Nov. 17, 1964 J. C. WILLIAMS, JR 3,157,140

PLEATER ASSEMBLY FOR SEWING MACHINE

Filed Feb. 12, 1963 6 Sheets-Sheet 1

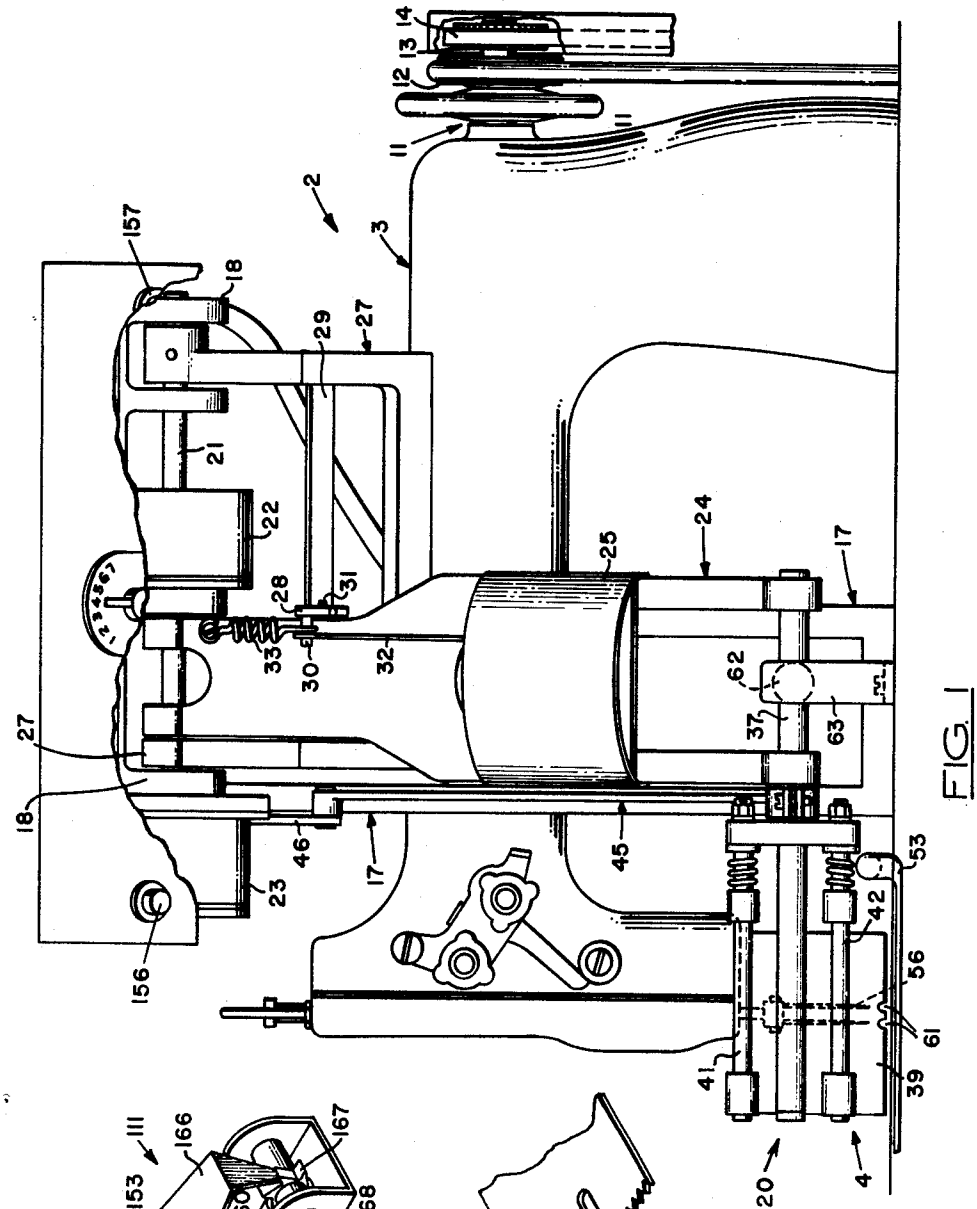


FIG. 1

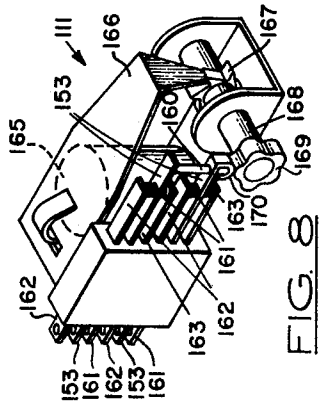


FIG. 8

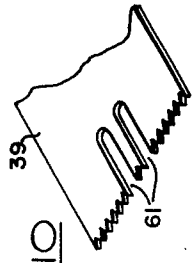


FIG. 10

INVENTOR.
JAMES C. WILLIAMS JR.

