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[54] **ELECTRICALLY CONTROLLED CLOTH SPREADING MACHINE**

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[52] **U.S. Cl.** **270/31**

[51] **Int. Cl.** **B65h 29/46**

[58] **Field of Search** 270/30–31

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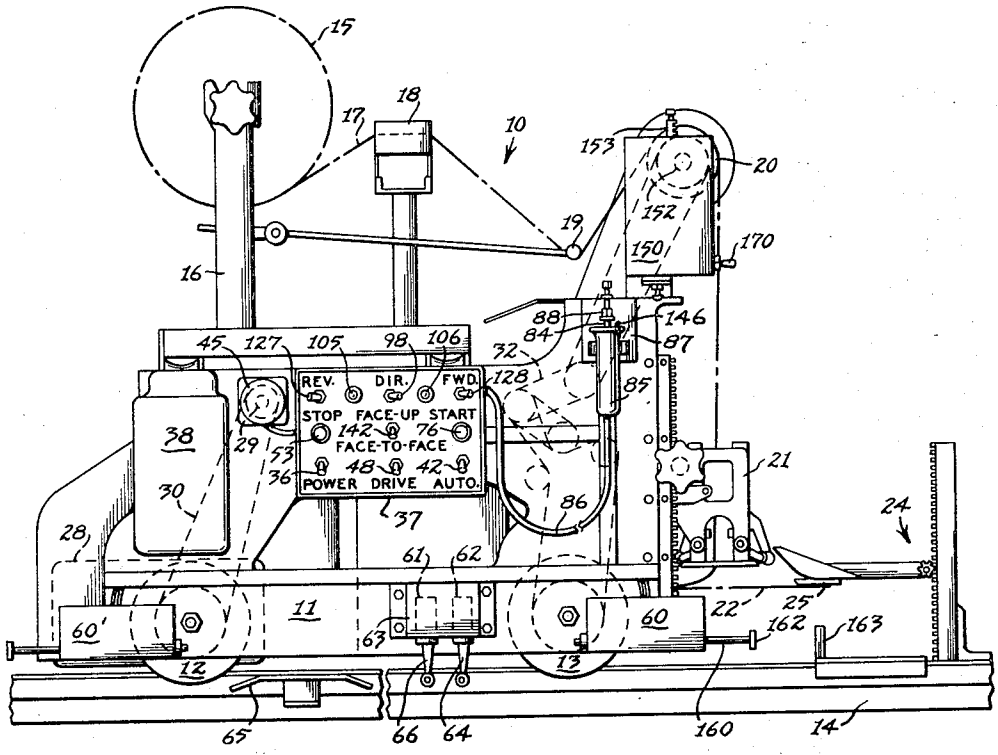
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[57] **ABSTRACT**

An electrically driven and controlled cloth spreading machine including means for reversing the travel of the machine, means for controlling the high and low speeds of the machine, means for causing the machine to fail safe at low speed upon power failure and open circuit conditions caused by different changes in function of the machine.

The machine is also provided with various selective controls for manual, semi-automatic and automatic operation of the machine, and for spreading cloth face-to-face, face-up or face-down.

