

[54] **HIGH-SPEED CONTROL APPARATUS
FOR CLOTH SPREADING MACHINE**

[75] Inventors: **Johnny L. Fort**, Nashville; **Cecil S. Frederick**, Murfreesboro, both of Tenn.
[73] Assignee: **Cutters Machine Company, Inc.**, Nashville, Tenn.
[22] Filed: **May 17, 1972**
[21] Appl. No.: **254,272**

[52] U.S. Cl.**318/258, 318/282, 270/30**
[51] Int. Cl.**H02p 7/00, B65h 29/46**
[58] Field of Search.....**318/256, 257, 258, 318/282, 286, 39, 466-470; 270/30, 31**

[56] **References Cited**

UNITED STATES PATENTS
3,573,588 4/1971 Geyer.....318/39

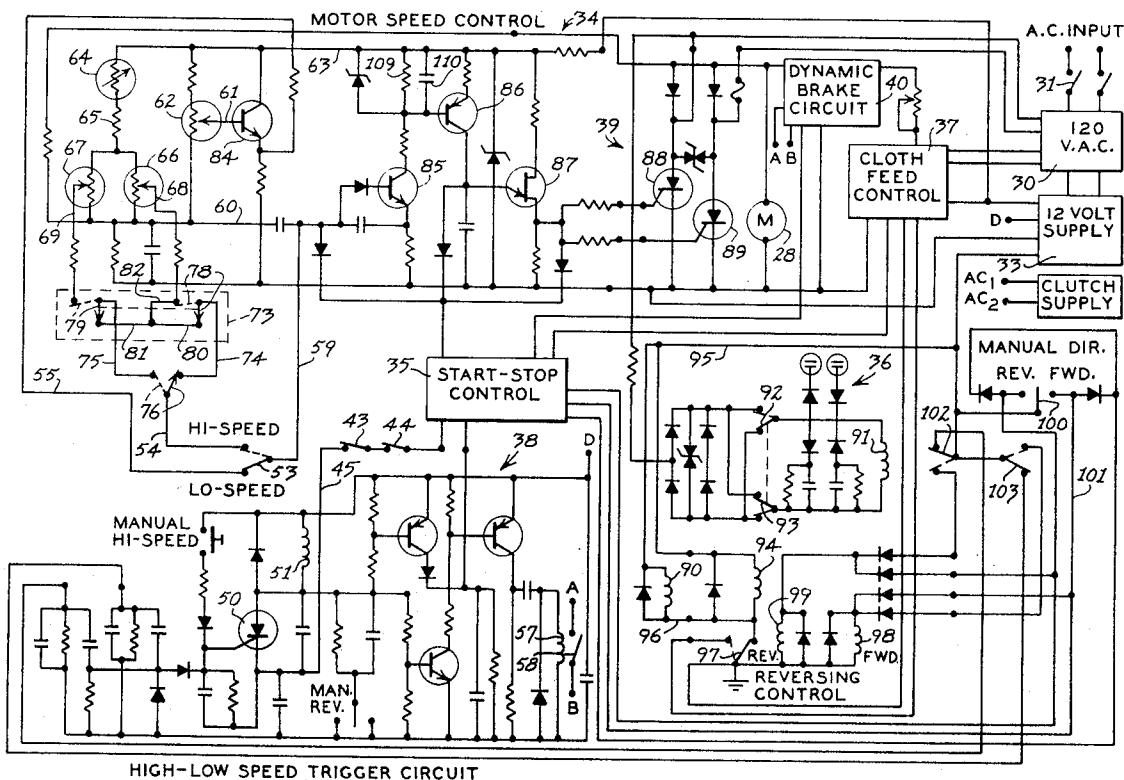
3,673,482 6/1972 Davey318/467
3,699,411 10/1972 Miller.....318/286

Primary Examiner—Bernard A. Gilheany
Assistant Examiner—Thomas Langer
Attorney—Harrington A. Lackey

[57] **ABSTRACT**

An electrically driven and controlled cloth spreading machine including means for controlling the high and low speeds of the machine, and also for selectively controlling and presetting high speeds of the machine in its forward and reverse directions of movement.