BY

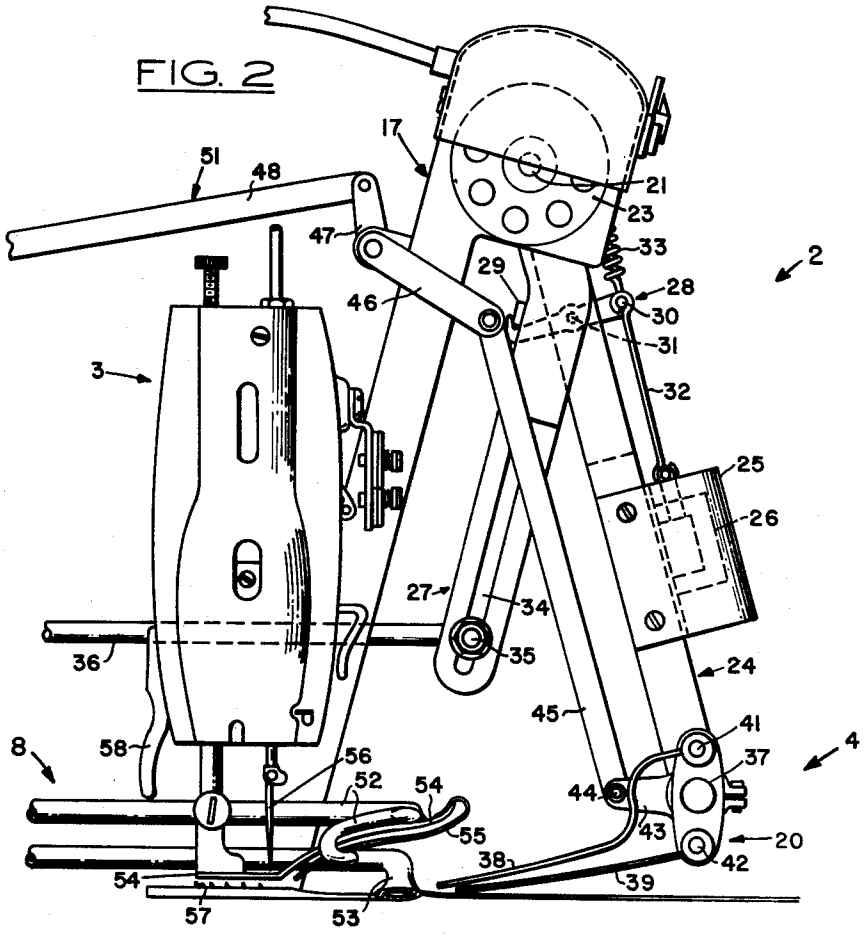
J. D. Copeland Jr.
ATTORNEY

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FIG. 2



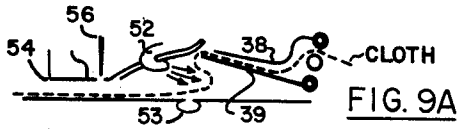


FIG. 9A

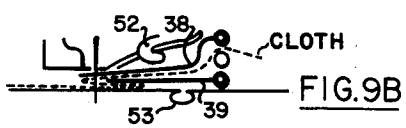


FIG. 9B

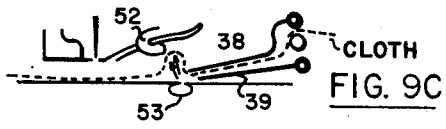


FIG. 9C

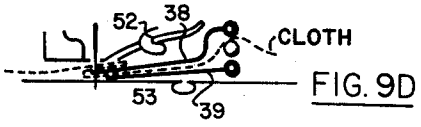


FIG. 9D

INVENTOR.
JAMES C. WILLIAMS JR.
BY
F. D. Copeland Jr.
ATTORNEY

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PLEATER ASSEMBLY FOR SEWING MACHINE

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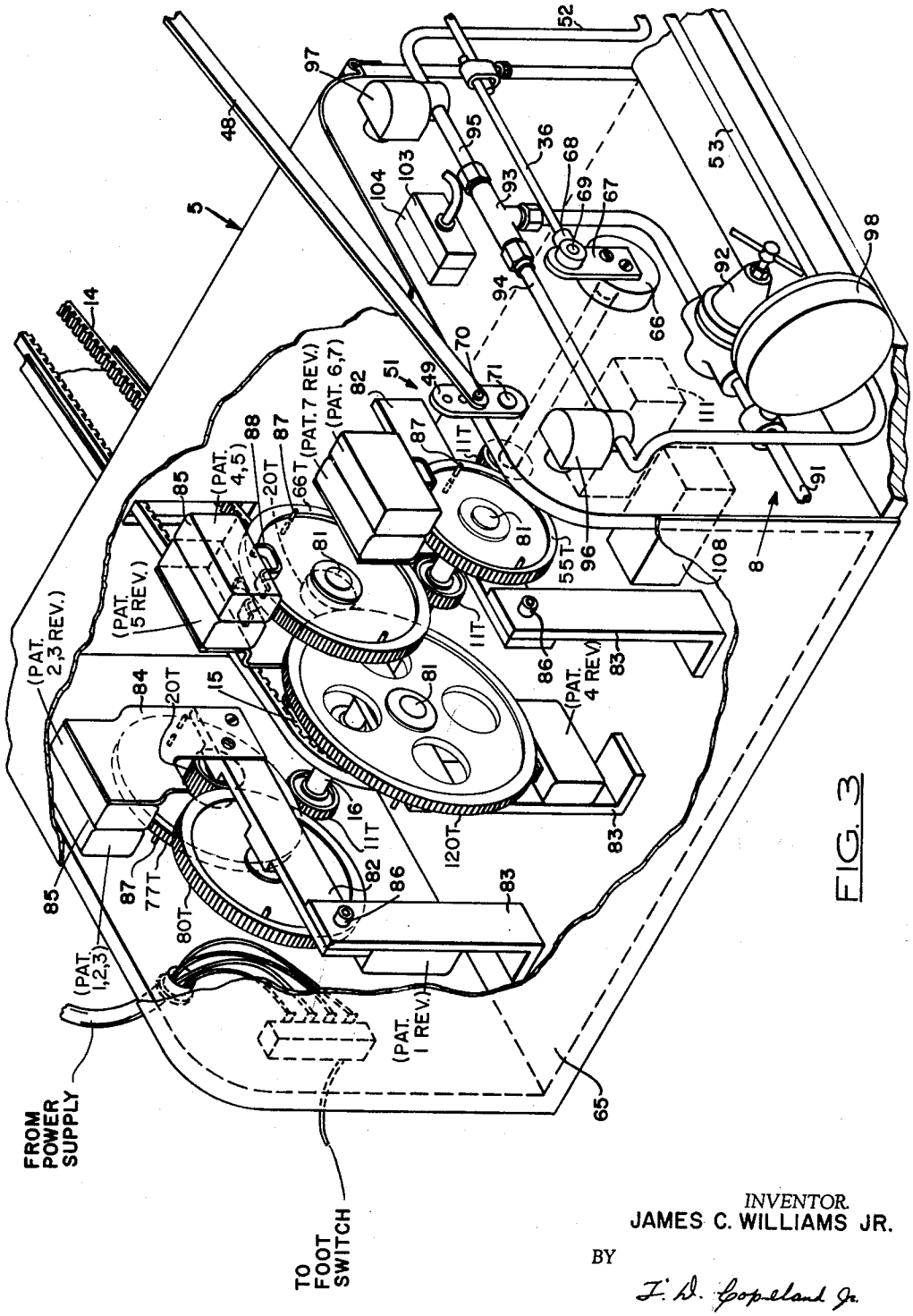


