Sept. 1, 1942. R. M. SCOTT ET AL 2,294,634

STRANDING MACHINE

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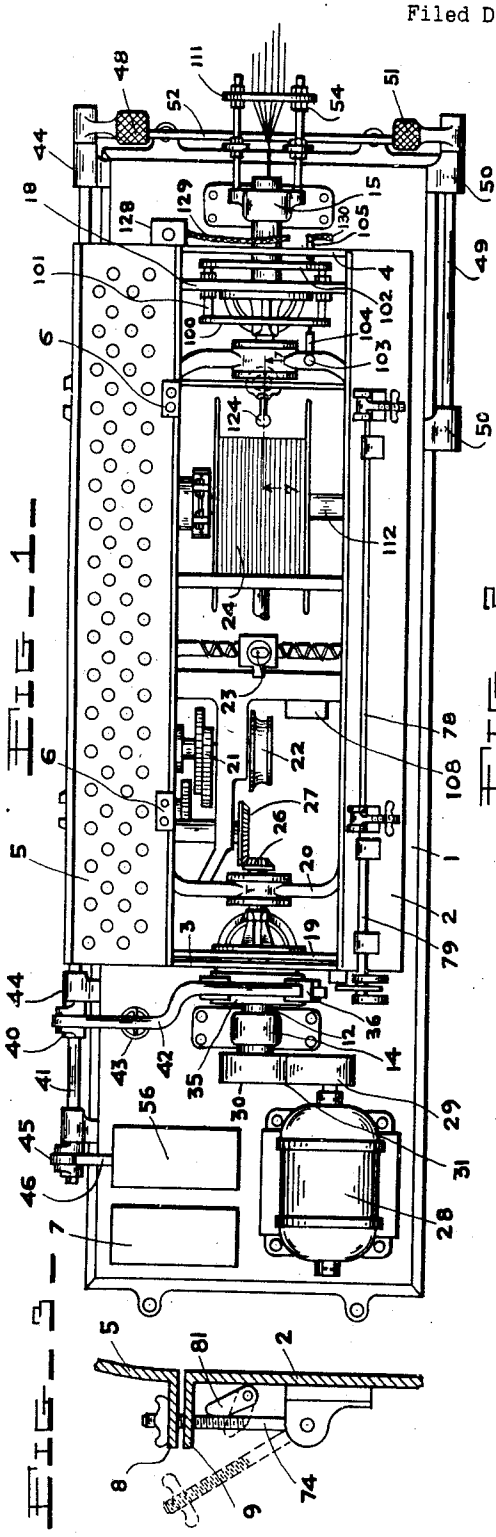