5 Claims, 4 Drawing Figures



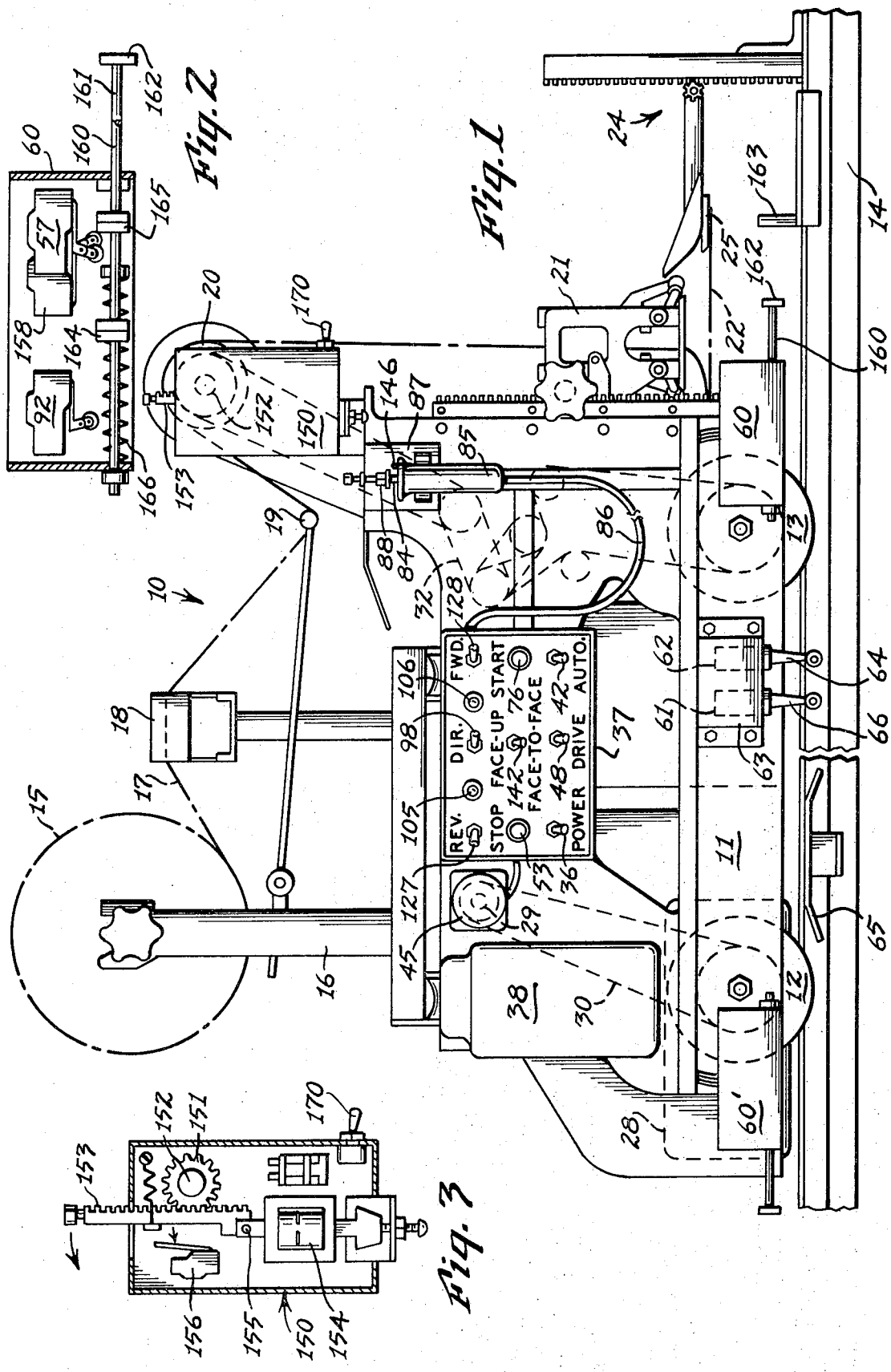


Fig. 1

Fig. 2

Fig. 3

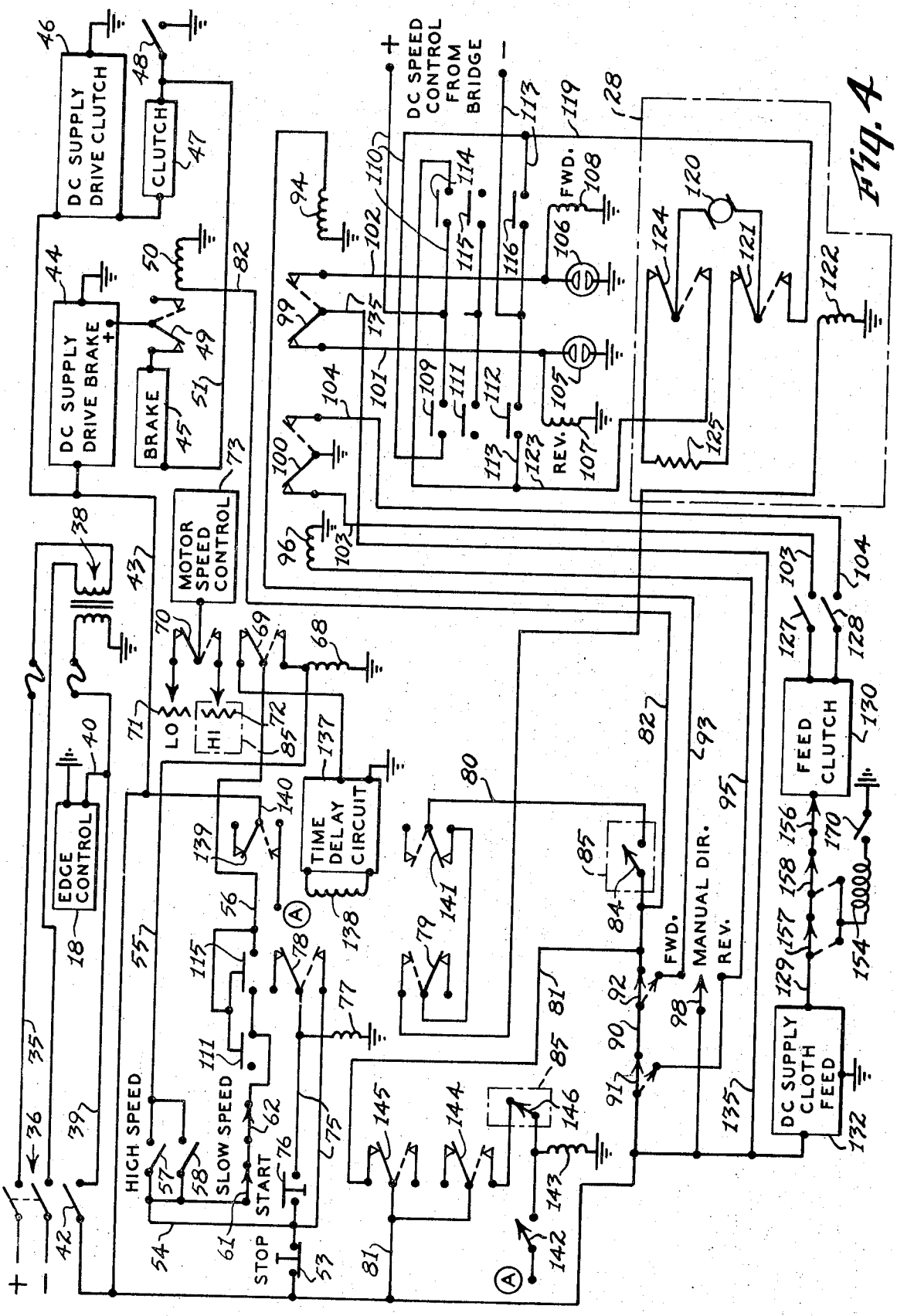

DC SUPPLY DRIVE CLUTCH
CLUTCH
DC SUPPLY DRIVE BRAKE
BRAKE
MOTOR SPEED CONTROL
DC SPEED CONTROL FROM BRIDGE
FWD.
REV.
EDGE CONTROL
HIGH SPEED
SLOW SPEED
START
STOP
LO
HI
TIME DELAY CIRCUIT
MANUAL DIR.
FWD.
REV.
FEED CLUTCH
DC SUPPLY CLOTH FEED

Fig. 4

ELECTRICALLY CONTROLLED CLOTH SPREADING MACHINE

This is a division of application Ser. No. 857,509, filed Sept. 12, 1969, now Pat. No. 3,663,006.

BACKGROUND OF THE INVENTION

This invention relates to a cloth spreading machine, and more particularly to a versatile, electrically operated cloth spreading machine.

Cloth spreading machines, and even electrically operated cloth spreading machines are known in the art. Also, cloth spreading machines have been developed, and are now in operation, which travel at high speed over the major portion of their reciprocable course between a pair of reversing stations and in low speed adjacent the reversing stations for cooperative engagement with the catcher mechanism to form folds in the ends of the layers of cloth. However, in order to minimize damage to the machine and cloth and jerking and irregular folding of the cloth at the reversing stations, various electrical switch controls have been adopted in order to reduce the speed of the machine just prior to its cooperation with the catcher mechanism. It is also known to resume the high speed of the machine as soon as possible after it has reversed its movement and formed the fold in the layer of cloth.

Difficulty has been experienced with speed controls for cloth spreading machines, either because of the reliability of the controls, or because of the lack of skill of the operators of the machine. Thus, on occasions, a spreading machine has been known to enter the catcher mechanism and reversing station at high speeds, and sometimes without reversing.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an electrically driven cloth spreading machine provided with various elevtrical controls to cause the machine to fail safe in low speed.