FIG. 3

INVENTOR.
JAMES C. WILLIAMS JR.

BY

F. D. Copeland Jr.
ATTORNEY

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PLEATER ASSEMBLY FOR SEWING MACHINE

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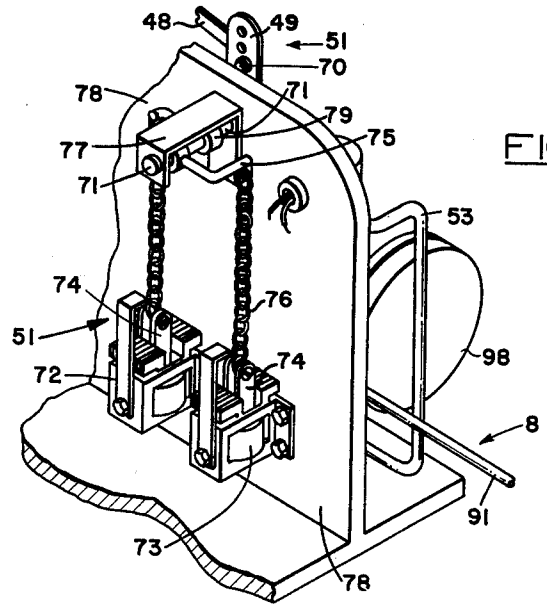


FIG. 4

PATTERN NO. 1		7 TO 1 RATIO REVERSE 4 CYCLES
PATTERN NO. 2		7 TO 1 RATIO REVERSE EA. CYCLE
PATTERN NO. 3		7 TO 1 RATIO REVERSE EA. CYCLE
PATTERN NO. 4		6 TO 1 RATIO REVERSE 6 CYCLES
PATTERN NO. 5		6 TO 1 RATIO REVERSE EA. CYCLE
PATTERN NO. 6		5 TO 1 RATIO NO REVERSE
PATTERN NO. 7		5 TO 1 RATIO REVERSE EA. CYCLE

FIG. 7

INVENTOR.
JAMES C. WILLIAMS JR.

BY

F. D. Copeland Jr.
ATTORNEY

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PLEATER ASSEMBLY FOR SEWING MACHINE

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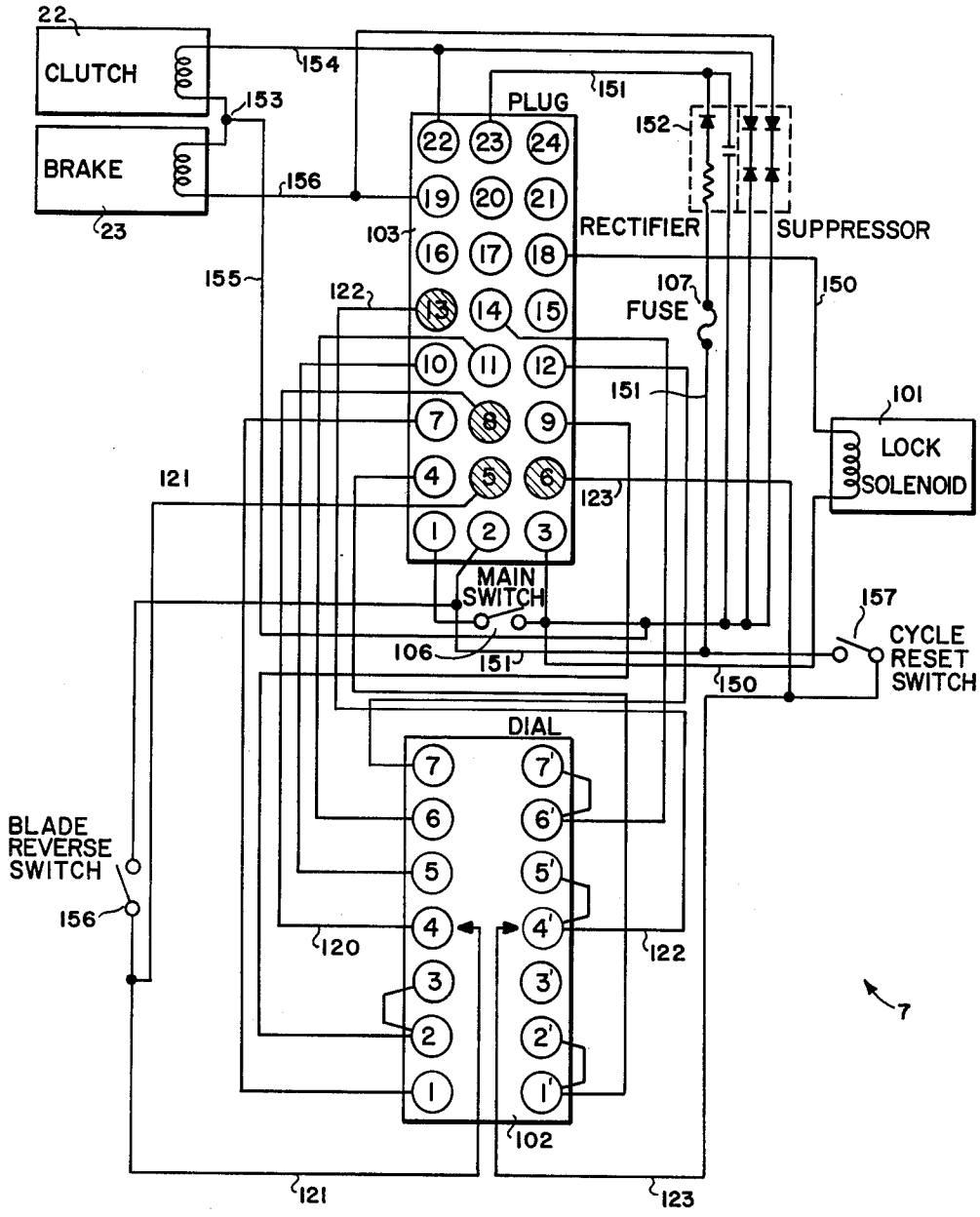