6 Claims, 4 Drawing Figures



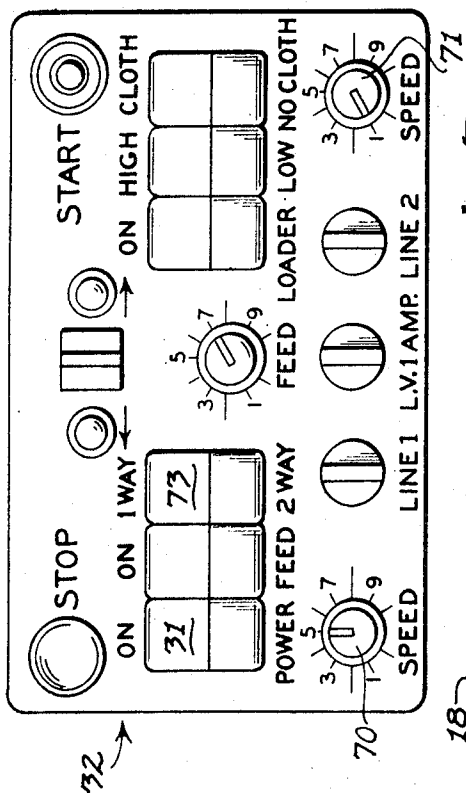
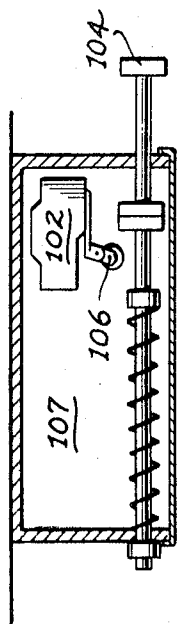