FIG. 1

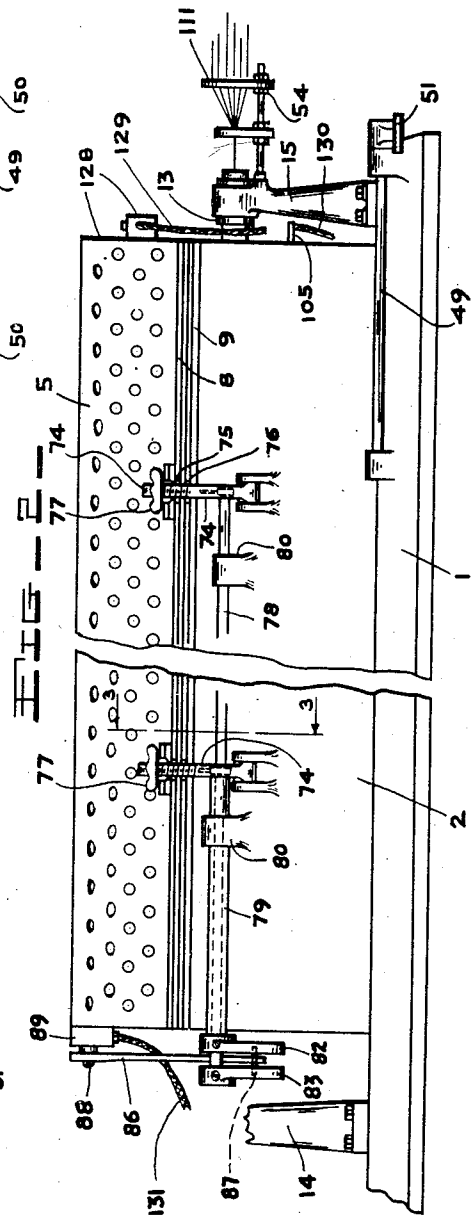


FIG. 2

FIG. 3

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FIG. 4

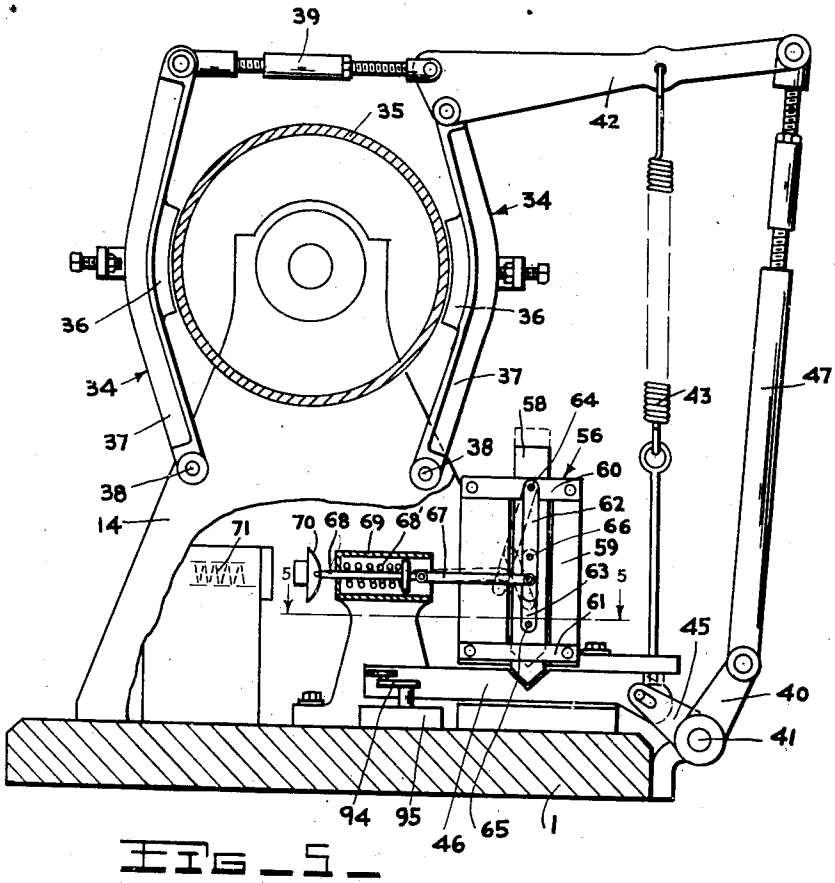


FIG. 5

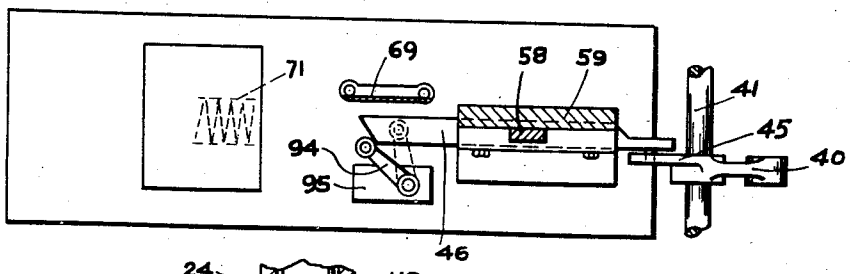
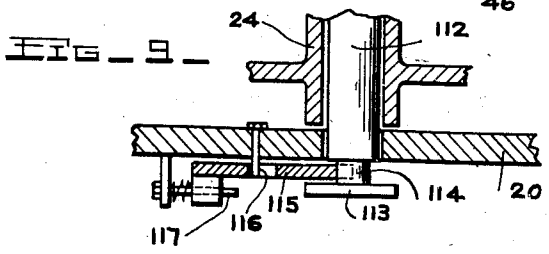


FIG. 9



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FIG. 6

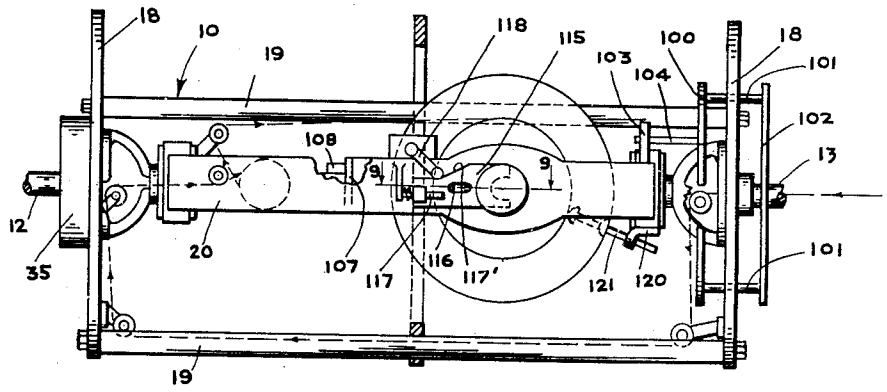


FIG. 7

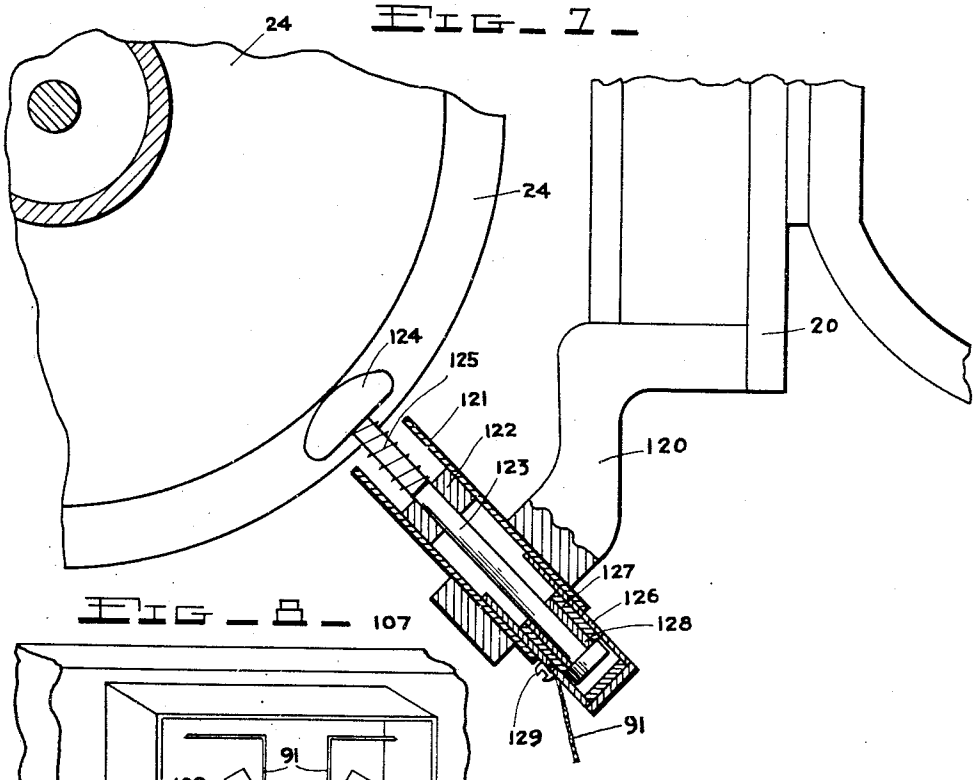
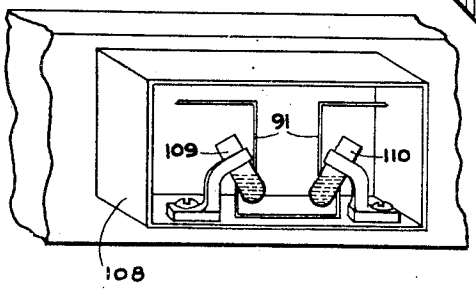