FIG. 5

INVENTOR.
JAMES C. WILLIAMS JR
BY
F. D. Copeland Jr.
ATTORNEY

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PLEATER ASSEMBLY FOR SEWING MACHINE

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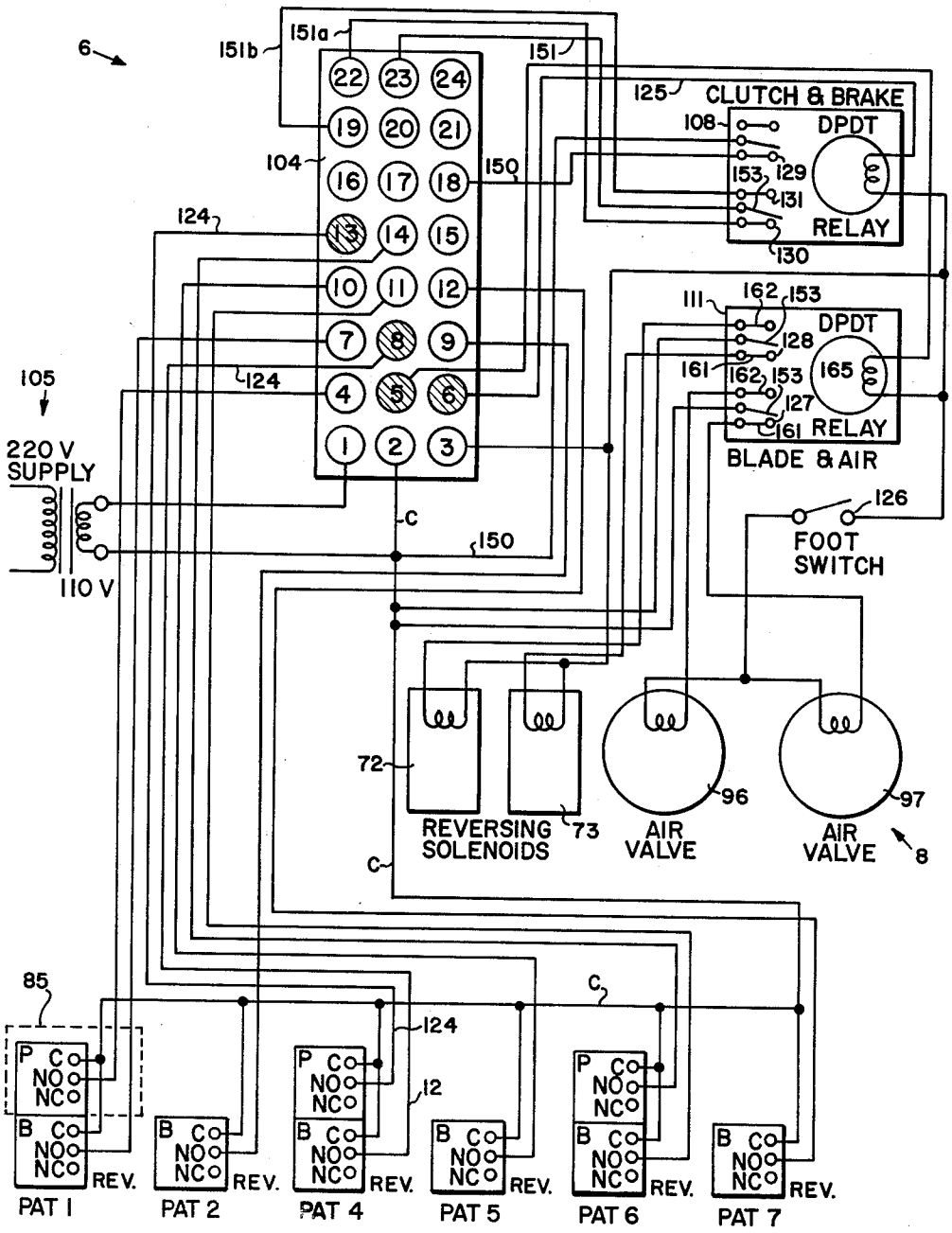


FIG. 6

INVENTOR.
JAMES C. WILLIAMS JR.