Fig. 3

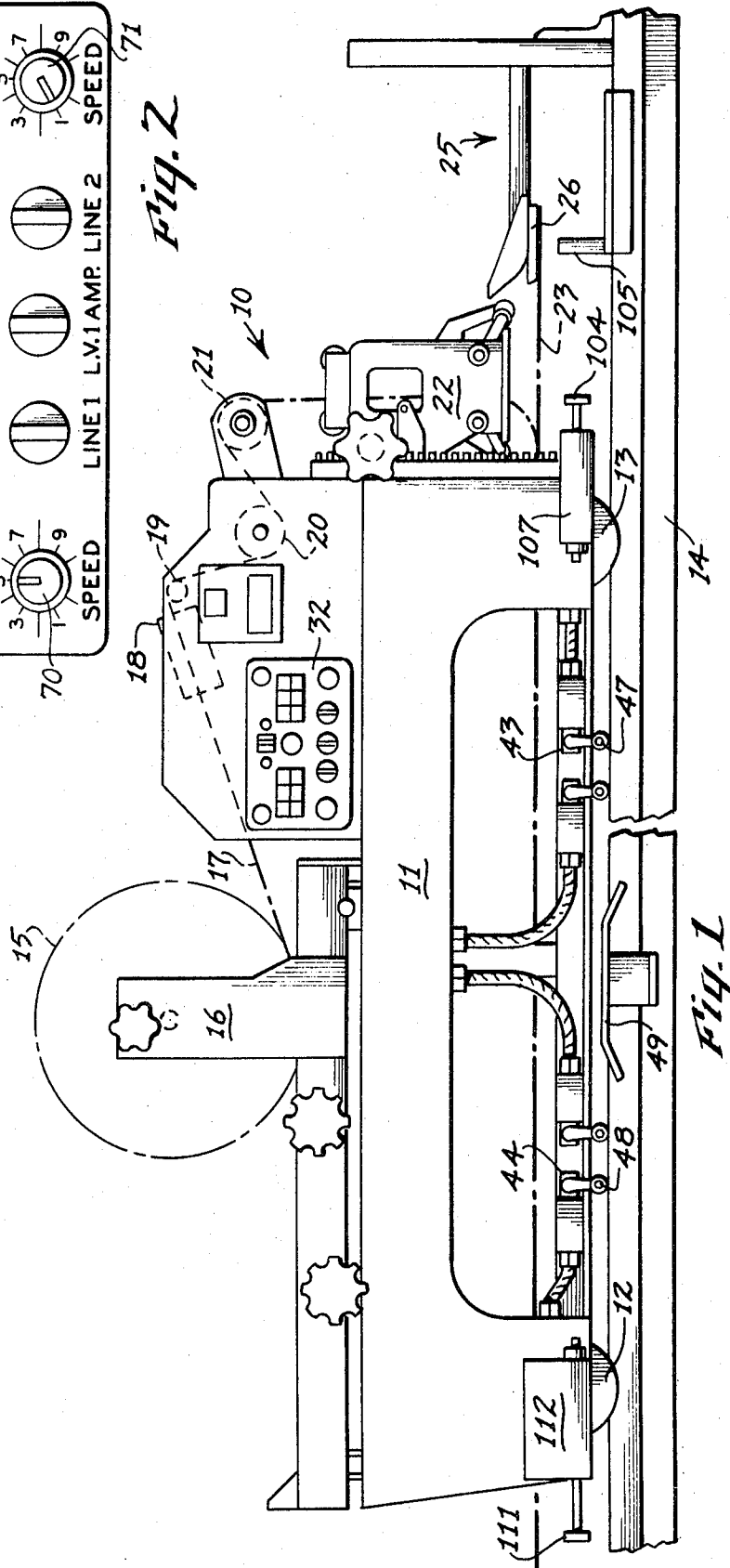
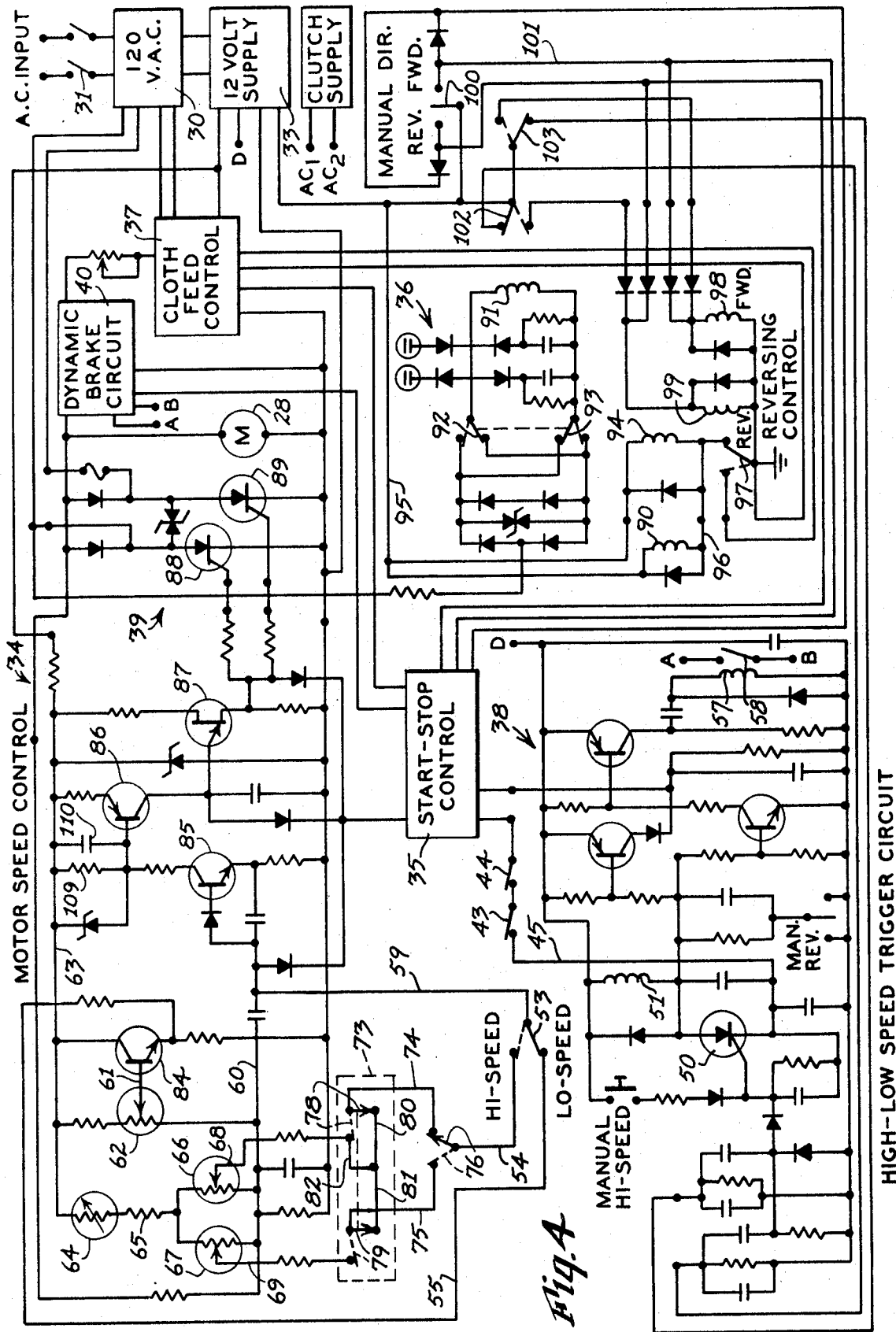