FIG. 8



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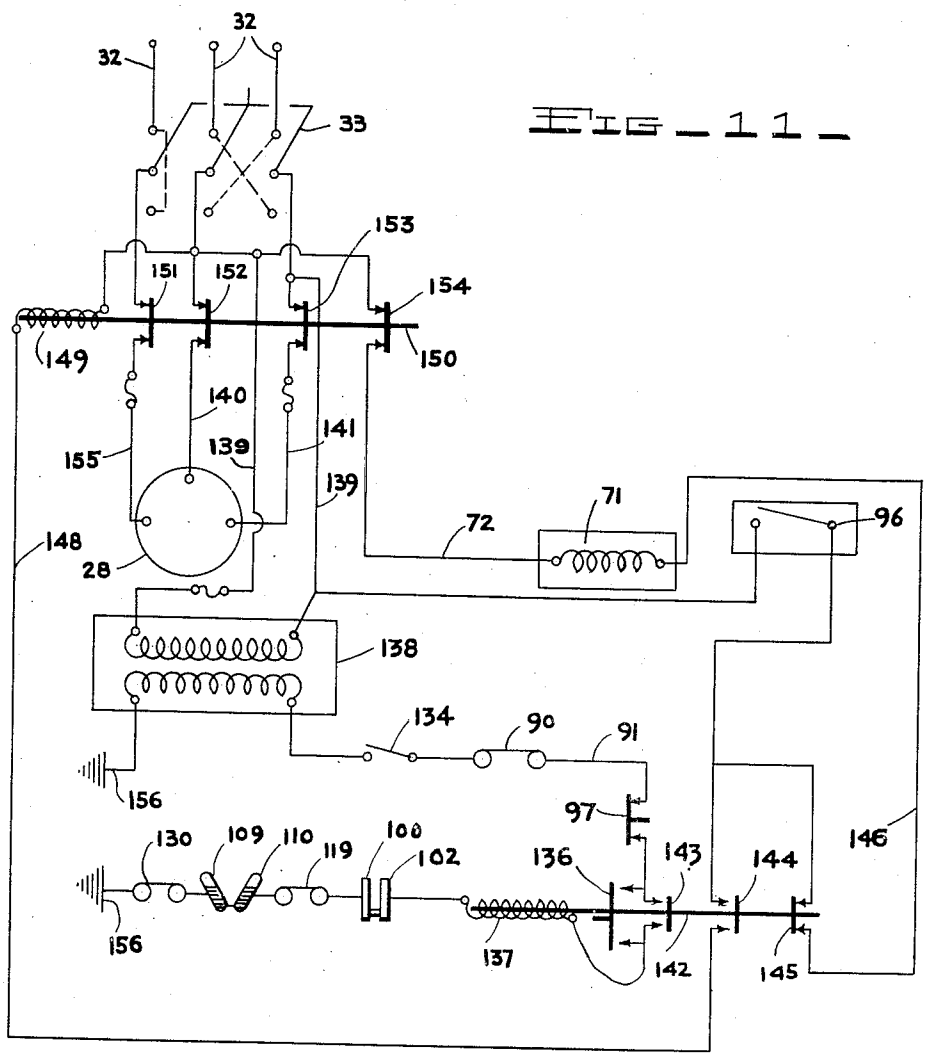


Fig. 11.

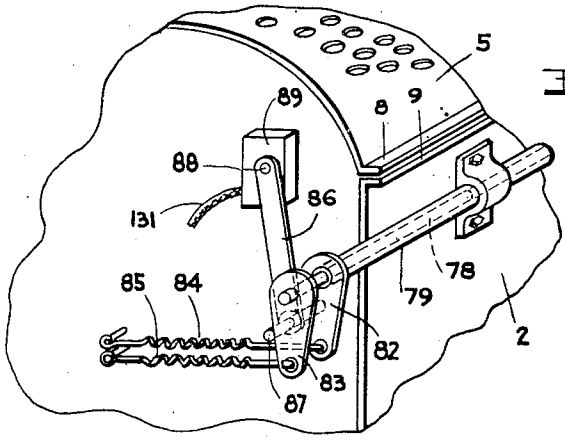


Fig. 10.

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Patented Sept. 1, 1942

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UNITED STATES PATENT OFFICE

2,294,634

STRANDING MACHINE

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Application December 3, 1941, Serial No. 421,410

9 Claims. (Cl. 57—78)

This invention relates to an improved stranding machine, and more particularly to improved regulating and control means for governing the operation of a stranding machine and providing operating control and safety devices therefor.

One object of the invention is the provision in a device of this character of means for controlling the operation of the mechanism in stopping and starting the same as well as means actuated in the operation of the mechanism for stopping the same automatically upon the completion of a specified quantity of material being operated upon or a particular or undue movement of certain of the operating parts during the operation of the mechanism.

Another object of the invention is the provision in a device of this character of an improved brake control and operating means therefor adapted to provide a quick acting means for stopping the mechanism when required by any one of a plurality of operating or control factors.

A further object of the invention is the provision in a device of this character of safety control means adapted to serve as a protection for the operator in the use of the mechanism and prevent injury to the mechanism or the operator through carelessness or oversight in the machine operation.

A further object of the invention is the provision in a device of this character of a protective casing together with control means therefor and novel means for connecting the control elements for actuation through the casing, either to control the operation of the mechanism or to facilitate the operation of certain of the safety and control elements thereof.

