

[54] **SEWING SYSTEM**

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[51] Int. Cl. **D05b 33/02**

[58] Field of Search **112/121.12, 121.15, 121.11,**
112/121.29

[56]

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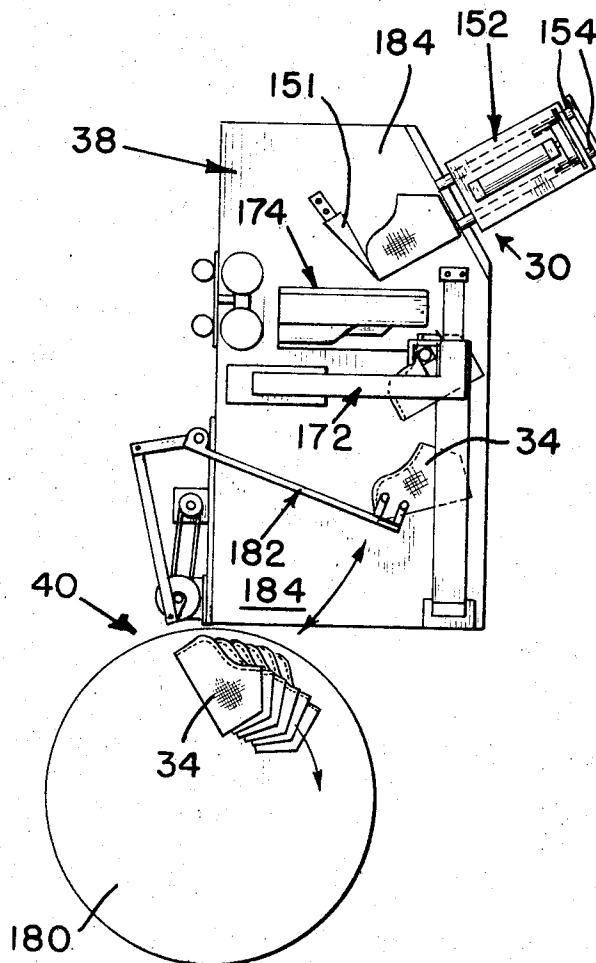
Primary Examiner—James R. Boler

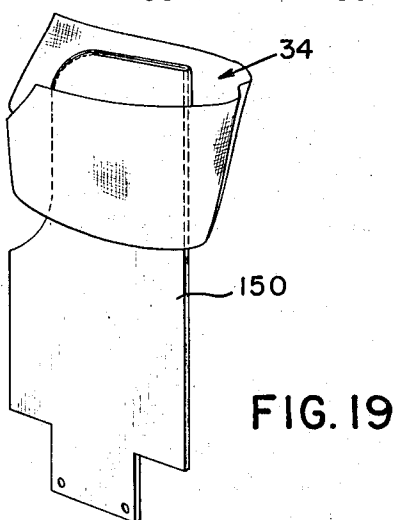
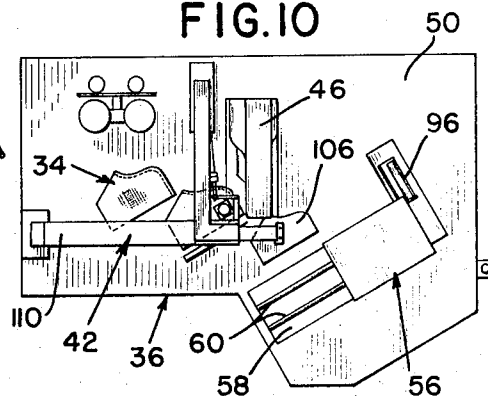
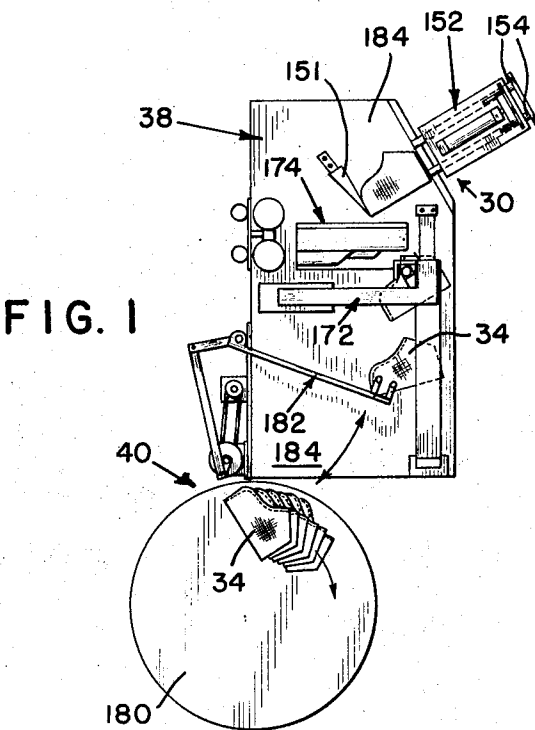
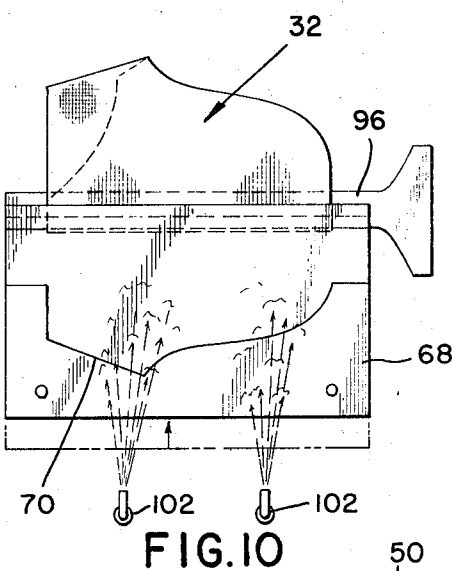
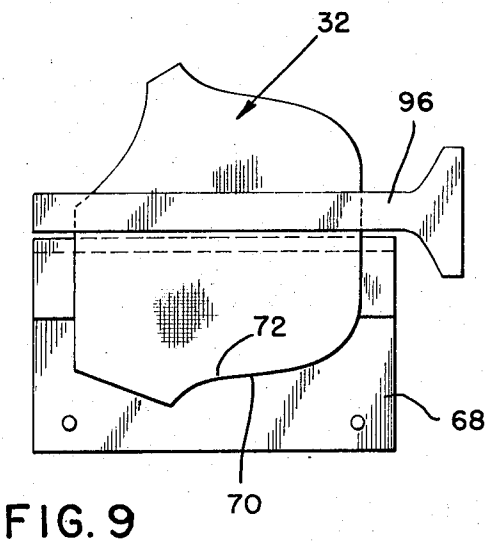
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ABSTRACT

Apparatus for the sewing of preformed fabric blanks into garment components includes first and second stitch machines for sewing and controlling the fabric in a prescribed manner and a mechanism for collecting and stacking the sewn fabric. Each stitch machine includes means for positioning and aligning preselected edge portions of fabric in a prescribed manner. The fabric is directed in a predetermined path of travel relative to sewing instrumentalities to stitch selected portions to form a garment component.