Fig. 2

Fig. 1



HIGH-SPEED CONTROL APPARATUS FOR CLOTH SPREADING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to a cloth spreading machine, and more particularly to an electrically operated cloth spreading machine having a selectively operated high-speed control apparatus.

Cloth spreading machines have been developed, and are now in operation, which travel at high speed over the major portion of their reciprocal course between a pair of reversing stations, and in low speed adjacent each reversing station 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 each reversing station, 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.

In U.S. Pat. No. 3,663,006, which issues to Benson on May 16, 1972, and which is owned by the assignee of this application, an electrically controlled cloth spreading machine is described which is capable of spreading cloth in both the forward and reverse directions, known as two-way or face-to-face spreading; or alternatively, to spread the cloth in only one direction, known as one-way or face-up or face-down spreading. The cloth spreader in the above Benson patent maximizes its travel distance in both forward and reverse directions at high speed, while minimizing its travel distance in low speed, in order to spread as much cloth as possible in a given period of time. The Benson machine spreads at high speed to a point just short of the catcher, where it is dynamically braked into low speed to enter the catcher. Then, after reversing and leaving the catcher, the machine resumes its high speed in a very short time after it leaves the catcher and spreads in the opposite direction to the catcher at the other end of the cutting table. If the Benson machine is spreading face-up or face-down, that is spreading in only one direction, then it returns in its non-spreading direction, or "deadheads" at the same high speed at which it spreads. The upper limit of the high speed is the maximum speed at which a machine can efficiently spread cloth without damaging, wrinkling or misaligning the cloth or the cloth layers.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to overcome the above limitations on the maximum high speed at which the spreading machine "deadheads" in its forward direction of travel.

Furthermore, it is an object of this invention to provide a more versatile and flexible high-speed control apparatus in which a spreading machine, capable of both face-to-face, and face-up or face-down spreading may travel at a uniform high speed in both directions while spreading face-to-face, yet may travel at a much faster high speed in its reverse non-spreading direction when spreading face-up or face-down.

More specifically, the speed control apparatus for a cloth spreading machine made in accordance with this invention includes two high speed control circuits pro-

vided with a special selector switch for connecting one or the other of the high speed control circuits in the drive circuit. The selector switch is also coupled to a directional switch which automatically shifts simultaneously with the actuation of the reversing control for reversing of the drive of the machine. The selector switch and the directional switch are also connected to the high - low speed selector switch which is de-actuated by the tripping mechanism for shifting the speed of the machine from high to low as it moves into the catcher, and which is actuated into high speed immediately after the spreading machine leaves the catcher. The high speed control circuits function only when the selector switch is in high position.