The spreading machine made in accordance with this invention is provided with an electrical motor drive, a reversible motor circuit, a motor speed control apparatus, and reversing and speed change switches adapted to be actuated at appropriate stations to permit the reduction of the speed of the spreading machine as it approaches its reversing station, to permit reversing of the machine at each end of its travel, and to resume its high speed within a short distance of the reversing station as the machine resumes its spreading operation. The high speed switches are designed to momentarily close to energize a holding relay circuit which will maintain the machine at high speed as long as the holding relay circuit is energized. However, upon any interruption of current to the holding relay circuit, the speed of the machine will automatically be reduced.

A further object of this invention is to provide a time-delay circuit which will automatically brake the machine every time the speed of the machine is reduced from high to low, to reduce the deceleration time, and therefore decrease the production time, of the machine.

This invention further contemplates circuitry which permits selective face-to-face cloth spreading, or face-down or face-up spreading. In either the face-down or the face-up spreading operation, an automatic braking mechanism is provided to stop the machine after each layer of cloth is spread, so the cloth may be cut. The circuitry also provides means for manually re-starting the machine in its reverse direction to the opposite end of the course, without layer cloth, preparatory to laying the next layer of cloth.

The machine made in accordance with this invention also is provided with a remote control handle incorporating a starting switch, and a re-starting switch for face-up or face-down spreading, to afford the operator of the machine the opportunity of viewing the spreading operation from the front of the machine while still being in full control of the machine.