7 Claims, 22 Drawing Figures





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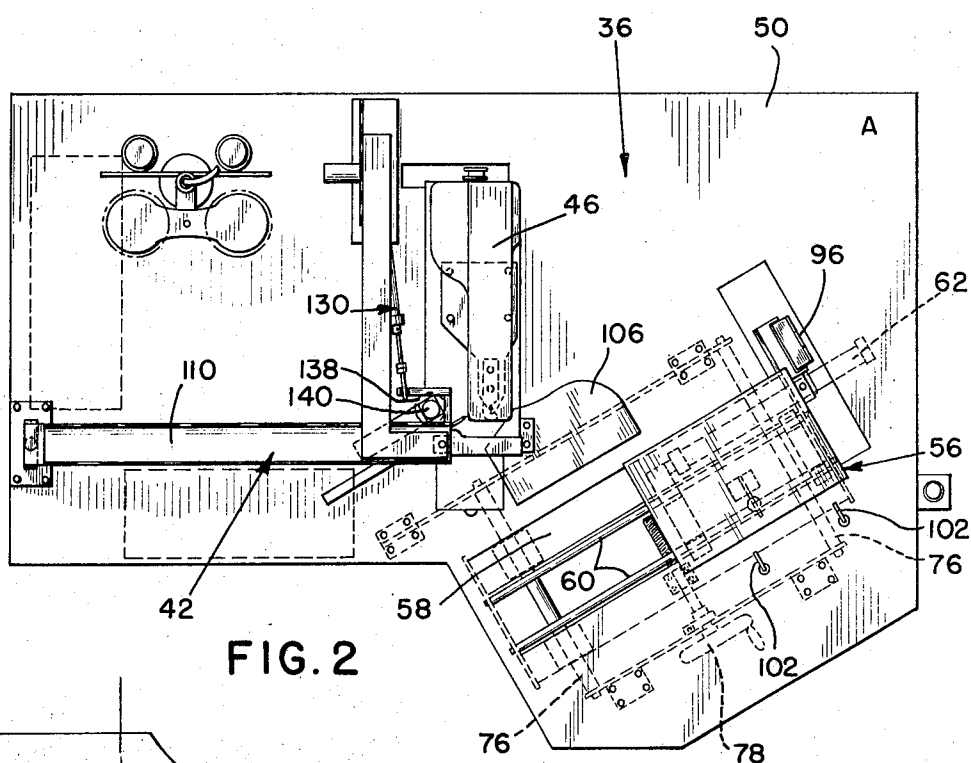


FIG. 2

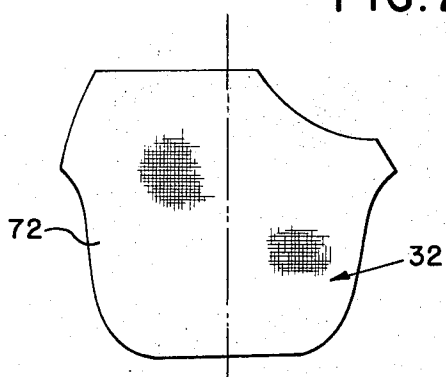


FIG. 5

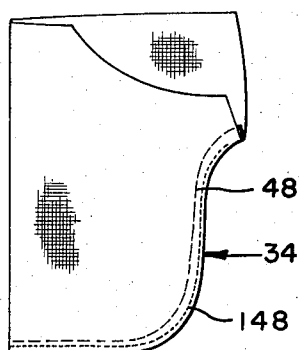


FIG. 7

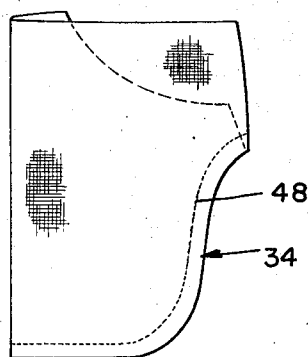


FIG. 6

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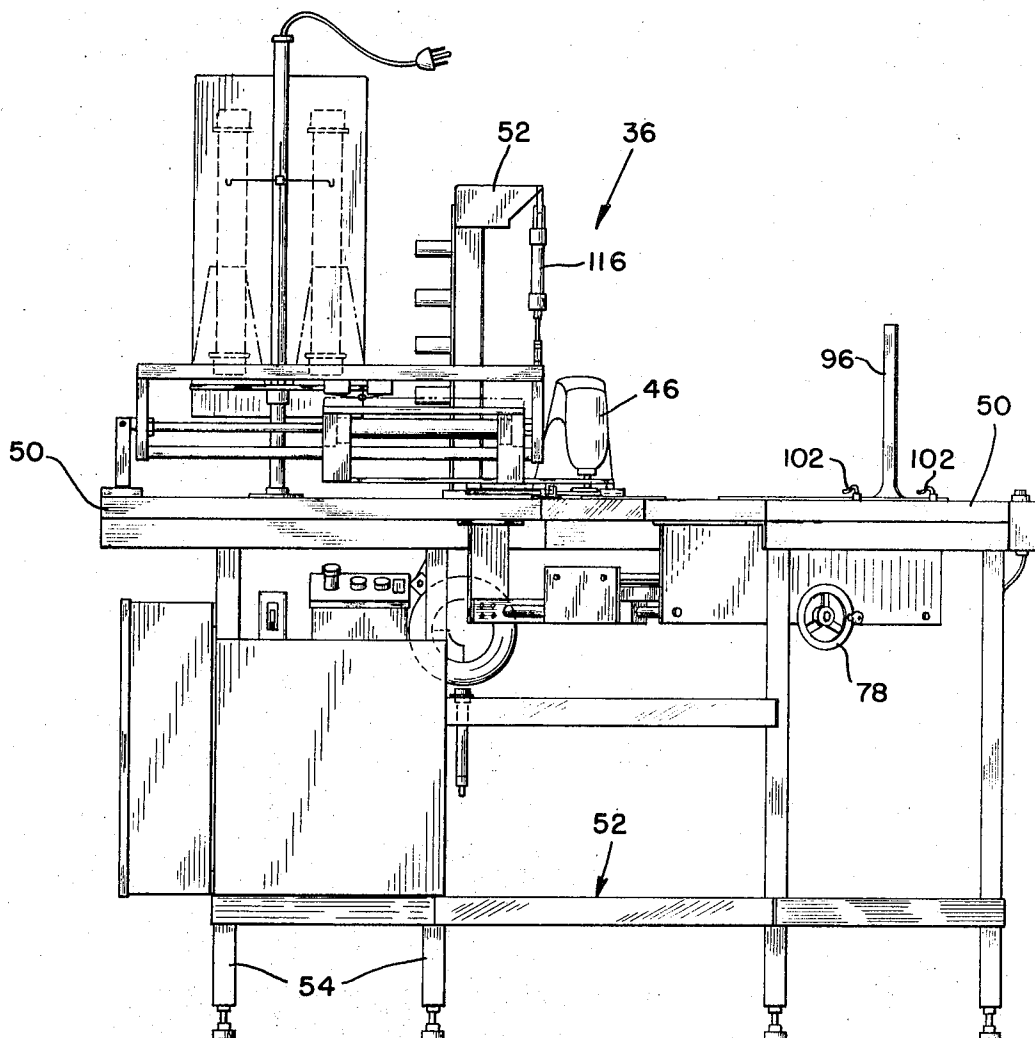