BY

F. D. Copeland Jr.
ATTORNEY

United States Patent Office 3,157,140 Patented Nov. 17, 1964

3,157,140

PLEATER ASSEMBLY FOR SEWING MACHINE

James C. Williams, Jr., 1705 Houghton Road, Dallas, Tex., assignor of one-half to Sunny Isle, Inc., Dallas, Tex., a corporation of Texas

Filed Feb. 12, 1963, Ser. No. 257,954
10 Claims. (Cl. 112—134)

This invention relates generally to sewing machinery for performing selected operations on cloth or other materials.

A principal object of this invention is to provide an apparatus which is capable of performing pleats in cloth in a selected sequence.

Another object is to provide an apparatus which will permit pleats of greater depths than possible when using conventional machines.

A further object is to provide an apparatus which may be attached to a conventional garment sewing machine to control and feed cloth in a particular manner for its operation.

And another object is to provide an apparatus which is attached to a conventional garment machine to both selectively, and automatically control pleating operations by means of said machine.

A still further object is to provide a control apparatus for installation on a garment machine for controlling depth and direction and style of pleats performed with said machine.

And yet another object is to provide an electro-pneumatic control apparatus for installation on garment machines for controlling pleating operations.

A still further object is to provide a unique attachment for a sewing machine which will automatically make multiple pleats in ladies' skirts in one direction and then automatically reverse and make pleats in the other direction.

And another object is to provide a pleating attachment for use on a conventional sewing machine which utilizes the medium of air to provide increased depth of pleats.

And yet an additional object of this invention is to provide a compact, precisely accurate and extremely durable pleating attachment for a garment machine.

These and other objects will become apparent upon examination of the following specifications and drawings in which:

FIG. 1 represents a side elevational view of the apparatus of this invention;

FIG. 2 is a front end view of the device of FIG. 1;

FIG. 3 is a pictorial view partly in cross-section showing details of the timing gear control mechanism used with the apparatus of FIGS. 1 and 2.

FIG. 4 is a fragmentary pictorial view showing details of the blade reversing mechanism.

FIG. 5 is a circuit diagram of the power pack unit of the electrical system of this invention;

FIG. 6 is a circuit diagram of the pattern pleater gear box control unit of the electrical system;

FIG. 7 is a schematic diagram of typical pleat patterns which can be performed using the device of this invention.

FIG. 8 is a pictorial drawing of a stepping relay employed in this invention.

FIGURES 9 *a–d* are diagrammatic outline illustrations to represent the action of the blade unit in forming forward and reverse pleats.

FIG. 10 is a fragmentary detail view of one pleat guiding blade of FIGURES 1 and 2.

Referring now more particularly to the characters of reference on the drawing it will be observed that the complete assembly of this invention is composed generally of a plurality of operating and control subassemblies which are mounted on a standard industrial sewing machine. The principal utility of the complete assembly is for sewing selected patterns of pleats into cloth, ladies' clothing and particularly in skirts.

The complete pattern pleater assembly, identified generally at 2 on the drawing, operates in conjunction with a standard garment sewing machine 3, on which is mounted a mechanical pleating subassembly 4, a gear box mechanical control subassembly 5, a gear box electrical control subassembly 6, an electrical power control subassembly 7 (known in the trade generally as a "power pack") and an air supply subassembly 8. Each of the named subassemblies cooperate to provide an efficient pattern pleater for fabric garment materials.

The sewing machine 3, as seen in FIG. 1, may be any of several industrial types used in the garment industry, one typical example is identified as Model 31–63 lock stitch double needle machine made by Singer Manufacturing Co. The drive shaft 11 of machine 3 includes a conventional input drive pulley 12 at its outer end, and in addition includes an output pulley 13 which delivers driving power to the gear box subassembly 5 through the medium of corrugated belt 14 which cooperates with corrugated output pulley 13 and the corrugated input pulley 15 on gear box main shaft 16 of FIG. 3. This main shaft provides a timing basis for all operations of the pleater pattern mechanical and electrical subassemblies 4 and 6.

In FIGS. 2 and 3 the mechanism utilized in performing the pleating operation is seen to include a stationary frame 17 having brackets 18 supporting a longitudinal two-section shaft 21 on which is located an electric clutch 22 and an electric brake 23. Shaft 21 also supports the pleater arm 24 which is bifurcated and contains a housing 25 and a lock solenoid 26 in the housing to positively tie the pleater arm 24 to the reciprocating pleater drive arm 27 by means of latch 28 on pleater arm 24 and bar 29 on drive arm 27. The latch 28 is pivoted to pleater arm 24 at pin 31 and is operated to latch with bar 29 by a pull on rod 32 when the solenoid 26 is energized; latch 28 is moved in the other direction by spring 33 to disengage from bar 29 when the solenoid 26 is de-energized. Both spring 33 and rod 32 engage latch 28 thru pin 30. Drive arm 27 is slotted at 34 to receive lock nut, bolt and washer combination 35 at a selected location and thereby pivotally attach reciprocating drive rod 36 at an adjustable location. This adjustment will change the depth of pleat on the finished cloth by changing the length of the radius about shaft 21. The lower end of pleater arm 24 supports a gathering blade unit 20 pivoted on rod 37 so that cooperating blades 38 and 39 may be positioned at a lower position as shown in solid lines in FIG. 2, or in an upper position as indicated in FIG. 9*a*.

Blade unit 20 includes upper and lower blade supporting rods 41 and 42 and includes a short lever arm 43 which is connected by pin 44 to a long lever 45 pivoted at its upper end to crank lever 46. Arm 43, levers 45, 46, 47, and 48 and crank unit 49 are all part of the blade position control assembly 51 shown in FIGS. 2, 3 and 4. The position of the blades 38 and 39 and the activation of air tube 52 or 53 determines whether a forward or reverse pleat will be formed in the material being sewn.