The selector switch and directional switch are so connected that when the selector switch is shifted to its two-way spreading position, that is, face-to-face spreading, one high speed control circuit is connected to the drive means regardless of the position of the directional switch. Thus, the machine travels at the same high speed in either direction for face-to-face spreading.

When the selector switch is shifted to the other position, the first speed control circuit is connected to the drive means when the directional switch is in its forward position so that the machine travels at its normal high speed for spreading the cloth in the reverse direction for one-way spreading. However, with the selector switch in the same one-way position, when the directional switch shifts to its forward position, the second speed control circuit is connected to the drive means in order to drive the machine at a much higher speed to minimize travel in the forward direction when the machine is spreading one-way, or in other words, to minimize the non-productive time of the spreading machine.

Each of the two high speed control circuits as well as the low speed control circuit has a potentiometer. The potentiometer in the low speed control circuit is pre-set for a constant low speed, while both high speed potentiometers are adapted to be manually adjusted by the operator of the machine so that either or both of the spreading or deadheading speeds may be independently pre-set at any desired value.

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 view of the control panel on the side of the spreading machine disclosed in FIG. 1;

FIG. 3 is an enlarged sectional elevation of the plunger-actuated switch mechanism mounted on the front of the machine;

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 rotary movement upon standard 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, over guide bar 19 and under guide roller 20, and then over a driven top feed roll 21. The web 17 then depends through a cloth spreader frame or unit 22, having tuck blades or spreader blades, not shown, for spreading the cloth web 17 in layers 23 upon the table 14. A catcher mechanism 25 including a catcher bar 26 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 22 in a well-known manner to fold the end of each cloth layer 23.

An electrical motor 28 (FIG. 4) mounted on the frame 11 is operatively connected to drive the rear wheels 12 by a suitable drive transmission, not shown.

The top feed roll 21 is driven by a separate motor, not shown, within the cloth feed control system 37, in the same direction independently of the direction of movement of the frame 11.

Referring now to the electrical circuit diagram in FIG. 4, a power supply circuit 30 is connected to any suitable source of AC electricity, not shown, through the power switch 31, which is also disclosed in FIGS. 1 and 2 upon the control panel 32 mounted on the side of the frame 11.

The low voltage supply circuit 33 supplies various voltages, including B+ supply voltage, to some of the other circuits of the system, such as the motor speed control circuit 34, the start-stop control circuit 35, the reversing control circuit 36, the cloth feed control circuit 37, and the high-low speed trigger circuit 38.

Connected in parallel with the drive motor 28 is a motor drive circuit 39 and the dynamic braking circuit 40.

The motor drive circuit 39 is an SCR bridge circuit.

The trigger circuit 38 includes a pair of unidirectional, momentary, normally closed, low-speed switches 43 and 44 in low-speed switch circuit 45. The low-speed switches 43 and 44 are mounted on the side of the frame 11 as disclosed in FIG. 1 so that each switch 43 and 44 is adapted to be opened by engagement of its corresponding lever 47 and 48 upon the trip ramp 49 fixed to the table 14.

The low-speed switch circuit 45 is connected in series with SCR 50 and high-low selector switch relay coil 51. When the relay coil 51 is energized, it moves selector switch 53 to its high-speed position indicated in dashed-lines in FIG. 4, to close the high speed circuit 54. When the relay coil 51 is de-energized, selector switch 53 is moved to its solid-line, low-speed position, as indicated in FIG. 4, to close the low-speed control circuit 55.

When the low-speed switch circuit 45 is interrupted by opening one of the low-speed momentary switches 43 or 44, the dynamic braking relay coil 57 is energized to close the dynamic braking relay switch 58 to energize the dynamic braking circuit 40 when the speed of the machine 10 changes from high to low, as previously described in the common assignee's pending application of Robert G. Reed, Ser. No. 125,470.

