Sept. 22, 1931. M. CASTRICUM ET AL 1,824,593

WIND-UP MECHANISM

Filed April 3, 1925 2 Sheets-Sheet 1

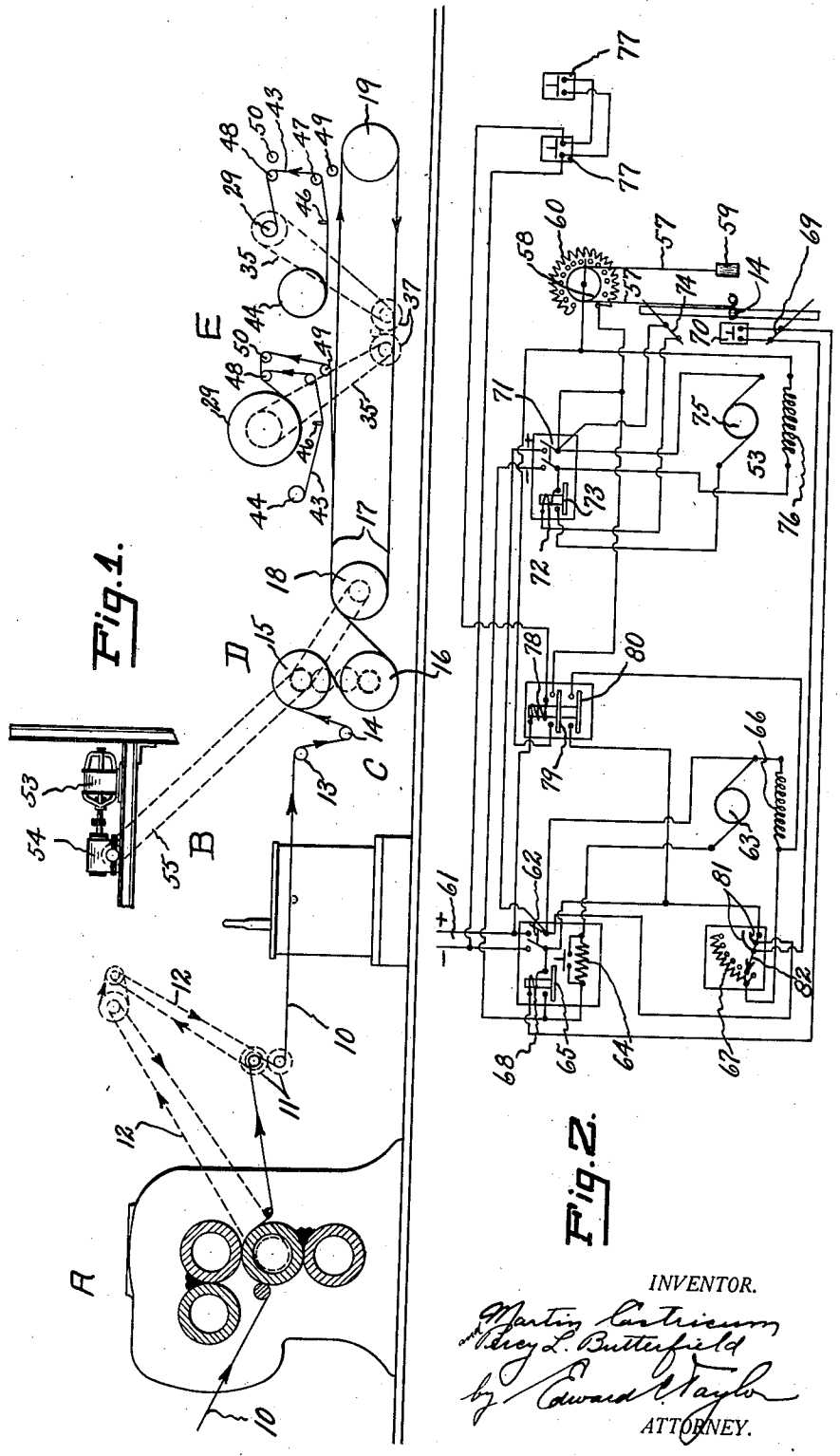


Fig. 1.

Fig. 2.