Another object of the invention relates to an improved form of unified operating means for the control mechanism capable of rapid response to control factors or impulses for controlling the operating and regulating means with certainty and speed.

Other objects and advantages of the invention relate to various improved details of construction and novel arrangements of the parts in association with a variety of control elements and operating mechanisms as will be more fully set forth in the detailed description to follow.

Referring to the drawings:

Fig. 1 is a top plan view of the stranding machine showing generally the location of the parts with reference to a mechanism enclosing casing and with the casing cover open to show portions of the operating elements of the machine.

Fig. 2 is a side elevational view of the casing showing the location and arrangement of the cover holding or locking means together with control mechanism associated therewith,

Fig. 3 is a detail sectional view through a portion of the cover and casing, taken substantially along the line 3—3 of Fig. 2, showing one of the cover holding members and its cooperating control actuating element in side elevation,

Fig. 4 is a side elevational view, partially in section, taken substantially along the line 4—4 of Fig. 1, showing the brake mechanism and operating means therefor together with a portion of the brake control and brake actuating mechanism for controlling the operation of the brake,

Fig. 5 is a horizontal sectional view, taken substantially along the line 5—5 of Fig. 4, and showing parts of the brake control mechanism shown in Fig. 4 as seen from above,

Fig. 6 is a side elevational view of the flier and cradle showing portions of the cradle supported mechanism including the winding reel, and illustrating the location of certain control elements including the reel stop, reel safety means and cradle stabilizing means, all shown in their relation with the cradle generally together with the transmission ring members carried by the flier for transmitting impulses to the brake control mechanism upon actuation of any one of these control elements tending to apply the brake.

Fig. 7 is a detail view, taken substantially along the line 7—7 of Fig. 1, and showing portions of the reel stop mechanism in section,

Fig. 8 is a front elevational view of the cradle stabilizer box and mercury switches mounted therein,

Fig. 9 is a detail sectional view of the reel holding mechanism, taken substantially along the line 9—9 of Fig. 6,

Fig. 10 is a perspective end view of a portion of the casing as taken from the left in Fig. 2 showing parts of the control means and operating elements connected therewith for actuating the brake control mechanism upon release of the cover, and

Fig. 11 is a diagrammatic view of the electric circuits for operating the motor as well as the brake control mechanism through the various operating and control instrumentalities.

In the form of construction to which the present improved mechanism is shown as applied herein, the stranding machine, as concerns the operating elements and their operation generally for forming strand material, is similar to that

shown and described in U. S. Letters Patent No. 1,952,929, dated March 27, 1934, and the present improved features are or may be applied to a mechanism of the character shown in the above patent for controlling the operation of the mechanism generally as well as certain elements thereof to provide operating means as well as safety control means for the protection of the mechanism and the operator.

In the present form or embodiment of the invention, the stranding machine including the control and operating elements thereof may be mounted upon a base 1, and includes a main casing 2, having ends 3 and 4, for housing the operating elements. A cover 5 is hingedly connected to a portion of the casing, as indicated at 6, and is provided with a flanged edge 8 adapted to engage a flanged edge 9 formed on a meeting edge portion of the casing 2.

A panel board of conventional form (not shown) provided with the usual or any suitable means for supporting the necessary electrical connections for the various electric circuits employed in the control of the operating and safety means, together with control switches therefor, is mounted on the base 1 and enclosed within a housing 7 carried by the base.

As shown, the casing 2 encloses a flier frame 10 which is supported rotatably by suitable shafts 12 and 13, mounted for rotation in standards 14 and 15 respectively, carried by the base 1. The flier frame 10 may comprise headers 18 connected by strand guiding bars 19, as is usual in devices of this character, and has mounted therein and supported thereby a cradle 20 upon which are mounted plural operating elements for operating and controlling the operation of parts and mechanisms carried by the cradle during the stranding operation, which may include a transmission gear 21, a take-up roll 22, strand guiding means 23 and a reel 24 for receiving the strand material after its formation, all driven from a gear 26 carried by an extension of the flier driving shaft 12, the gear 26 engaging operatively with a gear 27 for driving the various mechanisms above described.

A reversible motor 28 is mounted on the base 1 and operatively connected with the shaft 12 through driving and driven pulleys 29 and 30 and a belt 31 for rotating the flier frame or rotor 10 as well as operating the cradle supported mechanism through the gear 26 carried by an extension of the shaft 12. The motor 28 as shown, is operated from a 3-phase motor circuit 32 having a double throw reversing switch 33 therein for supplying current to operate the motor in either direction.

A brake mechanism 34 is provided for the flier frame which comprises a brake drum 35 carried by the flier 10 and mounted for engagement by brake shoes 36 carried by brake arms 37, which may be pivotally mounted, as at 38, on the supporting standard 14 or other convenient support. A link 39 connects the brake arms 37, and the brake arms are connected through the link 39 with an operating arm 40 carried by a brake control shaft 41 by means of a toggle link 42 and an adjustable connecting member 47. A coiled spring 43 connects the toggle link 42 with the base 1 or a fixed portion thereof. The brake mechanism may be said to include the control shaft 41 which is supported rotatably by bearings 44 carried by the base 1 and carries the brake operating arm 40 movable upon rotation of the shaft 41 to release the brakes. A second operating arm 45 carried by the control shaft 41 is connected with a slide 46 which serves to hold the control shaft 41 against rotation in a direction to apply the brakes while the flier is being rotated in the operation of the stranding mechanism.

A brake release pedal 48 is carried by the shaft 41 for rotating the shaft to move the brake shoes 36 out of engagement with the drum 35, and a supplemental control shaft 49 may be mounted in bearings 50 located upon the opposite side of the base 1 from the bearings 44 and is provided with a pedal 51 whereby the brake control shaft 41 may be actuated from either side of the machine, the supplemental shaft 49 being operatively connected with the shaft 41 through a connecting link 52.

