine. The pulley 60 also includes both a fast pulley element and a loose pulley element between which the belt 59 is shifted simultaneously with the actuation and release of the stop motion mechanism to provide for driving the machine and to accommodate the continuous running of the motor 56 when the machine is at rest.

The machine 55 includes a button-holding type work-clamp 61 having a clamp lifting mechanism including a lever 62 pivoted intermediate its ends on the frame of the machine, which lever is operatively connected at one end to the button clamp and at the other end to an operating rod 63. The stop motion mechanism of the machine includes an actuating lever 64 that is connected to an operating rod 65. In the usual manner, tension extered through the rod 63 will lift the resiliently biased button clamp and tension exerted through the rod 65 will release the stop motion mechanism and also shift the belt 59 from the loose to the fast pulley element of the pulley 60. At the completion of the sewing cycle, the stop motion mechanism is automatically actuated to shift the belt 59 to the loose pulley element of the pulley 60 and to stop the machine.

Mounted on the table top 32 to the rear of the button attaching machine 55 is a button feeder 66. The illustrated button feeder 66 is a commercially available machine marketed by the A. J. Mitchell Company of Boston, Massachusetts, under the trade name "Button Robot." Briefly this machine includes a driving motor 67 and a movable arm 68 Fig. 2 that places a properly oriented and aligned button into the jaws of the button clamp 61 of the machine 55. In addition to feeding buttons to the machine 55, the button feeder 66 also actuates the stop motion and clamp lifter mechanisms of the machine 55. Control of the stop motion mechanism is obtained by a lever 69 pivotally mounted intermediate its ends on a bracket 70 depending from the top brace 30, which lever is connected at one end to the actuating rod 65 of the stop motion mechanism and at the other end is connected to the button feeder 66 by a rod 71. Control of the presser lifter mechanism is obtained by a lever 72 pivotally mounted intermediate its ends on a bracket 73 depending from the top brace 30, which lever is connected at one end to the actuating rod 63 of the presser lifter mechanism and at the other end is connected to the button feeder 66 by a rod 74. A delay switch 75 is mounted on a bracket 76 depending from the top brace 29 of the table 6, the switch being arranged to be closed by the lever 72 when it is actuated to lower the button clamp 61. Cycling of the button feeder 66 is started by a solenoid 77 mounted on a bracket 78 depending from the top brace 31 and connected to the button feeder by a rod 79.

The buttonhole sewing machine 33 and the button attaching machine 55 are arranged in spaced head-to-head relation and the work is presented thereto by a feeding mechanism including a plurality of work carrying or supporting trays 80 mounted in spaced relation on a chain 81. The chain 81 is entrained about a pair of idler sprockets 82 and 83 and a drive sprocket 84 which are arranged to provide a run for the chain that is in a plane normal to the support 1 and centrally between the machines 33 and 55 with the upper run of the chain in the horizontal plane of the work supports of the machines. The front idler sprocket 82 is journaled in a bracket 85 secured to an extension of the top brace 15 of the table 5 and the rear idler sprocket 83 is journaled in a bracket 86 secured to the top brace 13, Fig. 2. The drive sprocket 84 is fast on a drive shaft 87 journaled in bearings 88 and 89 on the cross braces 12 and 27 respectively.

The spacing of the trays 80 on the chain 81 is made such that with one of the trays in sewing position relative to the sewing machines 33 and 55 as indicated at A in Figs. 2 and 5, the next tray will be in the horizontal upper run of the chain in loading position as indicated at B in Figs. 2 and 5. The dimension of the drive sprocket 84 is made to advance the tray from loading position to sewing position in one revolution of the drive shaft 87. In order to locate the loading position at a point conveniently accessible to an operator who faces the machine, the bracket 85 is elongated to position the front idler sprocket 82 at a point well in front of the support 1.

An apron 90 is mounted on the table 6 by means of a bracket 91 secured to the upper cross piece 26, Fig. 5, and a similar apron 92 is mounted on the table 5 by means of a bracket 93 that is in turn mounted on the bracket 85. The aprons 90 and 92 which are arranged upon opposite sides of the chain 81 define a working surface about the loading position B of the trays 80.