FIG. 3

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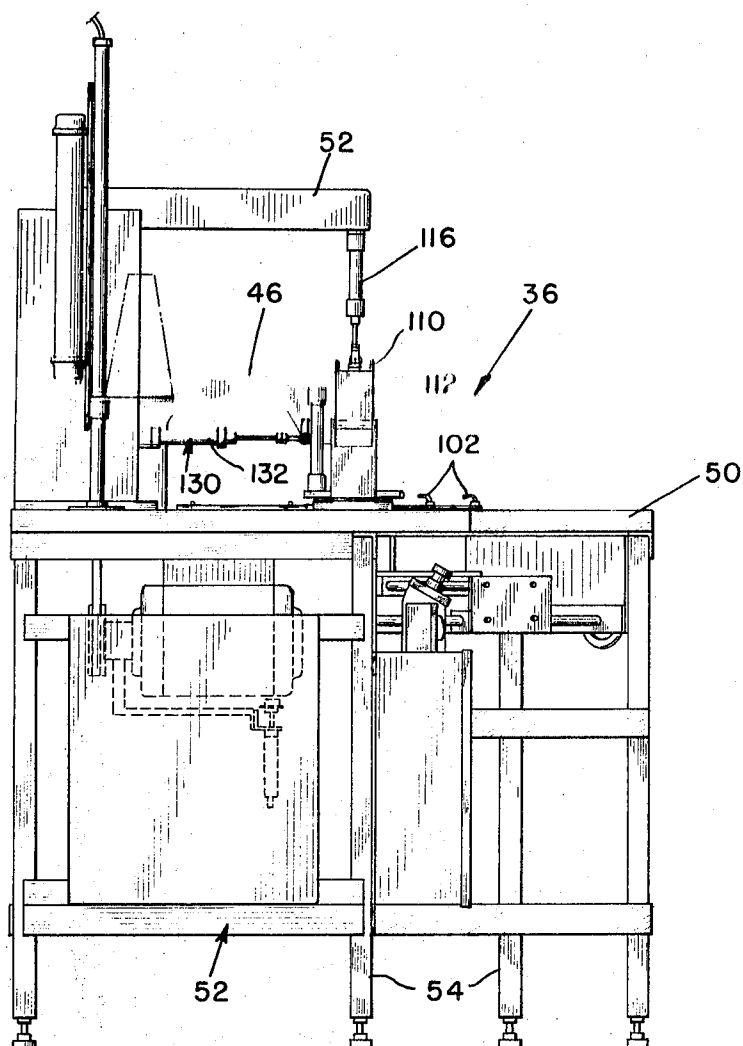


FIG. 4

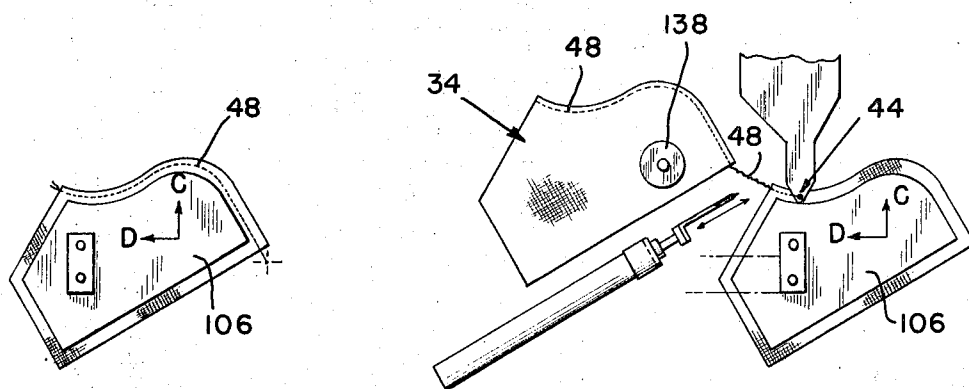


FIG. 14

FIG. 16

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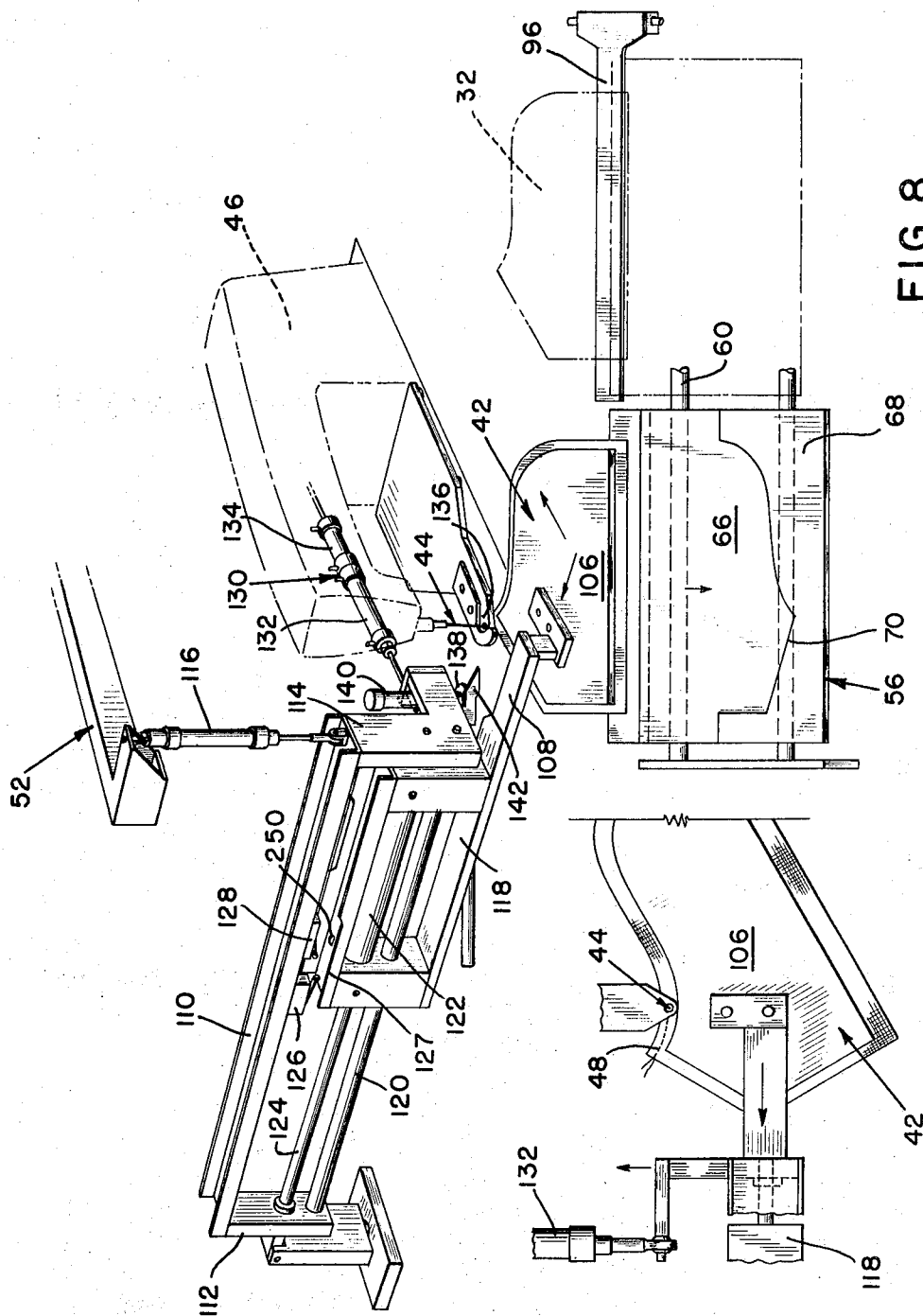