The brake mechanism 34 is adapted for actuation by the pedals 48 or 51 through rotation of the brake control shaft 41 whereby the brake shoes 36 are moved out of engagement with the drum 35 against the tension of the spring 43 through operation of the operating arm 40. Rotation of the brake control shaft 41 to release the brakes serves at the same time to actuate a brake control mechanism 56 to move the locking slide 46 into its locked position through movement of the slide by the operating arm 45 carried by the control shaft 41. Operation of either brake pedal 48 or 51 serves to release the brakes and moves the brake control mechanism into position to hold the brakes released until they are actuated in a manner hereinafter described for applying the brakes through operation of the coiled spring 43.

The brake control mechanism 56 is mounted on the base 1 and includes the slide 46 which is operatively connected with the arm 45 carried by the control shaft 41 which is adapted to be forced inwardly by movement of the shaft 41 into position to be engaged by a locking mechanism to hold the brake shoes out of engagement with the brake drum. The means for locking the slide 46 comprises a sliding latch 58 which is supported by an upright frame member 59 and guide plates 60 and 61 carried by the frame member. Toggle links 62 and 63 are pivotally connected to the guide plate 60 and the latch 58 respectively, as at 64 and 65, and are pivotally connected to each other at 66. A link 67 pivotally connects the toggle link 62 with a solenoid plunger connecting link 68. The solenoid plunger connecting link 68 is slidably mounted in a holder 69 and is connected with a plunger head 70 movable into solenoid engaging position under the influence of a solenoid coil 71 which is located within a solenoid circuit 72. The solenoid coil 71 is adapted to draw the plunger head 70 and plunger connecting link 68 inwardly towards the coil when energized to move the toggle links 62 and 63 into dotted line positions as shown in Fig. 4 and thereby raise the sliding latch 58 out of holding engagement with the slide 46. This release of the slide 46 permits application of the brake shoes 36 to the brake drum 35 by action of the coiled spring 43 upon the toggle lever 42. A coiled spring 68' is mounted in the holder 69 for retracting the plunger head 70 and plunger connecting link 68 upon its release by the solenoid and for returning the latch 58 to its slide engaging position.

The brake control mechanism may be operated by movement of the control shaft 41 through one of the brake pedals 48 or 51 to release the

brake by moving the brake shoes out of engagement with the drum 35, and this movement of the parts brings the slide 46 into position to be operatively engaged by the latch 58 whereby the brake shoes 36 are held out of engagement with the drum 35 until the slide 46 is released by upward movement of the latch 58, the movement of which is controlled by the solenoid coil 71. Energization of the solenoid coil, either through actuation of the stop switch by the operator or by one of the control actuating elements, draws the plunger head 70 and plunger connecting link 68 towards the coil, thereby moving the toggle links 62 and 63 to raise the latch 58 out of engagement with the slide 46. Release of the slide 46 permits immediate application of the brake by freeing the toggle lever 42 to permit it to be drawn downwardly by the coiled spring 43 to apply the brakes.

The brake mechanism and control means therefor are employed for controlling the operation of the stranding mechanism by the operator in stopping and starting the machine, as well as providing means for stopping the machine in response to their actuation by any one of a plurality of safety devices or automatically operated machine controls, the location and operation of which will now be more fully described in their relation to and means for actuating the brake control means.

It will be apparent also that the brake mechanism and operating means therefor, as shown and described herein, constitutes a novel and highly efficient form of flier control means apart from its adaptability for actuation through operation of any one of several control elements. That is, the provision in a structure of this character with a brake requiring the application of considerable force to render it effective, of an operating means comprising a high potential force adapted for application to the brake, together with a means for securing its application quickly which requires a relatively minute force furnishes a powerful operating control for the flier which is capable of instant application at the touch of a finger and without any interference with or vibration being imparted to the rest of the mechanism.

As previously mentioned, the casing 2 is provided with a hinged cover 5, serving with the casing to enclose the principal operating elements of the mechanism and to protect the operator from injury through accidental contact with moving parts of the machine. Locking means are provided for the cover 5 including pivotally mounted locking bolts 74 carried by the casing 2 and each adapted to fit within slots 75 and 76 formed in the edge flanges 8 and 9 respectively. The locking bolts 74 are each provided with a threaded clamping nut 77 for locking the cover firmly in its closed position relative to the casing. Means is provided for stopping the stranding mechanism when the clamping nuts 77 are turned to release the cover from the clamping bolts 74, which means include a shaft 78 and sleeve 79 concentrically positioned and mounted for rotation in bearings 80 carried by the casing. Fingers 81 are carried by the shaft 78 and sleeve 79 and each mounted for engagement with one of the locking bolts 74 in such a manner as to be turned upwardly and held in position by the locking bolt when in clamping engagement with the cover, as shown in full lines on Fig. 3 of the drawings. When the clamping bolt 74 is released from holding engagement with the cover it is capable of moving outwardly from the casing about its point of pivotal support, and the finger 81 associated therewith then moves outwardly into the position shown in dotted lines on Fig. 3 of the drawings. This outward movement of the finger 81 is effected through actuation of the shaft 78 or sleeve 79 as follows. An arm 82 is fixedly secured to the sleeve 79 outwardly of the end of the casing, and a similar arm 83 is fixedly secured to the end of the shaft 78. Coiled springs 84 and 85 connect the ends of the arms 82 and 83 respectively, to a portion of the casing end, and these springs act through the arms 82 and 83 to rotate the sleeve 79 or shaft 78 about their axes of rotation to move the fingers 81 outwardly into the position shown in dotted lines of Fig. 3 of the drawings when either of these fingers is released by outward movement of its cooperating locking bolt.