The trays 80 are made with an upstanding leading edge 94 and an upstanding trailing edge 95 between which the cuff is positioned. To position the cuff laterally on the tray 80, there is provided an edge guide 96 on the apron 90. The left side of the tray 80, which is on the side of the button attaching machine 55, is substantially shorter than the cuff so that it will move freely

past the work clamp 61 and also will accommodate moving the work relative to the stitching mechanism of the machine during the sewing cycle. A guide 97 is mounted on the apron 90 to position and force downwardly this edge of the cuff as it moves under the work clamp 61. The right side of the tray 80, which is on the side of the buttonhole sewing machine 33 is provided with a cut out 98 to accommodate the work clamp 42 as it is actuated during the sewing cycle to move the engaged edge of the cuff relative to the stitching mechanism of the machine. To hold down the leading edge of the cuff as it is moved under the work clamp 42, there is provided a finger 99 pivotally mounted on the leading edge 94 of the tray 80 as shown in Figs. 10 and 11 and biased upwardly by a pair of springs 100. The finger 99 overlies the leading edge of the cuff and has a contact piece 101 that is engaged and forced downwardly by a stationary arm 102 mounted on the face plate of the button attaching machine 55, Fig. 1.

As illustrated in Figs. 8 and 9, to mount the tray 80 on the chain 81, the chain 81 is provided with a special link 103 having ears 104 to which the tray is secured by screws 105.

Rotation is imparted to the drive shaft 87 by a pulley 106 mounted on the end of the shaft and connected thereto for rotation through a slip clutch 107 which will accommodate continuous rotation of the pulley while the shaft 87 is at rest. The pulley 106 is connected by a belt 108 to a pulley 109 on the end of a countershaft 110 journaled in bearings 111 and 112 mounted on the cross braces 12 and 25 respectively. The countershaft 110 is in turn driven by a pulley 113 secured thereon and connected by a belt 114 to a pulley 115 on the shaft 57 of the button attaching machine drive motor 56.

Rotation of the drive shaft 57 is limited to one revolution, each cycle, by means of a cam 116 secured thereon and having a notch 117 and a stop shoulder 118. A lever 119 is pivoted intermediate its ends on a bracket 120 extending upwardly from a support plate 121 that is in turn mounted on the cross pieces 12 and 14. The one end of the lever 119 cooperates with the stop shoulder 118 and is formed with a finger 122 that is adapted to seat in the notch 117. The other end of the lever 119 is connected to a solenoid 123 that when energized, pivots the lever to lift the finger 122 out of the notch 117 and clear of the stop shoulder 118 to permit the shaft 87 to rotate. A spring 124 pivotally biases the lever to urge the finger 122 into the notch 117. A switch 125 is mounted on a bracket 126 that is in turn mounted on the bracket 120. The switch 125 is arranged to be closed by the lever 119 when it is pivoted by the solenoid 123 and opened when the finger 122 falls into the notch 117. A starting switch 127 is mounted on the apron 92 and has a contact piece 128 extending above the apron to provide for actuating the same. As is hereinafter more fully discussed, the switch 127 energizes the solenoid 123 which initiates the cycling of the machine, and through the switch 125 starts the cycling of the button attaching machine 55 and the buttonhole sewing machine 33. There is also provided a cut-out switch 129 which is connected in the circuit of the solenoids 46 and 77, thus providing for operation of the feeding mechanism independently of the sewing machines 33 and 55.

To relieve the operator of the task of removing the completed work from the machine or handling it, there is provided a stacking mechanism to the rear of the sewing machines. The stacking mechanism comprises a pair of vertically arranged opposed side plates 130 and 131 secured to the inside portions toward the rear of the tables 5 and 6 respectively. A back plate 132 extends between the side plates and is secured thereto by means of angle brackets 133. An integral bottom plate 134 is bent at a right angle to the back plate 132. The back plate 132 is provided centrally and longitudinally with an elongated slot 135 behind which rides a chain 136 that runs about an idler sprocket 137 at the top and a drive sprocket 138 at the bottom. The idler sprocket 137 is journaled in a pair of brackets 139 secured to the back plate 132 on the opposite sides of the slot 135 and the drive sprocket 138 is mounted on a shaft 140 journaled in brackets 141 and 142 on the back plate 132 and a bracket 143 on the rear base member 3, Fig. 4. The sprockets 137 and 138 are arranged so that the one run of the chain 136 is disposed in the slot 135 substantially in the plane of the back plate 137.