FIG. 8

FIG. 15

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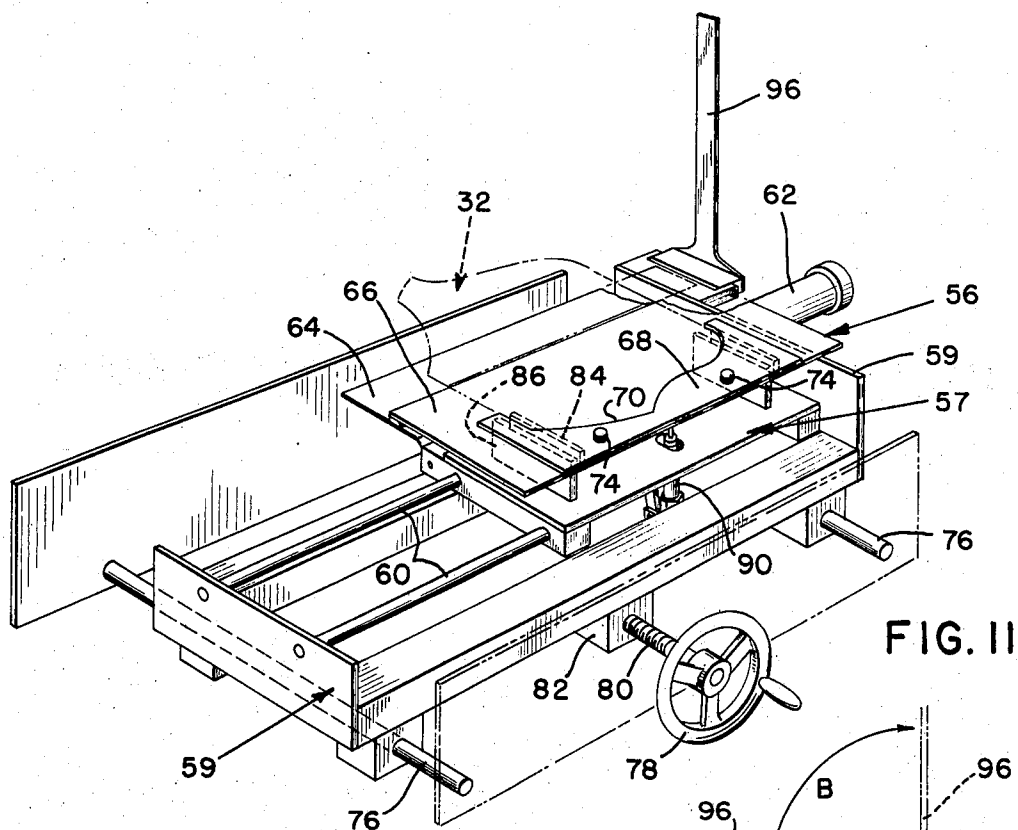


FIG. 11

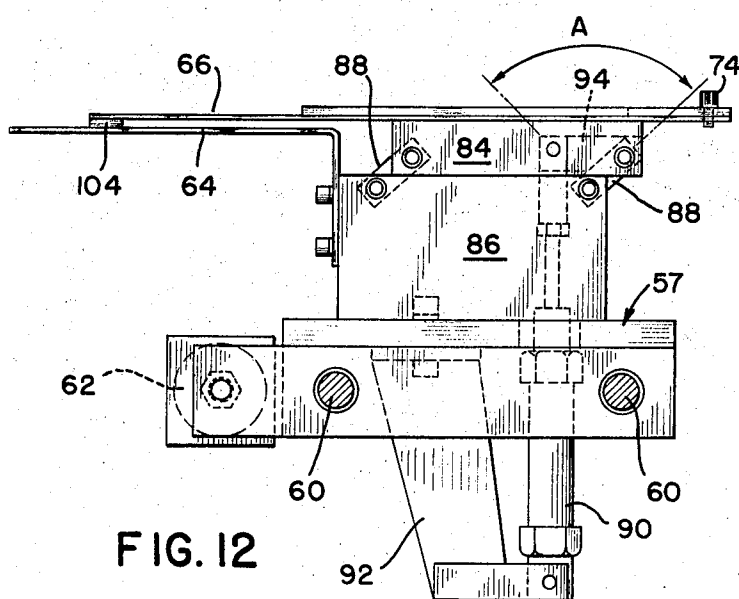


FIG. 12

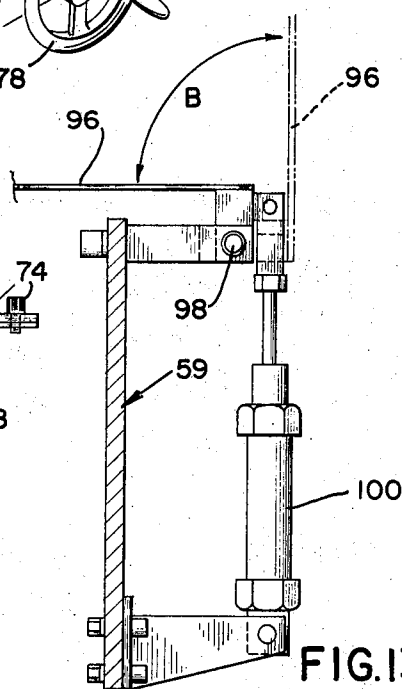


FIG. 13

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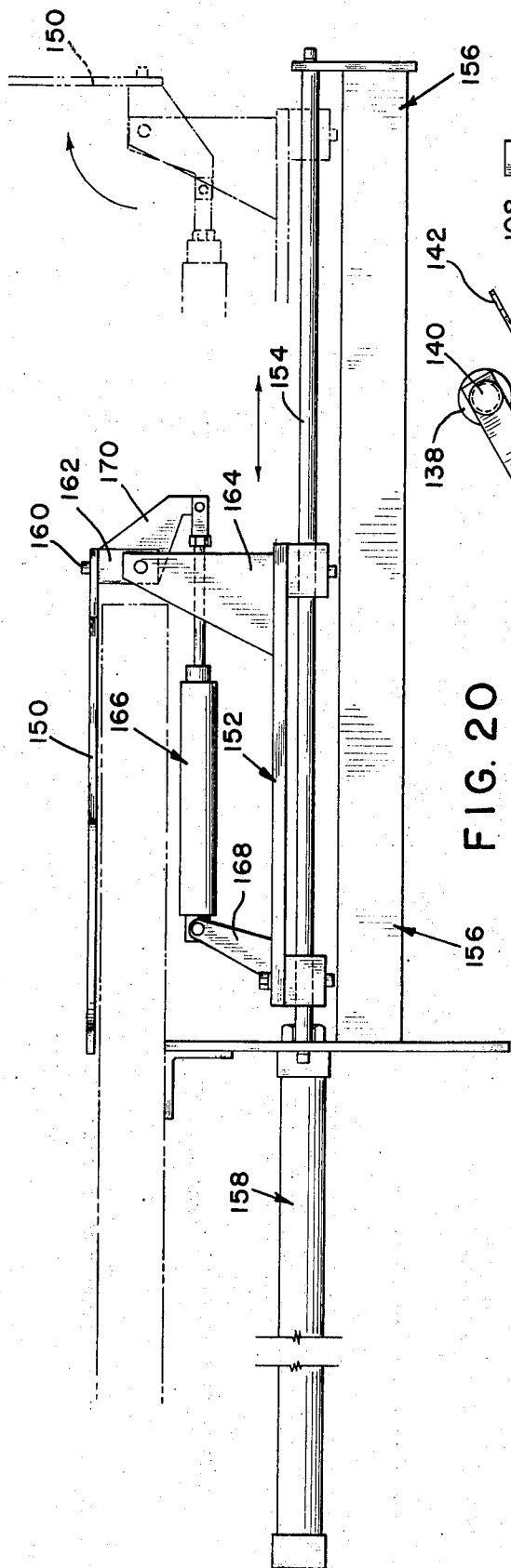