A switch control arm 86 is located outwardly of the casing end and positioned between the arms 82 and 83, being provided with a pin 87 extending across the paths of movement of the arms 82 and 83 so as to be engageable by either of the arms upon movement of the same under the influence of its operating spring. The switch control arm 86 is pivotally mounted, as at 88, in a switch box 89, and operates to open or close a switch 90 for actuating the control mechanism 56 to operate the brake mechanism 34 upon the release of either of the locking bolts 74. The door switch 90 is located within the low voltage control circuit 91 from the transformer and when opened serves to energize momentarily the solenoid coil 71 and draw the plunger head 70 to the left, as shown in Fig. 4, for moving the toggle links 62 and 63 to release the slide 46 and thus permit the brake shoes 36 to be applied to the brake drum 35 by action of the coiled spring 43.

A pivotally mounted switch arm 94 is carried by a switch box 95 and positioned to be engaged by the slide 46 to close the solenoid switch 96 to the solenoid coil 71 when the slide 46 is locked in its inwardly extended position, so that the solenoid coil circuit, while normally open during the operation of the machine, is capable of being closed and the coil energized by operation of the stop switch 97 or any one of the control element switches in the low voltage circuit 91.

The stranding mechanism comprises the rotatably mounted flier frame 10, having headers 18 connected by strand guiding bars 19 together with the cradle 20 and operating means carried thereby, the cradle being supported within the flier frame from the rotatable flier shafts 12 and 13.

Plural cradle carried control means responsive to the operation of control elements of the stranding mechanism for actuating the brake mechanism through the brake control means shown and described comprise a reel wind stop means, reel holding means and cradle stabilizing control means, and these controls, being operable from the cradle, involve the use of means for transmitting their impulses from the stationary or substantially stationary cradle through the flier or rotor frame to the brake control mechanism.

To provide means for actuating the control mechanism from these control elements a continuous conductor ring member 100 is carried by the header 18 located at the right of the machine as seen in Fig. 1, and mounted in electrically insulated relation therewith, being secured there-

to by posts 101 which extend through the header 18 and supporting a corresponding transmission ring member 102 outwardly of the header and inwardly of the casing 4. The posts 101 may be mounted in bushings of insulating material to insulate the rings 100 and 102 from the flier frame 10. A support 103 is mounted on the cradle frame 20 and carries a conducting contact member or brush 104 which is mounted to contact with the ring 100 and is insulated from the cradle frame 20. In a similar manner, a conducting contact member or brush 105 is carried by the end wall 4 of the casing and insulated therefrom, the same being mounted for continuous contact with the ring 102 carried by and located outwardly of the header 18 of the flier frame. The several control elements mentioned above operate through switches located within the low voltage circuit 91, which circuit is normally closed during the operation of the stranding mechanism.

The cradle frame 20 includes a transverse frame member 107 to which is secured a casing 108 enclosing mercury switches 109 and 110, which are oppositely inclined relative to each other and are positioned within the low voltage circuit 91, the mercury switches 109 and 110 being located each in the proper angular position transversely of the cradle frame 20 to open the low voltage circuit upon transverse tilting of the cradle frame in one direction or the other to a degree in excess of a predetermined limit of tilt during the operation of the stranding mechanism and under the influence of the rotating flier frame.

The winding reel 24 for receiving the stranded material after its formation is rotatably mounted on a shaft 112 and driven from the transmission gear 21 to wind the strand material. The shaft 112 supporting the reel 24 is passed through bearing openings formed in opposite sides of the cradle frame 20 and is provided with an enlarged head 113 and a reduced portion 114, located adjacent to the enlarged head, which is adapted to receive the end of a locking slide 115 mounted upon the outer face of the cradle frame 20, as shown in Fig. 6 of the drawings. The locking slide 115 is guided in its movement relative to the cradle frame by a pin and slot connection 116 and a bar slide 117. The locking slide 115 is provided with an inclined face 117' which engages a switch arm 118 controlling a switch 119 in the low voltage circuit 91. Upon movement of the locking slide into position to engage fully the reduced portion 114 of the shaft 112, the switch arm 118 is permitted to move into position to close the switch 119, while in the event of the locking slide being moved accidentally or otherwise out of its holding relation with the reduced portion of the shaft 112, the switch arm 118 is moved to open the switch 119 and thus actuate the brake control mechanism.

The full reel stop control means carried by the cradle 20 comprises a downturned arm 120 carried by a portion of the cradle frame which supports a sleeve 121 containing a bushing 122 in which is slidably mounted a plunger 123 provided with a head 124 adapted to contact with the stranded material as it is wound upon the reel and which is held resiliently in an outwardly extended position by means of a coiled spring 125 engaging the bushing 122 and the enlarged head 124. A cup-shaped member 126 of insulating material is telescoped within the sleeve 121 in which is located a sleeve 127 of conducting material and a sleeve 128 of insulating material. The bushing 122 and sleeve 121 are both formed of metal or other conducting material. A screw 129, serving as a terminal for an element of the electric circuit 91, is passed through the cup-shaped member 126 and into the conducting sleeve 127, which normally bears against the lower end of the plunger 123 to ground the current in the circuit. When the strand material being wound upon the reel fills the reel to such an extent as to engage the enlarged head 124 of the plunger 123 and force the same downwardly against the tension of the spring 125, the lower end portion of the plunger 123 is moved out of engagement with the conducting sleeve 127 to break the circuit through the stop control means which lies within the low voltage circuit 91 and this switch means is indicated on the wiring diagram as a switch member 130.

The low voltage circuit 91 which contains the mercury switches previously described together with the reel locking switch 119 and the full reel switch 130 passes to the support 103 and is connected with the contact member or brush 104 for completing the circuit through the conductor rings 100 and 102 and to the contact member or brush 105 which is carried by the end wall 4 of the casing. The several switches above named are connected in series as shown in the wiring diagram illustrated in Fig. 11 of the drawings, and in consequence the opening of either of these switches opens the low voltage circuit 91.