The invention also contemplates the provision of an automatic mechanism for over-feeding the cloth web to accommodate the extra cloth demand created by the interaction of the spreading unit with the catcher mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation of a cloth spreading machine made in accordance with this invention adjacent a catcher mechanism at one end of the travel of the machine;

FIG. **2** is an enlarged sectional elevation of the plunger-actuated switch mechanism mounted on the front of the machine;

FIG. **3** is an enlarged sectional elevation of the cloth overfeed mechanism; and

FIG. **4** is a schematic circuit diagram of the electrical drive and control system for the machine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings, FIG. **1** discloses a cloth spreading machine **10** made in accordance with this invention, including a carrier frame **11** supported by wheels **12** and **13** for longitudinal movement along a spreading table **14.** A cloth supply roll **15** is supported for free rotary movement upon standards **16** mounted upon the frame **11** for unwinding and feeding a web of cloth **17.** In the machine **10,** the web **17** is threaded through an edge control device **18,** beneath a pivotally mounted cloth tension rod **19** and then over a dirven top feed roll **20.** The web **17** then depends through a cloth spreader frame or unit **21,** having tuck blades or spreader blades, not shown, for spreading the cloth web **17** in layers **22** upon the table **14.** A catcher mechanism **24** including a catcher bar **25** is stationed upon the spreading table **14** at one end of the travel or course of the carrier frame **11** to cooperate with the spreader unit **21** in a well known manner to fold the end of each cloth layer **22.**

An electrical motor **28** mounted on the frame **11** is operatively connected to drive the left rear wheel, not shown, which is connected by suitable chain and sprocket mechanism, not shown, to transverse drive shaft **29,** which in turn is coupled through suitable sprocket end chain mechanism **30** to drive the right rear wheel **12.**

The left front wheel behind the right front wheel **13,** is drivingly connected to the top feed roll **20** through a transmission system **32,** including sprockets and chains, over-driven clutches, and an electromagnetic feed clutch **47,** in such a manner that the top feed roll **20** is driven in the same direction independently of the front wheels **13.**

Referring now to the electrical circuit diagram in FIG. 4, a power supply circuit 35 is connected to any suitable source of electricity, not shown, through the power switch 36, which is also disclosed upon the control panel 37 mounted on the side of the frame 11, as disclosed in FIG. 1.

The supply circuit 35 comprises the primary circuit of transformer 38 which changes the voltage in secondary circuit 39. Connected in parallel to secondary circuit 39 is the edge control circuit 40 for energizing the edge control apparatus 18.

Automatic switch 42 is provided in secondary circuit 39 for supply electricity to all of the other electrical circuits of the spreading machine 10, except the edge control circuit 40. Thus, as long as the power switch 36 is closed and automatic switch 42 is open, the edge control 18 will continuously operate to align the cloth web 17. Thus, when the cloth supply roll 15 is loaded and the web 17 is threaded to the spreader frame 21, or when the frame 11 is pushed for manual spreading, the web 17 is continuously and automatically aligned.

Connected in series with the secondary circuit 39 is the brake-clutch circuit 43 which feeds current to the D.C. supply drive circuit 44 for the electromagnetic brake 45, and to the D.C. supply drive circuit 46 for the electromagnetic clutch 47. The brake 45 and the clutch 47 are connected in parallel by brake circuit 51. The electromagnetic brake 45 is disclosed in FIG. 1 for engaging and disengaging the drive shaft 29, which in effect will brake or release the rear wheels 12 for moving the carriage frame 11. The electromagnetic clutch 47 couples the electric motor 28 to the left rear drive wheel in any convenient manner, not shown. The electromagnetic clutch 47 and the electromagnetic brake 45 are energized by the closing of drive switch 48. Thus, when it is desired to manually operate, that is manually move, the spreader frame 11, then the drive switch 48 is opened to dis-engage the clutch 47 from the motor 28 and to de-energize the brake 45 so that the frame 11 may "free wheel". Electromagnetic brake 45 may also be de-energized by the opening of switch 49, normally closed, when the brake relay coil 50 is energized.

Connected in parallel to the brake clutch circuit 43 through the normally closed stop switch 53 is the speed circuit 54. The speed circuit 54 comprises a high-speed circuit 55 connected in parallel with the low-speed circuit 56. Mounted in parallel in high-speed circuit 55 are a pair of normally open, momentary, unidirectional, high-speed switches 57 and 58. The high-speed switch 57 is shown in FIG. 2 mounted in the plunger box 60. Connected in series in the low-speed circuit 56 are a pair of normally closed, momentary, unidirectional, low-speed switches 61 and 62, both of which are shown mounted in the low-speed switch box 63 on the side of the carrier frame 11. The front low-speed switch 62 is provided with a depending arm 64 which is adapted to engage and be actuated by the actuator ramp 65 as the carrier frame 11 moves from left to right in FIG. 1, that is, in a forward direction towards the catcher mechanism 24. However, when the frame 11 moves in its reverse direction away from the catcher frame 24, the arm 64 merely rides back over the actuator ramp 64 without energizing or de-energizing the switch 62. The switch 61 is provided with the depending arm 66 which operates in reverse upon a ramp similar to 65 at the opposite, that is, the far left, end of the table 14.

The high-speed circuit 55 includes a speed control relay coil 68, which is also connected in series with the low-speed circuit 56 through the holding relay switch 68, controlled by the coil 68. The speed selector switch 70 is also a relay switch controlled by the coil 68 to selectively connect either a low-speed potentiometer 71, or a high-speed potentiometer 72, to the motor speed apparatus 73 of conventional design.