FIG. 20

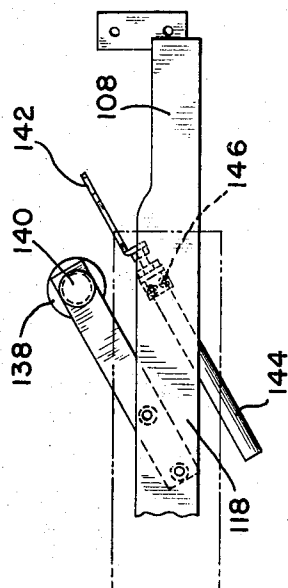


FIG. 17

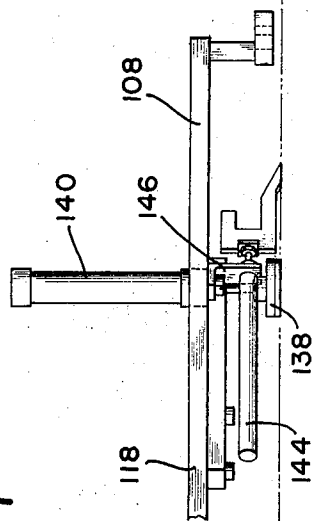


FIG. 18

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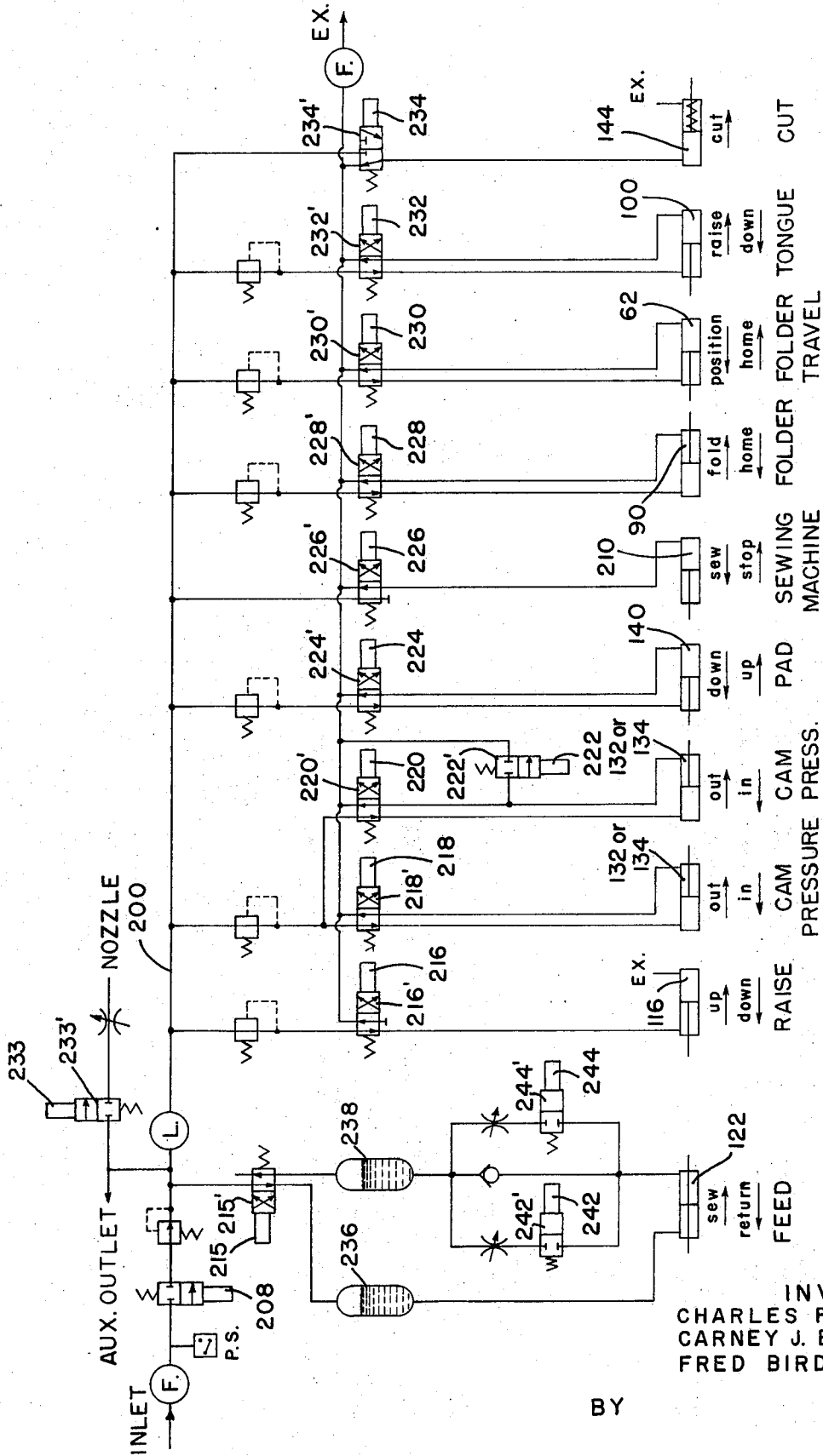
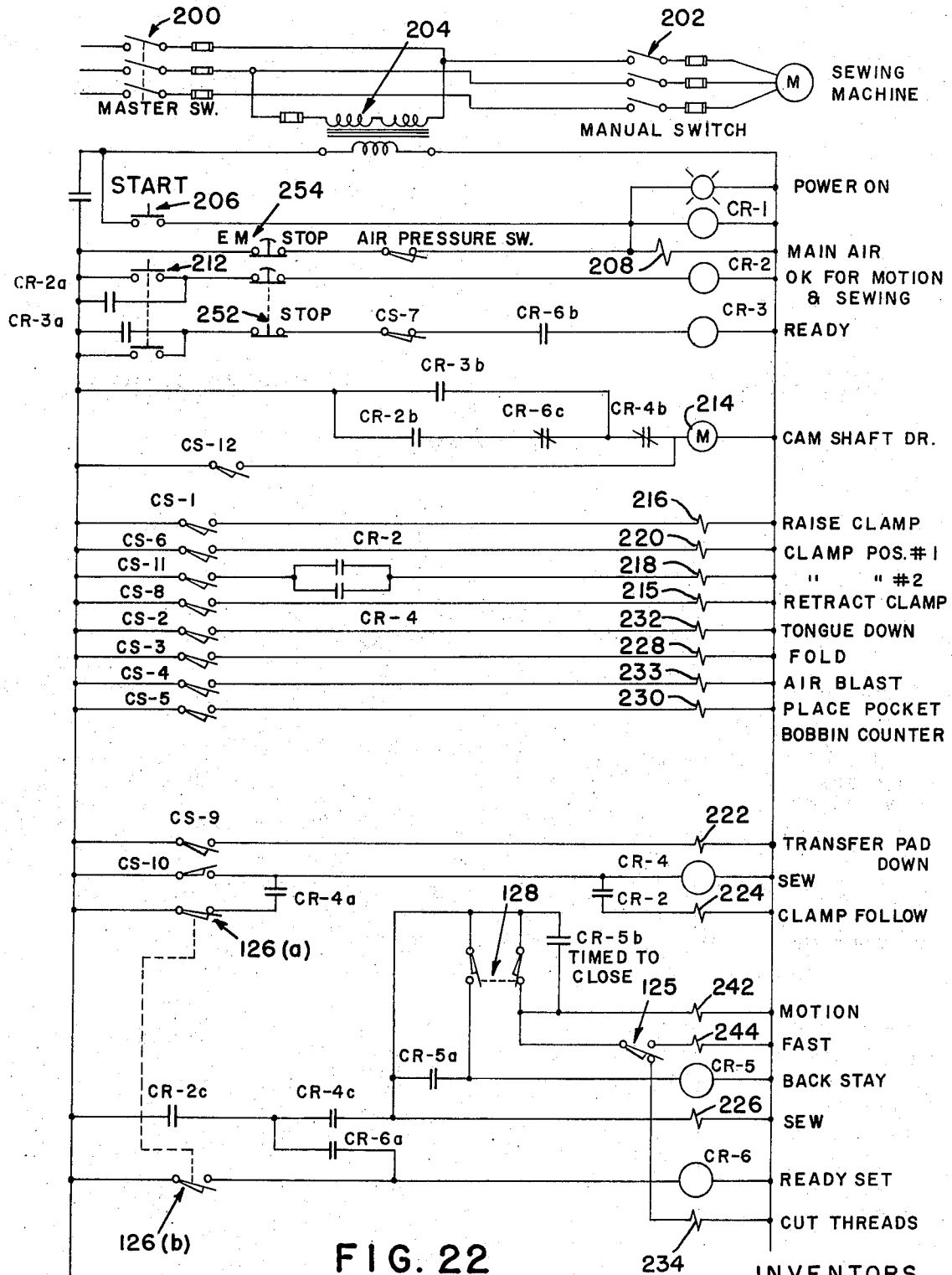


FIG. 21

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SEWING SYSTEM

BRIEF SUMMARY AND OBJECTS OF THE INVENTION

This invention relates generally to a system for guiding and sewing fabric and more particularly to apparatuses for the sewing of preformed fabric into garment components.