The base of the selector switch 53 is connected by lead 59 into the base of transistor 85 through a diode in the motor speed control circuit 34. The low-speed control line 55 is connected to the resistor on the emitter of transistor 84 whose base is connected to wiper arm or lead 61 of low-speed potentiometer 62, which is connected between the common line 60 and the sup-

ply line 63 in the motor speed control circuit 34. The wiper arm 61 of the low-speed potentiometer 62 is preferably adjusted to a preset value at the factory to establish a uniform low speed for the machine 10. The supply line 63 is also connected to maximum high-speed potentiometer 64 which is also adjusted to the pre-set maximum speed value at the factory. The high-speed potentiometer 64 is connected through resistor 65 to a pair of adjustable high-speed potentiometers 66 and 67 connected in parallel, and whose respective wiper arms 68 and 69 are manually adjustable independently of each other through the rotary speed knobs 71 and 70, respectively, on the control panel 32. Both adjustable high-speed potentiometers 66 and 67 are connected to the feed-back common line 60.

The wiper arms or leads 68 and 69 are both connected to a manually operated, speed selector switch 73 also mounted on the control panel 32. A reverse lead 74 and forward lead 75 connect the speed selector switch 73 to the respective reverse and forward contacts of the speed directional switch 76 connected in the high-speed control circuit 54.

More specifically, the speed selector switch 73 includes first and second switch arms 78 and 79, each connected, respectively, to the reverse lead 74 and the forward lead 75. The first and second switch arms 78 and 79 are ganged to move between their solid-line and dashed-line positions in FIG. 4. In their solid-line positions, the switch arms 78 and 79 make contact with branch leads 80 and 81, respectively, which are connected to the wiper lead 68 through connecting lead 82. It will be noted in FIG. 4 that when the switch arms 78 and 79 are in this first solid-line position, the high-speed control line 54 is always in communication with the first high-speed wiper lead 68 of the potentiometer 66, regardless of the position of the directional switch 76. It will also be noted that when the switch arms 78 and 79 are in their solid-line positions, there is no electrical communication between the high-speed control line 54 and the second high-speed wiper lead 69, regardless of the position of the direction switch 76.

When the ganged switch arms 78 and 79 are manually moved to their dashed-line positions disclosed in FIG. 4, the circuit is closed between the reverse lead 74 and the first high-speed wiper lead 68. Moreover, when the switch arm 79 is in its dashed-line position, electrical communication is established between the forward lead 75 and the second wiper lead 69. Therefore, the high-speed line 54 is connected to the first wiper lead 68 when the directional switch 76 is in its solid-line, reverse position, and the high-speed line 54 is connected to the second wiper lead 69 when the directional switch 76 is in its dashed-line forward position.

Thus, a voltage signal is generated between the supply line 63 and the base of transistor 85 through the speed selector line 59 and the respective wiper leads 61, 68 or 69 of the corresponding low-speed potentiometer 62, the first high-speed potentiometer 66 or the second high-speed potentiometer 67. The corresponding signal is transmitted through the successive transistors 85 and 86 and the unijunction 87 to fire the SCRs 88 and 89 in the drive circuit 39. The firing time of the SCRs 88 and 89 is a function of the signals generated by the respective speed potentiometers 62, 66 or 67.