A work receiving platform 144 is carried by the chain 136 and comprises a substantially horizontal work receiving plate 145 and a depending plate 146 integral and bent from the plate 145 at a right angle. At the outer and lower edges of the plate 146 there are formed ears 147 in which are journaled wheels 148 that bear against and ride on the surface of the back plate 132. Centrally of the plate 146 there is secured as by screws, a U-shaped bracket 149 the base of which is just wide enough to pass freely through the slot 135 in the back plate and to accommodate the chain 136 between the legs thereof. On the outer faces of the legs of the bracket 149 behind the back plate 132, there are journaled an upper pair of wheels 150 and a lower pair of wheels 151. A stud 152 extends through the plate 146 and the base of the bracket 149 and through a selected link of the chain 136.

The weight of the platform 144 acts to pivot the bottom of the depending plate 146 toward the back plate 132, thus holding the wheels 148 against the surface of the back plate 132 and the stud 152 in cooperation with one of the links of the chain 136, and acts to pivot the top of the depending plate away from the back plate 132 thus holding the wheels 150 against the surface of the back plate. Thus, during normal operation, the stud 152 secures the platform 144 to the chain and the wheels 148 and 150 support the same for running freely relative to the back plate 132.

To provide for adjustment of the platform 144 relative to the chain 136, the wheels 150 are located adjacent to and slightly above the juncture of the upper edge of the plate 146 and the rear edge of the plate 145 so that the bottom edge of the depending plate 146 can be swung outwardly to withdraw the stud 152 from engagement with the chain 136. When the bottom of the plate 146 is swung outwardly, the platform 144 pivots about the wheels 150 and with these wheels mounted slightly above the level of the juncture of the plates 145 and 146, the initial movement of this point is away from the back plate 132 to accommodate pivotal movement of the plate 146. The wheels 151 are mounted on the bracket 149 at a point spaced from the plate 146 a distance adequate to permit pivotal movement of the plate to release the pin 152 from the chain 136. The wheels 151 engage the surface of the back plate 132 after the pin 152 is released to provide for freely and smoothly running the platform 144 relative to the back plate 132 and the chain 136 to a new selected position.

The platform 144 is indexed downwardly each cycle by rotation imparted to the drive shaft 140 and thus to the drive sprocket 138 and to the chain 136. For this purpose, there is mounted on the end of the shaft 140 a one-way clutch 153 having a crank arm 154 that is connected by a pitman 155 to an eccentric crank pin 156 on an arm 157 that is in turn adjustably secured by a screw and slot connection to a crank disc 158 mounted on the end of the main shaft 87. Upon each cycle of the machine, the shaft 87 is turned one revolution and in increment of rotation determined by the eccentricity of the crank pin 156 is imparted to the shaft 140.

A pivot shaft 159 is journaled in the top of the opposed side plates 130 and 131 and a work receiving tray 160 is mounted on the shaft 159 between the side plates. The tray 160 is formed from a piece of sheet metal bent

intermediate its ends at a right angle to provide a work receiving plate 161 and an upstanding plate 162 that is secured intermediate its ends to the shaft 159. The trays 80 being mounted on the chain 81 adjacent to their leading edges, are tilted as the chain passes over the idler sprocket 83 throw the work therefrom and deposit it on the plate 161 of the tray 160, the plate 161 being disposed below and spaced from the trays 80 in order to receive the work. The work such as illustrated at W in Figs. 5 and 6, is deposited on the plate 161 which is tilted so that the work will slide thereon until the edge contacts the back plate 132, the work sliding under a guard 163 that is carried by the side plate 130 and 132 to which it is secured by means of screws 164 passing through ears 165 formed upon the ends of the guard. From the plate 161 the work W is dropped onto a stack S on the work receiving plate 145 of the platform 144, the plate 161 being slid from under the work by rapidly pivoting the tray 160 about the axis of the shaft 159. To accomplish this, the shaft 159 is provided with a crank arm 166 connected by a link 167 with the free end of a lever 168 pivoted on the cross brace 14 by a pivot screw 169. Intermediate its ends, the lever 168 has a cam follower roller 170 that engages a cam 171 on the main shaft 87 and having a substantially radial cam surface 172. A spring 173 acts on the link 167 to bias the cam follower 170 against the periphery of the cam. A pair of cushioning members are provided for the tray 160 and comprise arms 174 secured to the side plates 130 and 131 carrying cushioning pieces 175 that are adapted to engage the upper and outer corners of the plate 162.