Thus, when either of the high-speed switches 57 or 58 ismomentarily closed, the coil 68 is energized to depress the relay switches 69 and 70 causing the low-speed circuit 56 to act as a holding relay circuit and connecting the high-speed potentiometer 72 to motor speed control apparatus 73. However, when either of the low-speed switches 61 or 62 is opened, the holding coil 68 is de-energized to open the holding relay 69 and connect the selector switch 70 with the low-speed potentiometer 71.

From this description of the speed circuits 55 and 56, it will be seen that when any of the switches, that is low-speed switch 62, low-speed switch 61, stop switch 53, automatic switch 42, or power switch 36 is opened, the holding coil 68 will be de-energized causing the selector switch 70 to disconnect the high-speed potentiometer 72 and connect the low-speed potentiometer 72 to the speed control apparatus 73, thereby changing the speed of the carriage frame 11 from high to low. The change from high speed to low speed will also be effected if there is any power failure or if the power supply circuit 35, secondary circuit 39, speed circuit 54, or low speed circuit 56, is interrupted or broken in any manner. Thus, an electrical speed control has been designed for causing the machine 10 to fail-safe into low speeds for various changes in function of the electrical circuit.

Connected in series with the stop switch 53 is a starting circuit 75 including a manually operated, start switch 76. When the start switch 76 is depressed, the starting relay coil 77 is energized to close the holding relay switch 78 to maintain the starting circuit 75 energized, even when the manual starting switch 76 is released. A second relay switch 70 is connected in the motion circuit 80 to be moved to a closed position upon energization of the starting coil 77.

The motion circuit 80 is supplied with current through the motion supply circuit 81, which also furnishes current to the brake relay circuit 82 to energize the brake relay coil 50 and thereby release the brake 45. A motion switch 84 is adapted to open and close the motion circuit 80, and is in the form of a plunger located in the top of the remote control handle 85. The handle 85 is adapted to be held in the operator's hand, and is connected to the control panel 37 through an electrical cable 86, for remote control of the machine 10. As shown in FIG. 1, the operator's handle 85 is suspended in a bracket 87 mounted on the side of the carrier frame 11. While the handle 85 is mounted in the bracket 87, the motion switch plunger 84 is maintained depressed to close the motion circuit 80 by a depressing lug 88. The handle 85 may be removed from the bracket 87 so that the operator may start and stop the machine 10 from a remote position.

Also located within the handle 85, as indicated in FIG. 4, is the variable high-speed potentiometer 72 which is connected to the motor speed control appara-

tus 73 through a lead,not shown, within the cable 86 and through the selector switch 70. The wiper on the high-speed potentiometer 72 is connected to, or forms a part of, the plunger switch 84. Thus, as the plunger switch 84 is depressed, the motion circuit 80 is first closed to start the motor 28, and then the speed of the motor 28 is gradually increased with continued depression of the plunger switch 84, as long as the selector switch 70 is connected to the high-speed potentiometer.

When the remote control handle 85 is hanging in its bracket 87, the depressing lug 88, which is threaded for vertical movement, may be adjusted to maintain the plunger switch 84 depressed in any desired position to obtain motor speeds of various corresponding values, while the selector switch 70 is in high-speed position.

The cable 86 is preferably long enough so that the operator may stand in front of the machine to observe the spreading operation, and still control the starting, stopping and speed of the machine. The remote control handle 85 therefore provides a very versatile cloth spreading machine 10 in which the operator has full control over the motion and speed of the machine at all times while the machine is normally operating at high speed between the ramps 63. As soon as the machine is actuated into low-speed by either ramp 65 opening its corresponding low-speed switch 61 or 62, the operator can no longer control the speed of the machine, but can merely stop the machine, until the corresponding high-speed switch 57 or 58 is closed.

By manipulating the plunger switch 84 while the selector switch 70 is in high speed, the operator may select any maximum speed he desires within the range of the high-speed potentiometer 72. The operator may slow-down the machine 10 at any time, between the ramps 65, to inspect the fabric for flaws, and may increase or decrease the speed of the machine 10, at will, for any purpose.

An auxiliary motion supply circuit 90 is connected in parallel with the motion supply circuit 81, and contains in series the normally closed, momentary, reversing switches 91 and 92. One of these reversing switches 92 is disclosed in FIG. 2 in the plunger box 60. The other reversing switch 91 is located in a similar position in the catcher box 60' at the rear end of the carrier frame 11. The forward reversing switch 92, when actuated is adapted to move to its dashed-line position to close the forward directional circuit 93 which includes in series a forward relay coil 94. In a similar manner, when the rear reversing switch 91 is actuated, it moves to its dashed-line position to close the reverse directional circuit 95, which includes in series the reverse relay coil 96. Both of the directional circuits 93 and 95 may be provided with a manual directional switch 98, which is adapted to remain the neutral position disclosed in FIG. 4, or be selectively turned to close either the forward directional circuit 93 or the reverse directional circuit 95, at the will of the operator.