The speed directional switch 76 is a relay switch controlled by its relay coil 90 in the reversing control circuit 36. The direction of rotation of the drive motor 28

is determined by the direction of current through the motor field coil 91 in the reversing control circuit 36, which in turn is determined by the position of the field directional relay switches 92 and 93 responsive to the relay coil 94. Relay coils 94 and 90 are connected in parallel between the B+ supply line 95 and the common line 96. The coils 90 and 94 are energized by grounding through the directional relay switch 97 when it is in its solid-line forward position, as disclosed in FIG. 4. The directional relay switch 97 is pulled into its solid-line forward position by energization of the forward coil 98. Energization of the reverse coil 99 moves the directional relay switch 97 to its dashed-line position permitting the coils 90 and 94 to become de-energized, thereby holding their respective relay switches 92-93 and 76 in their respective reverse, solid-line positions. The forward coil 98 is energized through line 101 when the manual switch 100 is in its forward position, or when the reversing switch 103, in plunger box 112 (FIG. 1), is in its dashed-line position. The reverse coil 99 is energized when the manual switch 100 is in its reverse position, or when the reversing switch 102 is shifted to its dashed-line position in FIG. 4, when the plunger 104 engages the stop 105 at the front catcher mechanism 25 to trip the switch arm 106 in the plunger box 107.

In the operation of the machine 10, the frame 11 is moved by the motor 28, the top feed roll 21 is driven by the cloth feed control 37, and the spreading unit 22 cooperates with the catcher mechanism 25 at the forward extremity of travel of the frame 11.

Assuming that power switch 31 is closed and all the remaining switches, except speed selector switch 53 and direction switch 76, are in their solid-line positions of FIG. 4, the machine 10 is moving forward at high speed along the table 14 and is spreading cloth. The high-low speed selector switch 53 is in its dashed-line high-speed position and direction switch 75 is in its forward dashed-line position.

As the machine 10 approaches the catcher mechanism 25, the front switch lever arm 47 is tripped by the ramp 49 to momentarily open the low-speed switch 43. The relay coil 51 in the trigger circuit 38 is de-energized causing the high-low speed selector switch 53 to shift to its solid-line, low-speed position, connecting the resistor on the emitter of transistor 84 to the base of transistor 85, and producing a resultant signal causing the drive motor 28 to slow down to the low speed pre-set by the potentiometer 62. Moreover, the opening of the momentary low-speed switch 43 energizes the dynamic brake relay coil 57 to close the relay switch 58 and thereby energize the dynamic brake circuit 40 to cause the machine 10 to dynamically brake from its high to its low speed. After the machine 10 attains its low-speed, the dynamic braking circuit 40 is de-energized as described in the Reed application Ser. No. 125,470, and proceeds at low speed into the catcher mechanism 25. As the plunger 104 is thrust rearward by the front stop 105, the reversing switch 102 is actuated in FIG. 3 to momentarily shift to its dashed-line position in FIG. 4, energizing the reverse coil 99. Consequently, the directional relay switch 97 shifts to its dashed-line position disconnecting the coils 90 and 94 from ground, and causing the coils 90 and 94 to become de-energized to shift the relay switches 76 and 92-93 to their reverse, solid-line positions. Although the direction of the current through the motor

field 91 is reversed to reverse the drive of the motor 28, nevertheless the movement of the speed directional switch 76 from its forward to reverse position effects no change between the circuit 54 and the high-speed potentiometer wiper lead 68. As the machine moves in its reverse direction out of the catcher mechanism 25, it accelerates into high speed within a time dependent upon the characteristics of the resistor 109 and the capacitor 110 in the speed control circuit 34. When the reversing switch 102 returns to its solid-line position, SCR 50 is turned on to re-energize coil 51 and shift the selector switch 53 to high speed position.

As previously mentioned, since the selector speed switch 73 is in its two-way position and its switch arms 78 and 79 are in their solid-line position, there is no change between the high-speed line 54 and the potentiometer wiper lead 68. Thus the machine 10 proceeds in the reverse direction along the table 14, spreading cloth in the opposite direction at the same high speed as in the forward direction.