A strand guiding plate 111 may be carried by the support 15 or otherwise mounted in position for guiding individual cords or wires to the stranding machine through the flier supporting shaft 13, and a switch box 128 carried by the end 4 of the casing supports means for actuating the start and stop switches to start or stop the machine, and in the latter case, operate the control mechanism 56 to actuate the brake holding means and apply the brakes. Connecting circuits from the switch box 128, conductor 105 and switch box 89 of the cover control mechanism, which may be represented by reference characters 129, 130, and 131, respectively, lead to the panel board enclosed in the casing 7 where they are suitably connected into the circuits hereinafter described.

In the operation of the mechanism above described before starting the machine the brakes 36 are in operative engagement with the drum 35. The main reversing switch 33 and the manually operated switch 134 in the low voltage circuit 91, both of which are mounted on the panel board, are closed to make current available for the motor and other operating elements from the main line circuit 32. The stop switch 97 in the low voltage circuit 91 is also closed.

The operator starts the machine by first rotating the shaft 41 by actuation of one of the pedals 48 or 51, thus moving the brakes 36 out of engagement with the drum 35 through action of the arm 40 and connecting member 47 against the tension of the spring 43, and at the same time the slide 46 is moved inwardly by the arm 45 to be engaged by the sliding latch 58 and locked in position to hold the brakes 36 out of engagement with the brake drum 35. This inward movement of the slide 46 moves the switch arm 94 into position to close the switch 96 which when closed places circuit 148 in condition so that it may be closed and coil 149 energized by the closing of the start switch 136. It is to be

understood that upon closing the main reversing switch 33 current from the main line circuit 32 passes to the transformer 138 through the shunt circuit 139 although the line switch 150 is still displaced to the right holding open the switches 152, 153, 154 and 155. The operator then closes the start switch 136 which energizes the coil 137 in the low voltage transformer circuit, since the transformer 138 is receiving current through the shunt circuit 139 from the main lines 140 and 141.

The closing of the start switch 136 energizing the coil 137 serves to move the contact switch 142 to the left as shown on the diagram, closing switches 143 and 144 and opening the switch 145 through the circuit 146. The closing of the switch 144 completes the circuit 72 through the solenoid coil circuit, except for the switch 154, as the slide operated switch 96 was closed on release of the brakes before closing the start switch, and also closes the circuit 148 through the coil 149 thus moving the line switch 150 to the left as shown in the diagram to close the individual switches 151, 152 and 153 in the main lines 155, 140 and 141, respectively, as well as switch 154 in the solenoid circuit 72. This movement of the switches closes the main line circuit to the motor 28 and completes the circuit 72 to the solenoid coil from one of the main lines, but the high voltage current from the main line is prevented from energizing the solenoid coil by reason of the open switch 145 in the circuit 146. The low voltage circuit 91 is now completely closed by closing of the switch 143. The solenoid circuit 72 is closed into the main feed line 140 by the closing of the switch 154 and by closing of the solenoid switch 96 so that the circuit through the solenoid coil is in condition to permit the energizing of this coil from the main line circuit whenever the switch 145 is closed to complete the circuit. As stated, the start switch 136 when closed completes the circuit through the low voltage line of the transformer circuit 91 to energize the coil 137 and move the control switch 142 to the left closing the individual switches 144 and 143. The switch last named takes the place of the starting switch 136, which may return to its open position after being moved to effect the closing of the switch 143. Since the stop switch 97 and manually operated switch 134 were closed before operating the start switch, and since the low voltage circuit 91 is grounded at 156 and 157, the closing of the switch 143 closes the low voltage circuit 91 through the low voltage line of the transformer 138. The switches 119, 130 and mercury switches 109 and 110 in the low voltage circuit 91 are normally closed at all times except when one or another of them may be opened by some undesired operation of the cradle or its mechanism, such as failure of the reel latch to engage properly, filling the reel to its capacity or tilting of the cradle excessively.

The opening of any switch in the low voltage circuit 91, after starting the machine in the manner described above, operates through the brake control means to stop the operation of the mechanism and apply the brakes. If we assume, for example, that the stop switch 97 is opened by the operator to stop the operation of the machine the control means may be actuated in the following manner: The opening of the switch 97 opens the low voltage circuit 91 and immediately deenergizes the coil 137. The control switch 142 moves to the right as shown in the diagram to open the switches 143 and 144 and close the switch 145. The closing of the switch 145 closes the circuit through the solenoid coil and circuit 146 permitting the momentary passage of current to the solenoid coil from the high voltage circuit 140 through the circuit 72 to energize the solenoid coil 71. The energizing of the solenoid coil 71 moves the plunger head 70 to the left as shown in Fig. 4 and raises the locking slide 58 to release the slide 46 and permit the brake shoes 36 to be drawn into engagement with the brake drum 35 by action of the coiled spring 43. This operation also causes movement of the switch arm 94 upon outward movement of the slide 46 to open the switch 96 in the solenoid coil circuit 72.

The high voltage current from the main line 140 which energizes the solenoid coil lasts only momentarily since the opening of the switch 144 deenergizes the coil 149 immediately following the closing of the switch 145. This results in movement of the line switch 150 to the right as seen in the diagram, thus opening the switches 151, 152, 153 and 154 to cut the main line circuits to the motor 28 and also open the circuit 72 to the solenoid coil. Opening of the switch 154 is delayed slightly so that it opens in momentarily delayed relation with the switches 151, 152, and 153 to insure passage of a momentary current through the solenoid circuit 72 to energize the solenoid coil 71 and release the slide 46 before the opening of the switch 154 completes the opening of the solenoid circuit 72. The control mechanism is thus returned to its initial condition prior to the release of the brakes by the operator and the closing of the start switch. To restart the machine from this position of the parts, the operator must first release the brakes through the pedal 48 or 51 and reclose the start switch when the control mechanism may again be placed in operation after the manner previously described to bring the machine to full operation.