The forward coil 94 and the reverse coil 96 are adapted, when alternately energized, to simultaneously move between forward and reverse positions, the motor directional relay switch 99 and the cloth feed directional relay switch 100. Both of these relay switches 99 and 100 are disclosed in their solid-line positions for closing the respective circuits 101 and 103. The relay switches 99 and 100, when in their dashed-line positions, will close their respective forward circuits 102 and 104. When the respective reverse and forward motor relay circuits 101 and 102 are respectively energized from motor directional circuit 135, they will illuminate their respective pilot lights 105 and 106, as well as energize their respective forward and reverse motor relay coils 107 and 108. Energization of the reverse motor relay coil 107 simultaneously closes the reverse input relay switch 109 in the motor input circuit 110, the reverse fail-safe switch 111, and the reverse output relay switch 112 in the motor output circuit 113.

In a similar manner, when the forward motor relay coil 108 is energized, the input circuit 110 is closed by the forward input relay switch 114, the fail-safe switch 115 is closed, and the forward output relay switch 116 is closed to close the output circuit 113.

Motor input circuit 110 and motor output circuit 113 are connected to each other by the armature leads 119 and 123 adapted to be connected to opposite sides of the armature 120 through the armature relay switches 121 and 124 when closed in their dashed-line positions by the energization of the motor relay coil 122. When the motor relay coil 122 is de-energized, the relay switches 121 and 124 are returned to their solid-line positions which connect the armature 120 to the dynamic brake 125, and automatically disconnects the armature 120 from the armature leads 119 and 123. Thus, when the relay switches 121 and 124 are in their deenergized positions, the energy from the armature 120 is discharged through the dynamic brake resistor 125 in order to brake the motor 28. The input circuit 110 and the output circuit 113 are connected to the motor speed control apparatus 73, and to a D.C. source of supply.

The cloth feed reverse relay circuit 103 and forward relay circuit 104 are connected through the respective manual reverse feed switch 127 and forward feed switch 128 to the magnetic cloth feed clutch 130, which in turn is connected through feed circuit 129 to the D.C. cloth feed supply 132.

Referring back to the low-speed circuit 56, the fail-safe switches 111 and 115, which are selectively closed by the reverse and forward coils 107 and 108 in the motor directional circuity, are connected in parallel to alternately close the low-speed circuit 56. The fail-safe switches 111 and 115 are duplicated in FIG. 4 to more clearly disclose their actuation and their function by avoiding an unnecessarily complicated wiring diagram. Thus, every time either of the reversing switches 91 or 92 is actuated, the low-speed circuit 56 is momentarily interrupted by the shifting of the open and closed positions of the fail-safe switches 111 and 115, to release the holding relay 69 in the event it is being held in the high-speed position. In other words, the switches 111 and 115 cause the circuit to fail safe into low speed upon every reversing movement of the carrier frame 11.

It will be noted that when the holding relay 69 of the low-speed circuit 56 is in its normally de-energized position, it closes a time delay circuit 137. The sequence of the time delay circuit 137 is such that after it is supplied with power through the relay switch 69, it will energize a relay coil 138 at the end of a predetermined period of time, for example, 1 second. Then the sequencing of the time delay circuit 137 will de-energize the coil 138 after a second pre-determined period, for example one-half second. While the time delay coil 138 is energized, it will close the relay switch 139 in the

face circuit **140**, and will simultaneously open the relay switch **141** in the motion circuit **80**. After this brief period (one-half second) of energization of the relay coil **138**, it becomes de-energized so that the relay switch **139** and the motion relay switch **141** resume their solid-line positions disclosed in FIG. **4**.

However, if the face switch **142** in the face circuit **140** is manually closed, while the time relay switch **139** is closed, the face relay coil **143** is energized to close the face holding relay switch **144**, and to open, and hold open, the motion supply circuit relay switch **145**. The motion supply relay switch **145** will remain open until the manual overide switch **146** in the operator's handle **85** is manually opened, to de-energize the holding coil **143**.

The purpose of providing the time delay relay switch **141** is to open the motion circuit **80** a brief enough period to dynamically brake the motor **28** from high speed to low speed. Because of the more rapid deceleration of the frame **11**, the low-speed switch ramp **65** may be located closer to the catcher mechanism **24** so that the carrier frame **11** may travel a greater distance at high speed, and thereby improve production by reducing the spreading cycle time.

The manual face switch **142** is opened for face-to-face spreading, and is closed for either face-up or face-down spreading. When the face switch **142** is closed to hold open the motion supply circuit **81**, then the sole source of power for the motion circuit **80** is through the auxilary motion supply circuit **90**. Accordingly, during face-up or face-down spreading, the motion circuit **80**, as well as the brake circuit **82**, is de-energized upon the actuation of either of the reversing switches **91** or **92**. When either switch **91** or **92** is actuated, the carrier frame **11** is immediately stopped because, not only is the motor **28** dynamically braked, but also the magnetic brake **45** is immediately energized to brake the drive shaft **29** and therefore the rear wheels **12**. Whichever reversing switch **91** or **92** is actuated, remains in its open position because the machine stops immediately in the actuated position of the reversing switch. In order to re-start the machine **10**, the override switch **146** must be opened manually by the operator to close the relay switch **145** and thereby supply energy through the motion supply circuit **81** to the motion circuit **80** and the brake circuit **82**, by-passing the auxiliary motion supply circuit **90**.