At the completion of a cycle of actuation, the main shaft 87 stops in the position as illustrated in Fig. 6 with the follower 170 at the high point on the cam 171 and the tray 160 in the work receiving position and a work piece W is therein. As the shaft 87 starts to rotate, the cam follower 170 immediately encounters the radial cam surface 172 of the cam 171. The lever 168 is thus released and the spring 173 acting on the link 167 moves the link endwise to pivot the shaft 159 and thus move the tray from the full line to the dotted line position in Fig. 5. This is a very fast motion so that the work receiving plate 161 slides out from under the work W thereon and it falls onto the stack S. As the shaft 87 continues to rotate, the cam 171 restores the mechanism to the work receiving position. At the same time, the feed chain 81 is being moved carrying another tray 80 toward the stacking mechanism. At the completion of the cycle of actuation, the tray 80 passes over the idler pulley 83 and throws another work piece W onto the plate 161.

The shorter the distance is that the work has to fall onto the stack S when released by the plate 161, the less is the possibility that it will not fall uniformly smooth in the stack. Thus, the platform 144 is set high initially at a minimum distance to allow for pivotally movement of the plate 161, and is then indexed downwardly each cycle a distance equal to the thickness of the work by the eccentric 158 and one way clutch 153.

Electrical connections

To provide physically for the electrical wiring of the machine, there are provided various boxes and cabinets. These elements are of course only for wiring convenience and are not critical. However, for a more complete understanding of the machine, briefly, these include a pair of main power switches 176 and 177 mounted on the upper cross brace 11 of the table 5, a control cabinet 178 mounted by means of upstanding braces 179, Fig. 1, in the rear base member 3, a junction box 180 mounted on the outer front leg 7 of the table 5, a junction box 181 mounted by means of an upstanding brace 182, Fig. 1, in the rear base member 3, and a motor switch 183 mounted at the front of the outer front leg 7 of the table 5.

The electrical connections of the machine are illustrated in Fig. 7. Power is supplied to the motors 38 and 56 from a 220 volt source P1 through the main power switch 176, the motor switch 183 and leads 184 and 185 respectively. A 110 volt source of power P2 is supplied through the main power switch 177 to the motor 67 through the motor switch 183 and a pair of leads 186 and to the control mechanism through leads 187 and 188.

The power lead 187 is connected first by a lead 189 to one side of the interlock switch 54, the other side of which is connected by a lead 190 to one side of the starting switch 127. The other side of the starting switch 127 is connected by a lead 191 to the solenoid 123, the other side of which is connected to the power lead 188. Thus, closing the starting switch 127 energizes the solenoid 123 to pivot the lever 119.

Pivotal movement of the lever 119 closes the switch 125 which is connected at one side to the power lead 187 by a lead 192 and at the other side to two leads 193 and 194. The lead 193 is connected to one side of the solenoid 46 of the clamp lifter mechanism of the buttonhole sewing machine 33, the other side of the solenoid 46 being connected to the power lead 188. The lead 194 is connected to one side of a solenoid 195, the other side of which is connected to the power lead 188. Thus closing of the switch 125 by pivotal movement of the lever 119 energizes the solenoid 46 to lift the work clamp of the buttonhole sewing machine 33 and energizes the solenoid 195.

The solenoid 195 is connected to a double throw switch 196 which, when the solenoid 195 is energized, establishes a circuit from the power lead 187, through a lead 197, rectifier 198, resistance 199, and a condenser 200, to the power line 188, thus charging the condenser 200. The solenoid 195 is spring biased so that when it is de-energized by the opening of the switch 125, the switch 196 is thrown to discharge the condenser 200 through a lead 201, solenoid 202 and lead 203. The solenoid 202, when energized, closes a normally open starting relay switch 204 that is connected at one side by a lead 205 with the power lead 187 and at the other side by a lead 206 to one side of the cut out switch 129, the other side of which is connected by leads 207 and 208 with one side of the starting solenoid 77 of the button feeder 66. The other side of the solenoid 77 is connected to the power lead 188. The lead 207 is also connected to one side of the delay switch 75, the other side of which is connected by a lead 209 with one side of the starting solenoid 47 of the buttonhole sewing machine 33. The other side of the solenoid 47 is connected to the power lead 188. Thus, closing the switch 204, by discharging the condenser 200 through the solenoid 202, energizes the solenoid 77 to start the cycling of the button feeder 66 and the button attaching machine 55 controlled thereby, and through the delay switch 75, energizes the solenoid 47 to start the cyling of the buttonhole sewing machine 33.