Referring to FIG. 9 for a more explanatory description, when the blades 38–39 are in their upper position (FIG. 9*a*) air is directed against the cloth being sewn from the top side, or through air tube 52 and a reverse pleat is formed. When the blades are in their lower position, pressurized air is directed against the cloth from the bottom side thereof, through air tube 53 (FIG. 9*c*) and a forward pleat is formed. Travelling rails 54 and flexible guide rail 55 retain the cloth so that the pleating operations may be completed just as the cloth is sewn on by machine needles 56. Teeth 57 and rail 54 engage the cloth when release 58 is moved down and cooperate to pull the cloth thru the machine. When one

pleat is formed, blade unit 20 retracts and gathers another section of cloth and pushes it forward again until the air control forms the desired pleat and the needle 56 stitches it in place. The cloth passes over rod 37 and between the blades 38 and 39 when travelling thru machine 2.

The blades 38 and 39 are slotted at 61 as shown in FIGS. 1 and 10 to permit needles 56 to engage the folded and pleated cloth before the blades retract. The needles then place additional stitches in the cloth while the blade arm 24 and blades 38 and 39 are travelling back their full stroke to engage rubber bumper 62 on adjustable stop member 63. Depending on the pattern chosen, the blades may return forward and make a second identical pleat, or they may reverse (move up or down) and make a reverse pleat, or the blades may remain at their rearmost position (rod 37 against bumper 62) and permit the cloth be sewn without pleats.

With reference to FIGS. 3 and 4, the control operations may be described which affect the performance of the units described with reference to FIGS. 1, 2 and 9. The main shaft 16 of gear box assembly 5 is journalled in each end of the housing and extends beyond the housing at one end for attachment to crank 66 which has a crank arm 67 screwed thereto. Rod 36 is pivoted to crank arm 67 by end connector 68 and pivot pin 69 and thereby transmits reciprocating motion to arm 27 when shaft 16 is power rotated thru belt 14 and pulley 15. Rod 48 is adjustably pivoted via pin 70 to crank unit 49 which is rotated a short distance in a clockwise or a counterclockwise direction by shaft 71 in response to a force applied by either solenoid 72 or 73 (FIG. 4). The plungers 74 of solenoids 72 and 73 are attached to lateral extensions 75 on shaft 71 via chains 76. Bracket 77 attached to end wall 78 supports the extended end of shaft 71 for limited rotation and lock collars 79 adjustably position the extensions 75. Main shaft 16 (FIG. 3) contains three small gears (identified on the drawing by a reference number that corresponds to the number of teeth they contain) 11T, which mesh respectively from the crank end of shaft 16 with gears 55T, 66T and 77T. Gears 66T and 77T each are integral with smaller gears 20T which mesh respectively with gears 120T and 80T. All of the gears named except the main shaft gears are rotatably supported on stud shafts 81 which are attached to and are supported by arms 82 on support brackets 83 as are switchbox brackets 84 that support miniature switchboxes 85. Arms 82 are each pivoted to their support bracket 83 via hollow head set screws 86, so that the timing of any switch pin 87 may be changed relative to its switch in switchbox 85 by simply raising arm 82 and rotating the gears thereon. Each switchbox 85 contains one or more three terminal miniature switches (as indicated in FIG. 6), which complete the required circuits for the desired operations as described relative to FIGS. 5 and 6.

The air supply 8 includes an inlet supply line 91, (FIG. 3) from any suitable air tank or compressor unit that is capable of delivering pressurized air thru control valve 92, T 93 and lines 94 and 95 respectively to solenoid air valves 96 and 97 and thence to the bottom blower air line 53 and upper blower air line 52. Pressure gage 98 indicates the working pressure of the air supply at all times. Solenoid valves 96 and 97 are normally closed but are electrically energized to open and deliver pressurized air to their respective lines 53 and 52 when required by the electrical control circuit which is itself controlled by the gear box unit 5.

The electrical power unit (power pack) identified at 7 of FIG. 5 includes the necessary components and circuitry to operate the clutch and brake units 22 and 23 and the lock solenoid 101 and includes the pattern selector dial 102 and a multi-pin plug 103 which mates with multi-pin socket 104 of the pleater control unit 6 of FIG. 6.

The electrical pleater control unit 6 introduces electric power to the pleater assembly 2 thru a transformer 105 which converts the 60 cycle factory power supply from 220 v. A.C. to 110 v. A.C. and delivers this power to socket pins (1) and (2) which provide power to the entire system thru plug pins (1) and (2) when socket 104 and plug 103 are engaged. The electric power is first under the control of main switch 106 and also under control of safety fuse 107. The control circuit of unit 6 includes two multi-element relay units identified as the clutch and brake relay 108 and the blade and air relay 111 and a plurality of pattern selector switches identified by pattern number. These selector switches are contained in switch boxes 85 of FIG. 3, and each contains an extended operating lever 88 which is operated by a corresponding pin 87 on the gear corresponding to the particular switch box 85.