When the speed selector switch 73 is depressed to its one-way position, the switch arms 78 and 79 are now in their dashed-line position. When the machine 10 is proceeding in reverse, it is spreading cloth in the reverse direction and all the functions of the machine 10 are the same as they are when it is spreading in the reverse direction in a two-way spreading mode. However, after the plunger 111 engages the stop at the opposite end of table 14 corresponding to stop 105, to actuate the reversing switch 103, the energization of the coil 90 to shift the speed directional switch 76 to its forward, dashed-line position, does affect the high-speed circuitry in the motor speed control 34, by establishing electrical communication between the high-speed line 54 and the wiper lead 69 of the second high-speed potentiometer 67. Since the machine is only spreading cloth in the reverse direction, the potentiometer 67 is desirably pre-set by the speed knob 70 to drive the motor 28 at a higher speed than will the setting of the potentiometer knob 71, so that the machine 10 dead-heads in the forward direction to the front end of the table in a minimum of time.

After the machine 10 has reached the forward end of the table 14, and the reversing switch 102 is actuated momentarily to its dashed-line position in FIG. 4 by plunger 104, the machine 10 moves rearward again and the high-speed line 54 is again in electrical communication through the solid-line position of the directional switch 76 with the wiper lead 68 of the first high-speed potentiometer 66. Thus, the machine 10 again spreads cloth in the reverse direction at its normal high speed, that is, at a high speed less than the high speed generated by the potentiometer 67.

It will be observed in the motor speed control circuit 34 of FIG. 4, that when the speed-selector switch 53 is in its low-speed, solid-line position, no high speed signals are generated by the potentiometers 66 and 67, regardless of the position of the speed directional switch 75 and regardless of the position of the speed selector switch 73.

What is claimed is:

1. Speed control apparatus for a cloth spreading machine having a frame supported for longitudinal movement over a cloth-laying surface between reversing stations, a spreader unit to spread cloth in layers, and means for supplying cloth to the spreader unit, comprising:

- a. electrically energized motor drive means for moving said frame longitudinally of said surface,
 - b. reversing switch means adapted to control said drive means to reverse the movement of said frame, when actuated, between forward and reverse directions,
 - c. actuator means for actuating said reversing switch means at said reversing stations,
 - d. first speed control means for energizing said drive means, when actuated, to move said frame at a first pre-set speed,
 - e. second speed control means for energizing said drive means, when actuated, to move said frame at a second pre-set speed,
 - f. means operatively coupling said reversing switch means to said first and second speed control means,
 - g. selector switch means operable between a first position actuating said first speed control means and de-actuating said second speed control means regardless of the direction of frame movement, and a second position actuating said first speed control means and de-actuating said second speed control means when said reversing switch means is actuated to move said frame in said forward direction, and further in said second position de-actuating said first speed control means and actuating said second speed control means when said reversing switch means is actuated to move said frame in said reverse direction.
2. The invention according to claim 1 in which said first speed control means comprises a first speed control circuit and said second speed control means comprises a second speed control circuit, said reversing switch means comprising a reversing switch having a forward position closing said first speed control circuit and opening said second speed control circuit and a re-

verse position closing said second speed control circuit and opening said first speed control circuit.

3. The invention according to claim 2 in which said selector switch means comprises a selector switch in said second speed control circuit having a first position opening said second speed control circuit and closing said first speed control circuit regardless of whether said reversing switch is in said forward or reverse direction, and a second position closing said second speed control circuit when said reversing switch is in said reverse position.

4. The invention according to claim 2 in which said first speed control circuit includes a first adjustable potentiometer and said second speed control circuit includes a second adjustable potentiometer.

5. The invention according to claim 2 in which said first and second speed control circuits comprise high-speed control circuits, and further comprising a third low-speed control circuit for energizing said drive means, when closed, to move said frame at a low speed substantially lower than the high speeds produced by said first and second control circuits, a speed selector switch movable between a high position in series with said reversing switch to close one or the other of said first and second speed control circuits depending upon the position of said reversing switch, and a low-speed position opening both said first and second high-speed control circuits and closing said low-speed control circuit, and trip means for actuating said selector switch to move said selector switch from high position to low position while said frame is moving toward a reversing station.

6. The invention according to claim 5 in which said low-speed control circuit includes a third potentiometer pre-set at a value corresponding to a predetermined low speed.

* * * * *

40

45

50

55

60

65