Although the invention will be described in conjunction with the forming of garment pockets, the basic guiding and feeding concepts of the invention are susceptible to other uses wherein fabric-like material is guided in a predetermined path of travel while applying stitching thereto.

Briefly, the invention includes a first stitching assembly for applying a first line of stitching to a fabric blank to form a pocket, a second stitching assembly for applying a second stitching to the pocket and a collecting and stacking assembly for collecting the completed pockets.

The first stitching assembly serves to sequentially fold fabric blanks in a prescribed manner and displace the folded blanks to a predetermined location. At this location each blank is clamped under a plate and urged in a particular direction about the sewing instrumentalities of a conventional sewing machine. The plate acts as a cam and is guided about a cam follower member fixed to the sewing machine. The machine sews the folded blank along an edge portion to form a pocket. Another pocket is folded and displaced by the machine and as the second blank is clamped by the plate, a small pad, mounted upon a carriage and displaceable with the plate, will move the first sewn pocket away from the sewing instrumentalities at the same speed as the second pocket is being sewn. Since the first pocket is still attached to the sewing threads, moving the previous or first pocket in this manner allows the machine to chain between the pockets because the first pocket pulls the chain of thread away from the sewing instrumentalities at the proper speed. After the pocket to be sewn has moved under the sewing needle, a thread cutter cuts the chain of thread between the pockets. During normal operation there are always at least two pockets in the machine.

The sewn pockets are reversed or turned over a mandrel of the second stitching machine which subsequently conveys the pockets to an auxiliary clamp which holds the pockets. Thereafter, the second stitching machine displaces the pockets in the prescribed manner, similar to the first stitching machine, to apply a second stitching thereto.

Thereafter, the double sewn pockets are gathered by a stacking apparatus. The stacking apparatus includes a rotatable transparent disk controlled by a photocell and a displaceable arm mechanism for directing the sewn pockets from the second stitch machine table top to the rotatable disk.

One of the primary objects of the invention is the provision of a system for automatically applying a stitching to a fabric blank.

Another object of the invention is the provision of a stitching assembly for insuring the desired stitching of a garment component without significant control by an operator.

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Still another object of the invention is a pocket forming apparatus for increasing production while reducing the skill required for operating the apparatus.

Other objects and advantages of the invention will become apparent to those skilled in the art during the course of the following detailed description.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a top plan view of the apparatus for sewing first and second stitches on preformed fabric blanks for forming garment pockets;

FIG. 2 is an enlarged, top plan view of the first stitch sewing apparatus of FIG. 1;

FIG. 3 is a front elevational view of the first stitch sewing apparatus of FIG. 2;

FIG. 4 is a side elevational view of the first stitch sewing apparatus of FIG. 2;

FIG. 5 is a top plan view of a preformed fabric blank adapted to be formed into a garment pocket;

FIG. 6 is a plan view of the fabric blank of FIG. 5 folded and having a first stitching applied along one edge portion;

FIG. 7 is a plan view of the fabric blank of FIG. 6 having been reversed or turned and having a second row of stitching applied thereto to form a garment pocket;

FIG. 8 is a fragmentary, perspective view of a stitching apparatus illustrating the fabric blank guiding and folding assembly and the assembly for clamping and displacing the folded blank relative to stitching instrumentalities;

FIG. 9 is an enlarged, fragmentary, top plan view of the fabric blank guiding and folding assembly illustrating the fabric blank in the flat, unfolded condition;

FIG. 10 is an enlarged, fragmentary, top plan view of the guiding and folding assembly, similar to FIG. 9, illustrating the fabric blank in the folded condition;

FIG. 11 is a fragmentary, perspective view of a stitching apparatus illustrating the mechanism for displacing the blank guiding and folding assembly, the blank being shown unfolded;

FIG. 12 is an end elevational view of the apparatus of FIG. 11;

FIG. 13 is a fragmentary, side elevational view of the apparatus of FIG. 12 illustrating the cylinder for displacing the tongue member;

FIG. 14 is a top plan view of the plate which forms a part of the assembly for clamping and displacing the folded blank relative to the stitching instrumentalities;

FIG. 15 is an enlarged, fragmentary, top plan view illustrating the mechanism for displacing the clamped and folded fabric, relative to the sewing instrumentalities for applying a first stitching along an edge portion;

FIG. 16 is a fragmentary, top plan view of a first stitched fabric pocket connected by the stitching to a second clamped fabric blank, and cutter means for severing the interconnecting chain stitching;

FIG. 17 is a top plan view of the apparatus, similar to FIG. 16, illustrating the cutter means and a displaceable pad for guiding the sewn fabric blank;

FIG. 18 is a side elevational view of the apparatus of FIG. 17;

FIG. 19 is a perspective view of a form or mandrel comprising a part of the second stitching apparatus, for turning a pocket after sewing of the first stitching and before the second stitching is applied thereto;

FIG. 20 is a fragmentary, side elevational view illustrating the fluid cylinder arrangement for displacing and pivoting the form;

FIG. 21 is a schematic diagram illustrating the fluid systems of the first stitching apparatus; and

FIG. 22 is a schematic electrical diagram of the first stitching apparatus.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, and particularly to FIG. 1, the apparatus 30 for the sewing of preformed fabric blanks 32 into garment pockets 34 comprises a first stitching apparatus 36, a second stitching apparatus 38 and a mechanism 40 for collecting and conveying the completed pockets 34.

The first stitching apparatus 36 is designed to fold a properly positioned preformed fabric blank, displace the folded blank to a clamping and displacing arrangement 42 wherein the clamped, folded blank is directed in a prescribed path of travel while stitching is applied thereto by a first set of sewing instrumentalities 44 of a conventional sewing machine 46. The blank 32, an example of which has been shown by FIG. 5, is adapted to have a first stitching 48, FIG. 6, applied thereto by the sewing instrumentalities 44.

In a preferred embodiment of the invention, the first stitching apparatus 36 includes a table 50, having a relatively flat top, mounted upon a framework 52 supported by a plurality of legs 54. A folder mechanism 56 is mounted for displacement relative to the table top 50 and sewing machine 46 and is partially received within an elongated opening 58 in the table top 50. The folder mechanism 56 includes a frame 57 which is slidable upon rods 60, FIGS. 11 and 12, supported by the framework 59. A fluid cylinder 62 is secured to the slidable frame 57 and the framework 59 for displacing the folder 56 from a retracted position remote to the sewing instrumentalities 44 to a location adjacent the instrumentalities. The folder mechanism 56 further includes a first fixed plate 64 and a second cover plate 66 displaceable relative thereto. The displaceable cover plate 66 has a fabric blank guide member 68 secured thereto having a guide surface 70 which conforms to the contour 72 of a fabric blank. It is to be understood that various guide members, depending upon the particular configuration of fabric blanks to be sewn, may be secured to the plate 66 by fasteners 74. In addition, the folder 56 and frame 59 may be displaced upon slide rods 76 by a hand wheel 78 fastened to a threaded shaft 80 which is threadably received by a portion 82 of the frame 59.