While in the example above described the operation of the mechanism was stopped by action of the operator in opening the stop switch, a similar result will follow and similar movements of the control switches and operating parts will take place upon the opening of any of the switches in the low voltage circuit 91. Release of the locking bolts 74, or either of them, will operate through the switch control arm 86 to open the switch 90 in the low voltage transformer circuit 91 to stop the operation of the mechanism by actuation of the control mechanism in the manner above described, as will also failure of the winding reel locking means operating through the switch arm 118 to open the switch 119, or operation of the full reel stop mechanism to open the switch 130 or the opening of the circuit 91 through excessive tilting of the cradle 20 acting in one direction or the other and resulting in opening the circuit through one of the mercury switches 109 and 110. In the stopping of the machine operation through actuation of one of the control switches as above described, the particular control switch responsible must, of course, be closed through return of the operating element to its operating condition before the machine can be restarted after the manner above described.

By reason of the arrangement of electric circuits above described and their modes of operation, the current passing through operating parts of the mechanism is never anything other than a low voltage current from the low voltage trans-

former circuit 91, thus avoiding any possibility of injury to the operator, machine parts or material being operated upon through the presence in the mechanism of a high voltage current. Furthermore, by means of the arrangement of mechanism and operating circuits there is normally no current passing through the solenoid coil 71 and the current passed therethrough to operate the slide locking means is never anything other than a momentary current since the switch 154 is opened immediately following the closing of the switch 145 which completes the circuit through the solenoid coil 71.

From the above description it will be seen that the present control mechanism, as respects its protective features, operates in such a manner as to make injury to an operator practically impossible through contact with a part of the machine while it is in motion, by applying the brakes, not when the cover is lifted, but when one of the clamping nuts is loosened to such an extent as to permit its clamping bolt to move forwardly and cause actuation of the control. Since both clamping bolts must be released before the cover can be raised, it follows that the flier is brought to a full stop before access can be had to the moving parts. Moreover, the machine cannot be restarted under power until the cover is closed and both clamping bolts are locked in their holding positions.

The arrangement of the parts is such that the solenoid for actuating the brake control mechanism is never energized other than momentarily, the current being cut off immediately following release of the slide 46. Plural means are provided for cutting off the current to the solenoid coil including the slide controlled switch arm 94 for opening the switch 96 and the opening of the circuit 148 to the coil 149 which results in opening the switch 154 in the solenoid circuit 72 immediately following the energizing of the solenoid coil. Anything other than a momentary energizing of the solenoid coil 71 can only occur upon failure of both of these switches at the same time.

What we claim is:

1. In a stranding machine comprising a rotatable flier and a stranding mechanism supporting cradle tiltably mounted within said flier, means for rotating said flier about said cradle, brake means mounted for operative engagement with a portion of said flier, means for applying said brake means to said flier, means for holding said brake means out of operative engagement with said flier against the influence of said brake applying means, and brake control operating means carried by said cradle and operable in response to excessive tilting of said cradle for releasing said brake holding means.

2. A stranding machine comprising a rotatable flier, a stranding mechanism supporting cradle mounted within said flier, brake means movable into and out of braking engagement with said flier, constantly acting means for moving said brake means into braking engagement with the flier, means for holding said brake means out of operative engagement with the flier, a winding reel carried by said cradle, latch connected supporting means therefor, and control means for said brake holding means movable upon failure of said latch connected reel supporting means for releasing said brake holding means.

3. A stranding machine comprising stranding mechanism including a rotatable flier, a casing enclosing said flier having a movable closure and closure locking members, brake means mounted for operative engagement with the flier and means for applying said brake means to said flier, means for holding said brake means out of operative engagement with said flier, control means for releasing said brake holding means, and means actuated by release of said closure locking members for operating said control means to release the brake holding means.

4. A stranding machine comprising stranding mechanism including a rotatable flier, a casing enclosing said flier having a cover and locking means therefor, brake means mounted for operative engagement with the flier and brake applying means therefor, means for holding said brake means out of operative engagement with the flier against the action of the brake applying means, control means for releasing said brake holding means, and means operable by an element of said stranding mechanism or upon release of said cover member locking means for operating said control means to release said brake holding means.

5. A stranding machine comprising a rotatable flier, brake means for said flier comprising a brake control arm, means acting constantly on said control arm to move the same into position to apply the brake means to the flier, a rotatable member having means for holding said control arm in position to maintain the brake means out of operative engagement with the flier, and detent means holding said rotatable member in position to maintain the brake means out of operative engagement with the flier releasable to cause movement of the brake means into flier engaging position under the influence of the brake applying means.

6. In a machine of the character described comprising a rotatable member and driving means therefor, of a casing enclosing said rotatable member, a cover for said casing, releasable clamping members for holding said cover in its closed position, brake means mounted for operative engagement with said rotatable member, control means for said brake means and said driving means, and means operable upon release of a cover clamping member for actuating said control means to disconnect the driving means and apply the brake means to said rotatable member.

7. A stranding machine comprising stranding mechanism including a rotatable flier, a casing enclosing said stranding mechanism and flier, a closure for said casing, releasable clamping means for holding the closure member in closed position relative to the casing, driving means for driving the stranding mechanism and rotating the flier, control means for said driving means, and means operable upon release of the closure clamping means for actuating said control means to disconnect said driving means from driving relation with said stranding mechanism and flier.

8. In a stranding machine, stranding mechanism including a rotatable flier and a stranding mechanism supporting cradle tiltably mounted within said flier, driving means for operating said stranding mechanism and rotating said flier, driving mechanism control means, and means carried by said cradle and operable in response to excessive tilting of said cradle for actuating said control means to disengage said driving mechanism from operative connection with said stranding mechanism and flier.

9. In a stranding machine, stranding mechanism including a rotatable flier and a stranding mechanism supporting cradle mounted within said flier, driving means for operating said stranding mechanism and rotating said flier, driving mechanism control means, a winding reel carried by said cradle, latch connected supporting means for said winding reel, and means carried by said cradle and operable upon failure of said latch connected reel supporting means for actuating said control means to disengage said driving means from driving connection with said stranding mechanism and flier.

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