A typical operation of the pleater assembly of this invention may be observed by following thru one pleating pattern as selected by turning the dial 102 to the terminal "4" as shown in FIGS. 1 and 5. This selection will provide a pattern of pleats in the finished cloth as shown in FIG. 7 as "Pattern No. 4." When plug 103 and socket 104 are engaged the sub-circuits shown in FIGS. 5 and 6 are united into a complete operative electrical system whose operation may be followed by reference to these two figures. The input electric power for the pleater assembly and its electric control is supplied from transformer 105 to mating pins 1 and pins 2 of the assembled electrical connector and thus is made available to all operating and control elements of the pleater assembly. The power for operating the sewing machine 2 is conventional and not a part of this invention and hence is not shown, other than it may be take from the same 220v. source to which transformer 105 is coupled. The selected terminal 4 of dial 102 (FIG. 5) connects the pins 5 and 8 thru circuits 120, 121 whereas its counterpart 4 connects pins 6 and 13 thru circuits 122, 123. Referring to FIG. 6 it will be observed that when pins 6 and 13 are thus connected an electrical continuity is established from pin 13 thru circuit 124 to the "P" section of miniature selector switch identified "Pat 4" thru this switch and common lead C back to pin 2 to complete the power supply circuit when the P or "pleater" unit of switch "Pat 4" is closed, which occurs when pin 87 of gear 66T engages lever 88 of the desired miniature switch box 85. The circuit from pin 6 thru lead 125 (FIG. 6) includes the operating coils of the double pole double throw ratchet relays 108 and 111 and passes thru the selected one (97) of air valve 96 or 97 when foot switch 126 is closed (as it normally is during use), and thru contact 127 of relay 111 and back to common lead C. Contact 128 of relay 111 is also closed at this point to complete the circuit from pin 3 thru reversing solenoid 73 and back to common lead C. This supplies the electric power to operate the selected reversing solenoid 73 since pin 3 as shown in FIG. 5 is connected thru main switch 106 to one power input pin 1, and the common lead C is connected to the other power input pin 2. Similarly when double pole double throw relay 108 is energized it completes the circuits thru contacts 129 and 130 to engage the clutch and disengage the brake or vice-versa. Contact 129, for example, completes a circuit 150 from pin 18 of socket 104 (FIG. 6) thru contact 129 back to the common or power lead C; at the same time pin 18 of plug 103 (FIG. 5) completes the circuit 150 thru lock solenoid 101 and back thru main switch 106 to the other side of the power supply at pin 1. Pins (23) and (22) respectively of plug 103 (FIG. 5) each complete a portion of the circuit 151 from power pin 2 thru fuse 107 and rectifier 152 back to pin 23; and from power pin 1 thru clutch 22 to pin (22) and in parallel from junction 153 thru brake 23 (FIG. 5) and back to pin 19.

Thus it will be seen in FIG. 5 that if a circuit is com-

pleted between the power pin (23) and pin (22), the clutch 22 will be energized, whereas if a circuit is completed between power pin (23) and pin (19) a circuit will be completed to energize the brake 23. This alternate energization of either the clutch or the brake, but not both, is desirable since they perform opposite functions relative to shaft 21. This alternate circuit arrangement is completed thru the clutch and brake relay 108 (FIG. 6) which closes its power contact arm 153 either against contact 130 or 131 to complete either sub-circuit 151*a* or 151*b*, each of which is coupled to a suppressor unit for safety purposes. Since the power pin (23) for the clutch and brake receives its power thru rectifier 152, these units operate on D.C. power, whereas the other control elements of this system operate on A.C. power.

A blade reverse switch 156 is provided to permit changing the starting position of the blade to accommodate commencing any pattern in the proper direction (forward or reverse pleat), and a cycle reset switch 157 is installed in the circuit to permit alternating the ratio between the number of pleats and the time between pleat groups. Both of these switches will permit the operator to start or correct the timing of any pattern operation. Additionally since pattern No. 3 is simply the converse of pattern No. 2, the cycle reset switch may be applied to the circuit of pattern No. 2 to produce pattern No. 3 and thus a separate control miniature selector switch for pattern No. 3 is eliminated.

The circuit from miniature switch "Pat 6 Rev" (shown in FIG. 6) is available in the event the pattern identified as No. 6 in FIG. 7 is changed to include a reverse cycle, in which case, an additional gear and pin would be required to align with such switch.

Blade reverse switch 156 will, in effect, by-pass the miniature selector switch and thus relay 111 will be energized to rotate its ratchet one notch so the sequence will be changed one step. Therefore, the reversing solenoid 72 or 73 that ordinarily would operate first, will not operate second, and the sequence of blade positions will be reversed.

Recycle switch 157 is necessary, since the number of gear teeth between the switch operating pins in the gear box unit are not symmetrical. The 77T gear, for example, has two pins spaced 33 teeth apart in one clockwise direction and 44 teeth apart in the other clockwise direction. Switch 157 will likewise by-pass a miniature selector switch and reverse the sequence of the contacts on relay 108 and thus change the timing between clutch and brake energizing cycles.

By the use of air as the medium of pleat forming in combination with the other features of this invention, both forward and reverse pleats are attainable in greater depth of underlay with this machine than has been possible with prior machines. Prior art machines have an operating range of underlay up to about one inch, whereas the machine of this invention has successfully produced pleats in production in the 1⅜–2 inch underlay range. The change from one inch to two inches is not a matter of degree in the garment trade, it is a change that permits automatic machine operation to compete with hand pleating where the purpose is a predetermined consumption of material. In ladies' skirts there are certain categories that require a spread or sweep at the hem line of 164"; since a typical waist measurement would be 24", an extremely large amount of material must be consumed in pleats between the waist and hem line, and this amount is more than can be handled where the pleats are less than approximately one inch. In hand pleating, the cloth is laid over preformed paper patterns and treated with steam so that virtually any size can be attained, however with prior art machine pleaters the depth of pleat was machine controlled and reached a practical limit at about one inch. This ruled out the use of machine pleating where large consumption of material was required.

FIG. 8 is a perspective view of a double pole double throw relay (Guardian Series 670 or equivalent) of the type used for relays 108 and 111. For clarity of illustration this relay will be described relative to relay 111. Contact arms 153 are gang-connected thru pin 160 so that they move up to close their upper contacts 161 against mating contacts on arms 162 or down to close their lower contacts against corresponding contacts on arms 163. The contact arms all extend rearward of the relay to provide terminals for circuit connection. When coil 165 is energized, its spring loaded arm 166 is drawn down with sufficient force to move ratchet wheel 167 one notch. This action rotates shaft 168 and consequently cam 169 whose notches move follower 170 which causes the contacts on arms 153 to disconnect and open one circuit and close another circuit.