During face-to-face spreading the face switch **142** remains open so that the motion circuit **80** and brake circuit **82** receive a continuous supply of current through the closed motion supply circuit **81**, regardless of the actuation of the reversing switches **91** and **92**.

Where a catcher mechanism **24** is used to cooperate with the spreader unit **21** in order to form a fold in the end of a layer of cloty, particularly in face-to-face spreading, the catcher bar **25**, while engaging the depending web **17** and folding it over the tuck blades, not shown, creates an extra demand on the cloth feed, which, if not met, will produce undue tension on the cloth web **17**. In order to supply this extra demand of cloth during the very brief period of folding the end of the layer **22**, a cloth overfeed device **150** is mounted to control one end of the top roll. The cloth roll feed device **150** includes a gear or pinion **151** coupled to the cloth feed roll shaft **152** by an overriding clutch, not shown. A vertically reciprocable plunger rack **153** engages the gear **151** in such a manner that when it is thrust upward by the solenoid **154**, the top roll **20** is fed forward at a higher rate than its normal feed rate.

As best disclosed in FIG. **3**, the plunger rack **153** is pivotally attached by pin **155** to the armature of the solenoid **154**, so that it may be manually pivoted rearwardly, as disclosed by the arrows, to dis-engage the gear **151** and to actuate, and thereby open, the switch **156**. Opening the switch **156** will de-energize the magnetic feed clutch **130**, when it is desired for any reason to manually dis-engage the cloth feed drive, such as when it is desired to manually turn the top roll **20**. The solenoid **154** is energized by either one of the overfeed switches **157** and **158**. The overfeed switches **157** is located in the rear plunger box **60'**, while the other overfeed **158** is disclosed in FIG. **2** in the front plunger box **60**.

With reference to FIG. **2**, the front plunger box **60** includes the reversing switch **92** located at the rear of the box, and the overfeed switch **158** and the high speed switch **57** located in the front of the box **60**. Reciprocably mounted for longitudinal movement through the plunger box **60** are a pair of plunger rods **160** and **161** which carry a plunger plate **162** adapted to engage and be depressed by the stop plate **163** fixed to the table **14** adjacent the catcher mechanism **24**. Plunger rods **160** and **161** carry actuator lugs or cams **164** and **165** for selectively actuating the switches **92**, **158** and **57**. This, as the carrier frame **11** moves forward in low speed to cooperate with the catcher mechanism **24**, the plunger plate **162** engages the stop plate **163**. The plunger rods **160** and **161** are stopped while the plunger box **60** continues to ride along the rods causing one of the actuators **165** to actuate the overfeed switch **158**, which opens the feed clutch circuit **129** and simultaneously energizes the overfeed solenoid **154**, accelerating the top roll **20** to supply extra cloth to the spreader unit **21**. The high-speed actuator **165** merely rides over the high-speed switch **57** without actuation. As the plunger box **60** approaches the plunger plate **162**, the actuator **164** will actuate the reversing switch **92** causing the relay switch **99** and **100** to shift to their solid-line positions in FIG. **4**, thereby reversing the motor circuit as well as the cloth feed circuit. The carrier frame **11** then begins to move rearward away from the catcher mechanism **24**. Since the front wheels **13** reverse their rotation upon the table **14**, the transmission **32** between the wheel **13** and the top feed roll **12** is also reversed, but the energization of the feed clutch **130** is also reversed to continue to drive the top feed roll **20** and the cloth web **17** forward.

As the frame **11** begins to move in reverse, the plunger box **60** also moves in reverse with the spring **166** urging the plunger plate **162** outwardly while it remains abutting the stop plate **163**. As soon as the high-speed actuator **165** returns to the high-speed switch **57**, it actuates the high-speed switch **57** to close it, closing the relay switches **69** and **70** to actuate the motor speed control apparatus **73** into high speed. Consequently, after the frame **11** has moved a very short distance rearwardly away from its forward limit of travel, it immediately resumes its high speed movement toward the opposite end of the table **14**.

It is, therefore, apparent that a very complete electrically driven and controlled cloth spreading machine **10** has been developed which may be driven automatically, semi-automatically or even manually. Furthermore, the machine may be driven a maximum distance

at high speed, and then decelerated by dynamic braking of the electric motor in a minimum of time and distance to attain a rather constant low speed immediately prior to reaching its reversing station.

The machine is designed so that it may be selectively employed for either face-to-face spreading or face-up or face-down spreading by manually opening or closing the face switch **142**. When the face switch **142** is opened, and the motion switch **84** is maintained closed, the machine may continuously operate automatically for face-to-face spreading with the spreader unit **21** cooperating with the catcher mechanism **24** at one end and a similar catcher mechanism, not shown, at the opposite end of the table **14**.