Operation

In the operation of the machine, the main power switches 176 and 177 are closed and the motor switch 183 is closed to energize the motors 38, 56 and 66. The operator loads the work onto the tray so that it is in the loading position B and then momentarily closes the starting switch 127. The solenoid 123 is thus energized to pivot the lever 119 and thus close the switch 125 which energizes the solenoid 46 to lift the work clamp 42 of the buttonhole sewing machine 33 and release the work sewed in the previous cycle and simultaneously therewith, charge the condenser 200. Pivotal movement of the lever 119 also releases the main shaft 87 for one revolution. Initial rotation of the main shaft 87 presents the radial surface 172 of the cam 171 to the follower 170 on the lever 168, thus permitting the spring 173 to move the link 167 endwise and through the crank 166 and shaft 159 to snap tthe work receiving tray 160 of the

stacking mechanism about the pivot axis of the shaft 159. The work piece W on the tray 160 is thus deposited onto the stack S on the platform 144. Continued rotation of the cam 171 restores the tray 160 to the work receiving position. Upon each revolution of the shaft 87 the platform 144 is indexed downwardly an increment by the eccentric 158, pitman 155, one way clutch 153 and drive shaft 140 on which is mounted the drive sprocket 138 for the chain 136 that carries the platform 144.

One revolution of the main shaft 87 turns the drive sprocket 84 of the feed chain 81 to advance the loaded tray 80 from the loading position A to advance the preceeding tray from the sewing position A to the stop position over the rear idler pulley 83 to unload the sewed work piece therefrom onto the now-restored work receiving platform 160.

The lever 119 engages the stop shoulder 118 on the cam 116 to stop rotation of the main shaft 87 at the completion of one revolution, and the finger 122 at the end thereof falls into the notch 117 in the cam 116 thus opening the switch 125. Opening the switch 125, denergizes the solenoid 46 to lower the work clamp 41 of the buttonhole to grip the newly presented work piece, and simultaneously deenergizes the solenoid 195 to discharge the condenser 200 through the solenoid 202. When the solenoid 202 is thus momentarily energized, it closes the switch 204 and thereby energizes the solenoid 77 to initiate the cycling of the button feeder 66 which controls the operation and cycling of the button attaching machine 55, and also through the delay switch 75, energizes the solenoid 47 to initiate the cycling of the buttonhole sewing machine 33. The delay switch 75 is closed by the lever 72 which controls the work clamp 61 of the button attaching machine 55 so that the newly presented work piece is clamped by the work clamp 61 before the buttonhole sewing machine 33 starts. This delay is necssary since the machine 33 immediately begins to feed the work as soon as it starts and unless the work is securely held by the work clamp 61, the button will be sewed on at the wrong place.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purpose of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

Having thus described the nature of the invention, what we claim herein is:

1. In an automatic sewing machine, a support, a cyclically operated sewing machine mounted upon said support and having control means for initiating cycling thereof and for automatically stopping the same at the completion of the sewing cycle, cyclically operated feeding mechanism for advancing work upon each cycle from a loading position to a sewing position relative to said sewing machine and comprising an endless element having a run disposed in the line of feed of said sewing machine, a shaft journaled in said support, means connecting said endless element to said shaft for cycling said feeding mechanism upon one revolution of said shaft, means including a slip clutch for imparting rotation to said shaft, an element secured on said shaft and having a stop shoulder, a lever having one end cooperating with the stop shoulder on said element to restrain said shaft against rotation, operator actuated means for pivoting said lever to release said shaft for rotation and for re-engaging said stop shoulder after one revolution of said shaft, and automatically actuated means responsive to the pivotal movement of said lever at the completion of one revolution of said shaft for actuating the control means of said sewing machine for initiating cycling of said sewing machine.