The displaceable cover plate 66 is fixed to bars 84 which are adapted to be supported by blocks 86. The blocks and bars are interconnected by links 88 pivotably connected to the bars 84 and to the blanks 86. A fluid cylinder 90, having one end pivotably attached to a bracket 92 mounted upon frame 57 and having the other end connected to a bracket 94 is secured for movement with one of the links 88. Upon actuation of the double action cylinder 90 the links 88 are displaced through the angle A thereby displacing the cover plate 66 while maintaining the cover plate parallel with the table top 50.

A tongue member 96 cooperates with the folder 56 for folding a fabric blank 32 before the first sewing operation. The tongue 96 is pivotably mounted at 98 upon a portion of frame 52 and is connected to a fluid

cylinder 100 as shown by FIG. 13. The double action cylinder 100 pivots the tongue through an angle B of approximately 90° between operative and inoperative positions.

In the operation of folding a preformed blank, and with the folder 56 in the position of FIG. 12 remote to the sewing instrumentalities and with the tongue 96 in the upward, opened position, a preformed blank 32 is placed, as shown by FIG. 11, with the contour surface 72 against the guide surface 70. Thereafter, cylinder 100 is actuated to pivot the tongue 96 over a portion of the blank 32, as illustrated by FIGS. 9 and 13.

Actuation of cylinder 90 displaces the cover plate 66 to the FIG. 10 position in overlapping relation to the tongue 96 thereby partially folding and clamping the fabric blank 32. A friction pad 104 may be provided underneath the cover plate 66 to facilitate gripping of the folded blank. The folder 56 then is directed toward the sewing instrumentalities 44. An air blast through nozzles 102 completes folding of the blank 32 to the position of FIG. 10, the blank being retained in position by tongue 96.

The clamping and displacing assembly 42 receives the folded fabric blanks 32 from the folder mechanism 56 and directs each blank in a preselected path, with respect to said sewing instrumentalities, for applying a first stitching 48 thereto.

The clamping and displacing assembly 42 includes a relatively flat plate 106 mounted upon an arm 108 supported by a framework 110. The framework 110 is pivotably supported at one end 112 upon frame 52 while the end 114 adjacent clamp plate 106 is supported by a fluid cylinder 116 suspended from a portion of frame 52. The cylinder 116, having ends pivotably attached to the frame 52 and framework 110 is adapted to lift the clamp plate 106 to release the sewn blank 32. The plate 106 is supported upon a displaceable carriage 118 slidably mounted upon a slide bar 120. The carriage 118 is actuated by a fluid cylinder 122 secured to the carriage and having a piston rod 124 secured to the framework 110. Switches 125, 126 and 128 control the movement of the carriage 118 which supports the plate 106. The switches are controlled by an elongated cam member 127 mounted upon the carriage 118. Switch 126 stops the sewing operation while switch 128 momentarily stops the displacement of carriage 118 to permit the sewing machine to pile up stitches at one area to form a knot.

Since the sewing machine runs at a constant speed shorter or longer stitches can be obtained by moving the pockets slower or faster. During the first part of the sewing the line of stitches makes approximately a 30° angle with the direction of travel of the pocket, and during the second part of the stitching the line of stitches makes approximately a 60° angle with the direction of travel. Because of the difference in angle, the travel speed must vary in order to approximate a constant stitch length. Therefore, the switch 125 mounted upon member 110 and adapted to be controlled by cam 127 changes the speed of carriage 118 through solenoid actuated valve 244.

A fluid assembly 130 comprising back-to-back cylinders 132 and 134 controls the movements of clamp plate 106 towards and away from the sewing instrumentalities 44. When the rods of both cylinders 132 and 134 are extended, the plate 106 is displaced to a position away from the sewing machine 46. Retracting

the piston rod of one of the cylinders 132 moves the plate 106 to the FIG. 8 position with the plate abutting a cam follower 136 surrounding the needle of the sewing machine 46. Retraction of the piston rod of of the other cylinder 134 maintains the clamp plate 106 in contact with cam 136 as the plate 106 and carriage 118 are displaced by the cylinder 122. Referring to FIG. 14, it can be seen that forces are applied to plate 106 and folded blank 132 in the direction of arrow C by cylinder 134 and in the direction of arrow D by cylinder 122 during the sewing of the first stitching 48.

After a first blank 32 has been sewn to form a pocket 34, the plate 106 is removed from the pocket 34 by cylinders 116, 132, and 134 without disturbing the pocket 34. By cylinders 122, 132, and 116, the plate 106 is moved to an extended position to grip another folded blank 32 as illustrated by FIG. 8. Then pad member 138 is urged downwardly by a cylinder 140 for clamping the first or previously sewn pocket 34. During sewing, pad member 138 moves the previously sewn pocket in the same direction and with the same speed as plate 106 moves the pocket being sewn. Upon the completion of sewing, pad member 138 is lifted from the pocket by cylinder 140.

Since adjacent pockets 34, FIG. 16, are interconnected by a continuous stitching 48, means must be provided for dividing the interconnected pockets. In a preferred embodiment of the invention this means comprises a knife 142 mounted for reciprocation in the direction of the arrow, FIG. 16. The knife 142 is secured to the piston rod of a piston assembly 144, the piston assembly being secured to a bracket 146 mounted beneath the end of arm 108 of displaceable carriage 118.

The sewn pockets 34 are transferred from the first stitching apparatus 36, where stitching 48 is applied thereto, to a second stitching apparatus 38 where a second stitching 148 is applied. Prior to sewing of the second stitching, the pockets 34 are turned or reversed on a mandrel 150, as shown by FIG. 19. The mandrel 150 is pivotably mounted upon a traveling carriage 152, FIGS. 1 and 20. The carriage 152 is displaceable upon spaced parallel rails 154 which are supported by frame 156 of the second stitching apparatus 38. The carriage receives its movement from a double action cylinder arrangement 158, the limits of movement of carriage 152 being illustrated by FIG. 20. The mandrel 150 is attached by fasteners 160 to a block 162 pivotably mounted upon a support 164 fixed to carriage 152. The cylinder assembly 166, having one end fixed through support 168 to carriage 152, and the other end fixed to pivotably block 162 through member 170, is provided for pivoting the mandrel 150 between the horizontal and vertical positions. It is to be noted that at least the outer portion of the mandrel has a configuration conforming to the particular shape of the pockets 34.

An auxiliary clamp 151 grips the edge of the pocket 34 to permit retraction of the mandrel 150 and carriage 152 before the pocket is clamped by the clamping and displacing assembly 172. A suitable fluid cylinder, not shown, is provided for actuating auxiliary clamp 151.

The second stitching apparatus 38 is provided with a clamping and displacing assembly 172 which is substantially identical to the clamping and displacing assembly 42 of the first stitching apparatus and therefore will not be described in detail. The clamping and displacing assembly 172 includes fluid cylinders for lifting

and directing a relatively flat clamping plate, similar to plate 106, wherein the pocket edges have the second stitching 148 applied by sewing instrumentalities, not shown, of sewing machine 174. A cam member, similar to cam 136, guides the clamping plate relative to the sewing instrumentalities. The stitching 148 between adjacent pockets is severed by a cutter similar to knife 142.

The collecting and conveying mechanism 40 includes a turn table 180 for receiving sewn pockets 34 thereon in stacked relation and a pivotable arm mechanism 182 for receiving and conveying pockets 34 from the table 184 of assembly 38 to turn table 180. The turn table 180 is of transparent construction and a photocell underneath the turn table controls the rotation thereof, depending upon the location of pockets stacked thereon.