When the face switch **142** is closed, the machine **10** will automatically stop when either of the reversing switches **91** or **92** is actuated by the plunger plate **162** engaging the stop plate **163**. In this manner, the single layer of cloth which is spread face-up or face-down may be inspected, cut by any convenient cutting means, and then the manual override switch **146** opened to resume the movement of the frame **11** rearward in its non-spreading direction.

Further, in face-to-face spreading both the forward and reverse feed switches **127** and **128** must be closed; whereas, in face-up or face-down spreading, only one of the feed switches **127** or **128** is closed.

The machine is provided with not only dynamic brake **125** for decelerating the motor **28** rapidly every time the machine changes from its high speed to its low speed, but is also provided with an electromagnetic brake **45** for braking the wheels **12** to an immediate stop, when the brake circuit **82** is de-energized.

One of the most important features of the invention is the ability of the machine **10** to fail-safe in low speed for numerous changes in function of the machine, such as power failure, broken wires, and, most important, the automatic reduction of speed for every reversing motion of the machine. This is particularly important where, for example, if one of the low-speed switch arms **64** and **65**, for some reason, should not engage the ramp **65**, or the ramp **65** is misplaced or removed. Thus, as the machine **10** moves into the catcher **25** at high speed, the actuation of either reversing switch **91** or **92** will momentarily open both fail-safe switches **111** and **115** to open the low-speed circuit **56**, causing selector switch **70** to return to its low-speed position.

The remote control handle **85** is also adapted to hang on the bracket **87** to automatically maintain the motion switch **84** closed for full automatic movement. However, when the operator removes the remote control handle **85** from the bracket **87**, the motion control switch **84** must be manually depressed in order to move the frame **11**. If the operator for any reason in negligent, or has his attention distracted, or for any other reason, removes his finger from the motion switch **84**, it will automatically open the motion circuit **80**, de-energizing the motor relay coil **122** so that the armature **120** is immediately disconnected from its power and discharges its energy through the dynamic brake resistor **125** causing the machine **10** to stop in a very short distance.

Another safety feature of the machine **10** is that both the start switch **76** and the motion switch **84** must be closed before the motor **28** will be energized. As an extra precaution, the stop switch **53** is provided for manually opening both the speed circuit **54** as well as the starting circuit **75**, which in turn automatically opens motion circuit **80** to dynamically brake the frame **11** to a halt.

What is claimed is:

1. A cloth spreading machine comprising:

a. a frame supported for longitudinal movement over a cloth laying surface,

b. electrically energized motor drive means for moving said frame longitudinally of said surface,

c. reversing switch means adapted to control said drive means for reversing the travel of said frame, when actuated at longitudinally spaced reversing stations,

d. a spreader unit mounted on said frame to spread cloth in layers upon said surface as said frame moves over said surface,

e. means for supplying cloth to said spreader unit including a cloth feed roll,

f. electrical cloth feed control means operatively connected to said reversing switch means for driving said feed roll in a forward direction, regardless of the direction of frame movement,

g. face switch means operatively connected to said motor drive means and said reversing switch means,

h. said face switch means having a face-to-face mode for energizing said motor drive means continuously, regardless of the actuation of said reversing switch means, so that said frame continuously moves reciprocably over said cloth laying surface,

i. said face switch means having a face-up mode for de-energizing said motor drive means upon actuation of said reversing switch means, so that said frame stop at each reversing station,

j. selector switch means operatively connecting said reversing switch means and said cloth feed control means and actuable between a face-to-face position and a face-up position,

k. said cloth feed control means being operative, when said selector switch means is actuated into said face-to-face position, to continuously drive said feed roll in said forward direction simultaneously with the movement of said frame in either direction,

l. said cloth feed control means being automatically operative to drive said feed roll in said forward direction simultaneously with the movement of said frame in one longitudinal direction only, and automatically inoperative not to drive said feed roll while said frame is moving in the longitudinal direction opposite to said one direction, when said selector switch means is actuated into said face-up position.

2. The invention according to claim **1** further comprising electrical brake means adapted to positively stop movement of said frame when energized, switch means operatively connecting said brake means to said motor drive means so that said brake means is energized simultaneously with the de-energization of said motor drive means.

3. The invention according to claim **2** in which said face switch means comprises first circuit means including a normally closed reversing switch operatively connecting said reversing means to said motor drive means, said reversing switch being adapted to be opened upon actuation of said reversing switch means, and second circuit means connected to said first circuit

means and including a motion supply switch, said motion supply switch being closed in said face-to-face mode to override said first circuit means, said motion supply switch being open in said face-up mode.

4. The invention according to claim 3 in which said first and second circuit means comprise parallel circuit.

5. The invention according to claim 3 in which said face switch means further comprises a manual release switch for reclosing said first circuit means, regardless of the mode of said face switch means, to re-energize said motor drive means and de-energize said brake means.

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