2. In an automatic sewing machine, a support, a cyclically operated sewing machine mounted upon said support and having a constantly operating drive means and control means for coupling the sewing machine to said drive means for initiating cycling thereof and for automatically uncoupling the sewing machine from the drive means and stopping the same at the completion of the sewing cycle, cyclically operated feeding mechanism for advancing work upon each cycle from a loading position to a sewing position relative to said sewing machine and comprising an endless element having a run disposed in the line of feed of said sewing machine, a shaft journaled in said support, means connecting said shaft to said feeding mechanism for cycling said feeding mechanism upon one revolution of said shaft, means including a slip clutch connecting said sewing machine drive means to said shaft, automatically operable means for stopping said shaft after one revolution and restraining said shaft after further rotation, operator actuated means for releasing said automatically operable means to release said shaft for one revolution, and means responsive to the actuation of said automatically operable means in stopping said shaft for actuating the control means of said sewing machine for initiating cycling of said sewing machine.

3. In an automatic sewing machine, a support, a cyclically operated sewing machine mounted upon said support and having control means for initiating cycling thereof and for automatically stopping the same at the completion of the sewing cycle and having a work clamp and a clamp lifter mechanism, a first solenoid actuated means for actuating said control means for initiating cycling of said sewing machine, relay means including a capacitor for energizing said solenoid actuated means, a second solenoid actuated means for actuating said clamp lifter mechanism, cyclically operated feeding mechanism for advancing work upon each cycle from a loading position to a sewing position relative to said sewing machine, a third solenoid actuated means for initiating cycling of said feeding mechanism and simultaneously therewith energizing said second solenoid actuated means to lift said work clamp and actuating said relay means for charging said capacitor, operator actuated means for controlling said third solenoid actuated means, and automatically operated means responsive to the completion of the feeding cycle for deenergizing said second solenoid actuated means and for actuating said relay means to discharge said capacitor to energize said first solenoid actuated means.

4. In an automatic sewing machine, a support, a cyclically operated sewing machine having control means for initiating cycling of said sewing machine and for automatically stopping the same at the completion of the sewing cycle and having a work clamp and a clamp lifter mechanism, a first solenoid actuated means for actuating said control means for initiating cycling of said sewing machine, relay means including a capacitor for energizing said solenoid actuated means, a second solenoid actuated means for actuating said clamp lifter mechanism, cyclically operated feeding mechanism for advancing work upon each cycle from a loading position to a sewing position relative to said sewing machine and comprising an endless element having a run disposed in the line of feed of said sewing machine, a shaft journaled in said support, means connecting said endless element to said shaft for cycling said feeding mechanism upon one revolution of said shaft, means including a slip clutch for imparting rotation to said shaft, an element secured on said shaft and having a stop shoulder, a lever having one end cooperating with said stop shoulder to restrain said shaft against rotation, a third solenoid actuated means for pivoting said lever to release said shaft for rotation and for re-engaging said stop shoulder after one revolution of said shaft, operator actuated means for controlling said third solenoid actuated means, switch means responsive to the pivotal movement of said lever in releasing said

stop shoulder for energizing said second solenoid actuated means to lift said work clamp and actuating said relay means for charging said capacitor and responsive to the pivotal movement of said lever in re-engaging said stop shoulder for deenergizing said second solenoid actuated means and for actuating said relay means to discharge said capacitor to energize said first solenoid actuated means.

5. In an automatic sewing machine, a support, a cyclically operated buttonhole sewing machine mounted upon said support and including control means for initiating cycling and automatically stopping the same at the completion of the sewing cycle, a solenoid operatively connected to said control means for initiating cycling of said machine, a work clamp mechanism for said buttonhole sewing machine having a clamp lifter mechanism including a solenoid, a cyclically operated button attaching sewing machine mounted upon said support in head-to-head relation relative to said buttonhole sewing machine and including control means for initiating cycling and automatically stopping the same at the completion of the sewing cycle, a work clamp mechanism for said button attaching sewing machine having a clamp lifter mechanism, cycling mechanism for sequentially actuating said clamp lifter mechanism and said control means, a solenoid operatively connected to said cycling mechanism for initiating operation thereof, cyclically operated feeding mechanism for advancing work from a loading position to a sewing position relative to said sewing machines, operator actuated means for initiating cycling of said feeding mechanism and simultaneously energizing the solenoid of the clamp lifter mechanism of the buttonhole sewing machine, and means responsive to the completion of the feeding cycle for de-energizing the solenoid of the clamp lifter mechanism of the buttonhole sewing machine and simultaneously energizing the solenoids of the control means of the buttonhole sewing machine and the cycling mechanism for the button attaching sewing machine for initiating cycling of the same.