FIG. 21 of the drawings schematically illustrates a fluid system for controlling or regulating the various operations performed upon fabric blanks by the first stitching apparatus 36. Since the fluid system for actuating the various fluid cylinders of the second stitching apparatus 38 is substantially identical to the system of FIG. 21, only the system related to the first stitching apparatus will be described in detail.

FIG. 22 schematically illustrates one example of an electrical diagram for controlling the various valves of the fluid system.

In the operation of the first stitching apparatus 36, the master switch 200 is turned to the "on" position and the manual switch 202 is actuated which starts the motor of the sewing machine 46 and in turn actuates transformer 204. The system is now ready for actuation of the start button 206 which energizes control relay CR-1 through the air pressure switch and the emergency stop button 254, and energizes solenoid 208 which permits air pressure to the control valves for cylinders 116, 132, 134, 140, the cylinder 210 for operating the sewing machine clutch, not shown, and cylinders 90, 62, 100 and 144. Cylinder 122 is actuated due to the air pressure to control valve 215 of the air-oil tanks 236 and 238 which acts upon the hydraulic fluid. Also, air pressure is directed to valve 233 of fluid nozzles 102.

Upon actuation of run switch 212, control relay CR-2 is actuated through stop switch 252. The control relay CR-2 then locks in through contacts CR-2(a). At the same time a cam shaft motor 214 is actuated through contact CR-2(b). Control relay CR-2 also closes contacts CR-2(c).

The cam shaft motor 214 drives a cam shaft, not shown, having a series of cam switches CS-1 through CS-12 mounted thereon which are adapted to control the various operations performed upon the fabric blank 32 by the first stitching apparatus. The cam shaft motor 214 then operates various cam switches CS-1 through CS-12 which are arranged relative to each other in such a manner as to activate the folder mechanism, tongue, air-blast, etc., in the proper sequence as previously described to form a pocket 34 having a first stitching thereon. For example, cam switches CS-8, CS-1, CS-11, CS-6, CS-9, CS-3, CS-5, CS-2 and CS-4 controls either directly or indirectly, solenoids 215, 216, 218, 200, 222, 228, 230, 232 and 233. Each of the solenoids is associated with a valve 215', 216', 218', 220', 222', 228', 230', 232' and 233' which, in turn, controls fluid to the various cylinders of the fluid system.

For the sewing to begin at the proper time in the sequence, cam switch CS-10 is momentarily closed to energize control relay CR-4 which locks in through contact CR-4(a). At the same time that control relay CR-4 closes, contacts CR-4(b) open, however, the cam shaft drive motor continues to operate until cam switch CS-12 opens. Control relay CR-4 also closes relay CR-4(c) which actuates the sew solenoid 226 which starts sewing machine 46 by means of cylinder 210 and also energizes the "motion" solenoid 242 through limit switch 128 and the "fast" solenoid 244 through limit switches 128 and 125.

When the screw 250, mounted upon cam member 127, actuates limit switch 128 upon movement of the cam member, solenoids 242 and 244 are de-energized and control relay CR-5 is energized and locks in on itself through contact CR-5(a). Then after a predetermined time contact CR-5(b) closes so that solenoids 242 and 244 are energized. This action causes stitches to form a knot on the fabric simulating a back stay.

Sewing and motion of the clamp 106 continue until cam 127 operates limit switch 125 which de-energizes solenoid 244 to change the speed of the clamp from high speed to low speed. Previously, valves 242' and 244' were open, however, now one is closed to reduce the clamp speed. Simultaneously, solenoid 234 is energized by limit switch 125 to operate thread cutter cylinder 144 and cutter 142. The sewing continues and the motion of the clamp continues at a reduced speed until cam member 127 operates limit switch 126. Contact (a) of limit switch 126 de-energizes control relay CR-4 which in turn de-energizes CR-5 and solenoids 242, 226 and 234. At the same time control relay CR-4 closes contact CR-4(b). Simultaneously therewith, contact (b) of limit switch 126 energizes control relay CR-6 which locks in on itself through contact CR-6(a), closes contact CR-6(b) and opens contact CR-6(c). This completes the first machine cycle.

On subsequent cycles the run button 212 actuates control relay CR-3 through stop switch 252, cam switch CS-7 and relay contact CR-6(b). Control relay CR-3 locks in on itself through contact CR-3(a) and simultaneously closes CR-3(b) which in turn operates the cam shaft drive motor 214 through relay contact CR-4(b).

During the machine operation cam shaft drive motor 214 first closes cam switch CS-12 then momentarily opens cam switch CS-7 to de-energize control relay CR-3. The function of relay CR-3 is to remember that run switch 212 has been actuated before the completion of the previous cycle. In the event that the run switch 212 is actuated before completion of the prior cycle, control relay CR-3 is energized but cam shaft motor 214 cannot begin a new cycle until relay contact CR-4(b) is closed at the completion of the prior cycle.

Operating the stop switch 252 de-energizes control relay CR-2 and control relay CR-3, if energized. Control relay CR-2, in turn, de-energizes control relay CR-6 through relay contacts CR-2(c). If stop switch 252 is operated during a machine cycle, cam shaft drive motor 214 will run until cam switch CS-12 is opened at the end of the cam shaft drive motor cycle. However, because relay contact CR-2(c) is open, "sewing" and "motion" will not begin. Upon subsequent operation of run button 212, control relay CR-2 will be energized, but not control relay CR-3, because relay contact CR-6(b) will not be closed. Relay CR-2 closes relay contact

CR-2(c) which in turn permits "sewing" and "motion" to take place. Upon completion of this cycle, another cycle will not begin because control relay CR-3 has not been energized. Therefore, the function of relay CR-6 is to "remember" that the stop switch 252 has been operated.

We claim:

1. Apparatus for the sewing of fabric into garment components comprising, a support, a machine having sewing instrumentalities mounted upon said support and means for displacing the fabric in a predetermined path of travel during actuation of said sewing instrumentalities to stitch preselected portions of said fabric to form a stitch line having at least a portion at an angle with respect to the direction of travel of the fabric being sewn, said means including a member for clamping the fabric against said support, said member being rotationally fixed relative to said sewing instrumentalities, means for directing said member and fabric in a preselected path about said sewing instrumentalities, said means for directing said member including a follower member fixed relative to said support and sewing instrumentalities, and frictionally engaging and guiding a portion of said clamp member, and means for applying forces to said clamp member to yieldably maintain said clamping member in engagement with said fixed follower member during actuation of said sewing instrumentalities.

2. Apparatus for the sewing of fabric into garment components as recited in claim 1, said means for directing said clamp member and fabric in a preselected path including cam means on said clamp member for engaging said follower member adjacent said sewing instrumentalities for guiding said member and said fabric in a preselected path.

3. Apparatus for the sewing of fabric into garment components, as recited in claim 2, said means for applying forces to said clamp member including fluid power means for urging said member and fabric in a predetermined path relative to said cam means and sewing instrumentalities.

4. Apparatus for the sewing of fabric into garment components as recited in claim 1, and further including means for positioning and aligning preselected edge portions of said fabric in a prescribed manner and means for conveying the fabric having edge portions aligned to said displacing means.

5. Apparatus for the sewing of fabric into garment components as recited in claim 4, said means for positioning and aligning said fabric including means for displacing and positioning said fabric in a prescribed manner and for folding the fabric into an overlapped relation for aligning preselected portions.

6. Apparatus for the sewing of fabric into garment components as recited in claim 5, said displacing means clamping member having peripheral portions substantially conforming to and positioned in spaced relation to said fabric aligned, preselected portions.

7. Apparatus for the sewing of fabric into garment components as recited in claim 1 said clamp member having a cam surface thereon, and said follower means including a cam follower positioned adjacent said sewing instrumentalities for engaging said clamp member cam surface to guide said clamp member and fabric in a predetermined path of travel during sewing of the fabric.

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