This invention has been described in terms of the preferred embodiment, but it is obvious that numerous changes and modifications could be made to the disclosed combination and still fulfill the objects of the invention. Accordingly all changes and modifications which fall within the scope of the appended claims are claimed as part of the invention.

What is claimed is:

1. A pleater assembly for sewing machines, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, mechanical means for moving said blade assembly to a selected position for forming said selective pleat, and electrical means for controlling said mechanical means to provide pleats in a predetermined pattern in said cloth, and pneumatic means cooperating with said blade assembly for properly folding the cloth for said selective pleats.

2. A pleater assembly for sewing machines, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, mechanical means for moving said blade assembly to a selected position for forming said selective pleat, and electrical means for controlling said mechanical means to provide pleats in a predetermined pattern in said cloth, and pneumatic means cooperating with said blade assembly for properly folding the cloth for said selective pleats, said electrical means including means for controlling said pneumatic means for providing said selective pattern of pleats.

3. A pleater assembly for sewing machines, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, mechanical means for moving said blade assembly to a selected position for forming said selective pleat, and electrical means for controlling said mechanical means to provide pleats in a predetermined pattern in said cloth, and pneumatic means cooperating with said blade assembly for properly folding the cloth for said selective pleats, said electrical means including means for controlling said pneumatic means for providing said selective pattern of pleats, manual means for selectively setting said electric means to automatically control the operation of said mechanical means and said pneumatic means for providing predetermined pleats in said cloth of such a depth as to provide a predetermined large consumption of material.

4. A pleater assembly for attachment to a sewing machine, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, a pivoted blade unit in said blade assembly, linkage means to move said blade unit to selected positions, and electric solenoid means to actuate said linkage when desired, said cloth passing through said blade unit prior to being sewn by said sewing machine, and pneumatic nozzles directed toward said cloth at a location between the point that said cloth first engages said blade unit and the point at which said cloth is sewn.

5. A pleater assembly for attachment to a sewing machine, comprising: a cloth gathering blade assembly adapt-

ed to selectively form forward and reverse pleats in cloth, a pivoted blade unit in said blade assembly, linkage means to move said blade unit to selected positions, and electric solenoid means to actuate said linkage when desired, said cloth passing through said blade unit prior to being sewn by said sewing machine, and pneumatic nozzles directed toward said cloth at a location between the point that said cloth first engages said blade unit and the point at which said cloth is sewn, and electric means for directing fluid from selected nozzles onto said cloth to cause said cloth to billow in a selected direction.

6. A pleater assembly for attachment to a sewing machine comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, a pivoted blade unit in said blade assembly, linkage means to move said blade unit to selected positions, and electric solenoid means to actuate said linkage when desired, said cloth passing through said blade unit prior to being sewn by said sewing machine, and pneumatic nozzles directed toward said cloth at a location between the point that said cloth first engages said blade unit and the point at which said cloth is sewn, and electric means for directing fluid from selected nozzles onto said cloth to cause said cloth to billow in a selected direction, said nozzles being positioned one above said cloth and one below said cloth to billow said cloth for proper folding for forward and reverse pleats.

7. A pleater assembly for a sewing machine, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, reciprocating means for moving said blade assembly toward said sewing machine to gather cloth and form a pleat therein, fluid means to direct pressurized fluid onto said cloth to billow said cloth during the gathering operation, electric means to selectively control said reciprocating means and said fluid means to produce a desired amount of forward or reverse pleats, timing means cooperating with said electric means for determining said desired amount of pleats.

8. A pleater assembly for sewing machine, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, reciprocating means for moving said blade assembly toward said sewing macihne to gather cloth and form a pleat therein, fluid means to direct pressurized fluid onto said cloth to billow said cloth during the gathering operation, electric means to selectively control said reciprocating means and said fluid means to produce a desired number of forward or reverse pleats, timing means cooperating with said electric means for determining said desired amount of pleats, drive means operating said reciprocating means, and adjustable means in said drive means for selectively controlling the depth of said pleats.

9. A pleater assembly for a sewing machine, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, reciprocating means for moving said blade assembly toward said sewing machine to gather cloth and form a pleat therein, fluid means to direct pressurized fluid onto said cloth to billow said cloth during the gathering operation, electric means to selectively control said reciprocating means and said fluid means to produce a desired number of forward or reverse pleats, timing means cooperating with said electric means for determining said desired amount of pleats, drive means operating said reciprocating means, and adjustable means in said drive means for selectively controlling the depth of said pleats, said reciprocating means including a pleater drive arm, and means to selectively disconnect said pleater drive arm from said drive means to permit normal machine sewing without pleats.

10. A pleater assembly for a sewing machine, comprising: a cloth gathering blade assembly adapted to selectively form forward and reverse pleats in cloth, reciprocating means for moving said blade assembly toward said sewing machine to gather cloth and form a pleat therein, fluid means to direct pressurized fluid onto said cloth to billow said cloth during the gathering operation, electric means to selectively control said reciprocating means and said fluid means to produce a desired number of forward or reverse pleats, timing means cooperating with said electric means for determining said desired amount of pleats, drive means operating said reciprocating means, and adjustable means in said drive means for selectively controlling the depth of said pleats, said reciprocating means including a pleater drive arm, and means to selectively disconnect said pleater drive arm from said drive means to permit normal machine sewing without pleats, said last named means including a releasable solenoid actuated latch between said drive means and pleater drive arm, and a clutch to disconnect the power transfer therebetween.

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2,988,027	Guerard	June 13, 1961
3,099,970	Hite	Aug. 6, 1963