6. In an automatic sewing machine, a support, a cyclically operated sewing machine mounted upon said support, a constantly running drive means for said sewing machine, clutching means for connecting and disconnecting said drive means and said sewing machine, actuating means for said clutching means for coupling said drive means and said sewing machine to initiate cycling of said sewing machine, and means responsive to the completion of the sewing cycle for automatically actuating said clutching means to uncouple said drive means and said sewing machine thereby stopping said sewing machine, cyclically operated feeding mechanism for advancing work upon each cycle from a loading position to a sewing position relatively to said sewing machine, drive means for actuating said feeding mechanism, control means for said feeding mechanism drive means for controlling the operation of said feeding mechanism, operator actuated means for actuating said feeding mechanism control means to initiate operation of said feeding, means responsive to the completion of a feeding cycle for automatically actuating said feeding mechanism control means to terminate operation of said feeding mechanism, and means responsive to the actuation of said feeding mechanism upon the presentation of work to the sewing position relatively to said sewing machine for automatically actuating said sewing machine actuating means to initiate cycling of said sewing machine.

7. In an automatic sewing machine, a support, a sewing machine mounted upon said support and means for actuating said sewing machine through a cycle of operation for automatically performing a predetermined sewing operation upon actuation of said sewing machine, control means for initiating actuation of said sewing machine from a starting position in said cycle of operation and for automatically stopping the same at said starting position at the completion of a cycle of operation, feeding mechanism and means for actuating said feeding mechanism through a feeding cycle for advancing work upon each feeding cycle from a loading position to a sewing position relatively to said sewing machine, control means for controlling the actuation of said feeding mechanism, operator-actuated means for actuating said feeding mechanism control means to initiate operation of said feeding mechanism, means responsive to the completion of a feeding cycle for automatically actuating said feeding mechanism control means to terminate operation of said feeding mechanism with said feeding mechanism in loading position, and means actuated by said feeding mechanism after the presentation of work to the sewing position relatively to said sewing machine for automatically actuating said sewing machine control means to initiate cycling of said sewing machine.

8. In an automatic sewing machine in accordance with claim 7 in which said means for actuating said feeding mechanism comprises a shaft journaled in said support, means for rotating said shaft, operator actuated means for initiating rotation of said shaft, automatically actuated means for stopping rotation of said shaft at the completion of the feeding cycle, and means connecting said feeding mechanism to said shaft for actuation upon rotation of said shaft.

9. In an automatic sewing machine in accordance with claim 8 in which said feeding mechanism is actuated through the feeding cycle upon one revolution of said shaft and said automatically actuated means for stopping rotation of said shaft is effective at the completion of one revolution of said shaft.

10. In an automatic sewing machine in accordance with claim 9 in which said feeding mechanism comprises an endless element having a run disposed in the line of feed of said sewing machine, and means connecting said endless element to said shaft for cycling said feeding mechanism upon one revolution of said shaft.

11. In an automatic sewing machine in accordance with claim 7 in which said operator actuated means comprises a solenoid actuated means for initiating cycling of said feeding mechanism and in which said sewing machine control means comprises a solenoid actuated means for initiating cycling of said sewing machine.

12. In an automatic sewing machine in accordance with claim 11 in which there is provided relay means including a capacitor for energizing said solenoid actuated means for initiating cycling of said sewing machine.

13. In an automatic sewing machine in accordance with claim 7, a second sewing machine mounted upon said support in head-to-head relation to said first mentioned sewing machine and means for actuating said second sewing machine through a cycle of operation for automatically performing a predetermined sewing operation upon actuation of said second sewing machine, control means for initiating actuation of said second sewing machine from a starting position in said cycle of operation and for automatically stopping the same at said starting position at the completion of a cycle of actuation, and in which said feeding mechanism advances the work to a sewing position relative to both sewing machines and said feeding mechanism actuates the control means of both sewing machines to initiate simultaneously cycling of both sewing machines.

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