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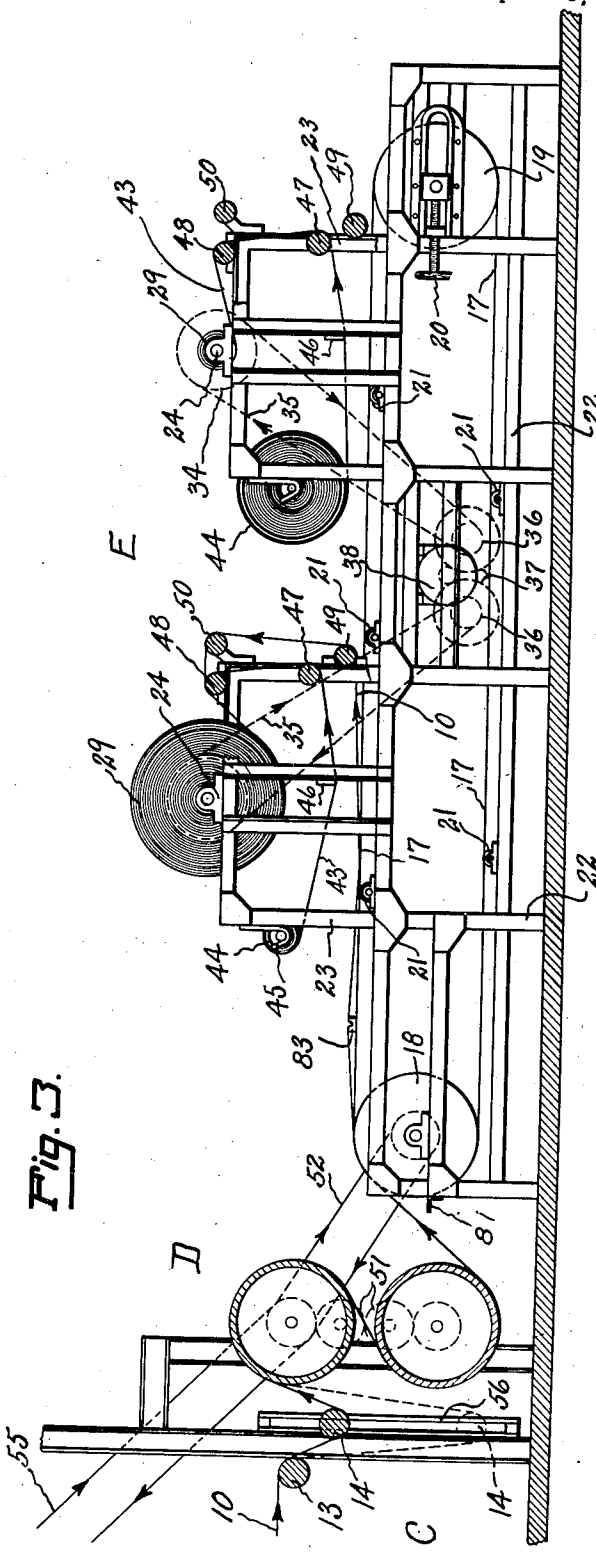


Fig. 3.

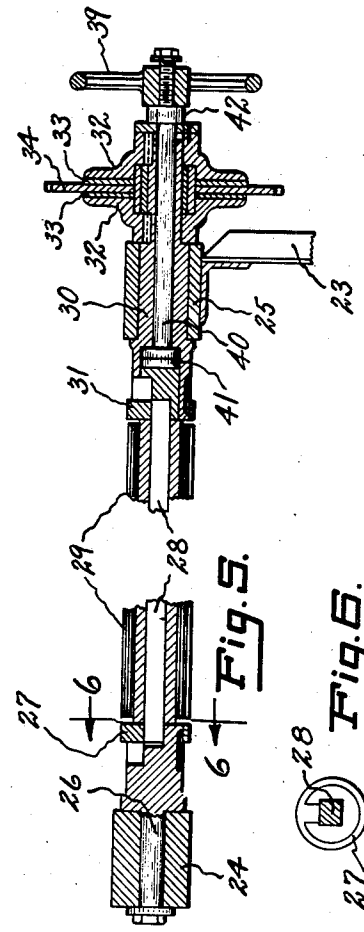


Fig. 5.

Fig. 6.

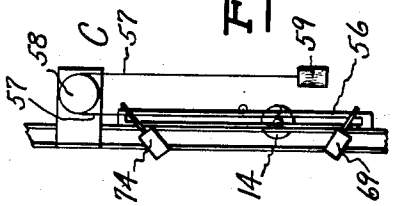


Fig. 4.

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UNITED STATES PATENT OFFICE

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WIND-UP MECHANISM

Application filed April 3, 1925. Serial No. 20,398.

This invention relates to the handling of fabric after it has received a calendered coating of rubber or similar material. The objects of the invention relate in the main to the winding of the calendered fabric between turns of a separating liner without requiring stoppage of the calender during the changing of wind-up spools, the automatic control of the relative speeds of the calender and the wind-up, and the improvement of the smoothness and facility of the operation in various particulars which will appear in the course of the following description.

Referring to the drawings,

Fig. 1 is a diagrammatic side elevation showing the general arrangement of apparatus;

Fig. 2 is a wiring diagram illustrating one manner of controlling the different drives;

Fig. 3 is an enlarged side elevation of the wind-up;

Fig. 4 is a detail of part of the control mechanism;

Fig. 5 is a section illustrating one manner of mounting the wind-up for the liner and calendered material; and

Fig. 6 is a section on line 6—6 of Fig. 5.

The apparatus may be for convenience divided into sections: the calender A, by which the material is coated with rubber; the weighing apparatus B, by which a constant check may be kept upon the amount of rubber deposited by the calender; a slack take-up device C, which also serves as a control for regulating the speed of the wind-up; cooling rolls D, which chill the rubber coating sufficiently to prevent its adherence to the liner; and a wind-up mechanism E, in which the stock is wound into rolls between turns of a liner or web of non-adherent material serving to prevent adjacent turns of the rubberized material sticking together.

The calender A may be of any usual or preferred type. As shown it is of the four-roll type, acting to coat both sides of a web of material 10. From the calender the material passes through tensioning rollers 11 having a chain connection 12 with one roll of the calender so that a constant speed relationship is at all times maintained and the material kept taut. The weighing apparatus may likewise be of any usual or preferred type, weighing the constantly changing span of material between rolls 11 and a roller 13. From roller 13 the material passes under a floating roll 14, concerning which more will be said later, and over the upper of the two cooling drums 15, 16. Passing around the upper and lower drums in a serpentine course the material finally reaches the belt 17 of the wind-up device.

The belt 17 is a width sufficient to carry the full width of the calendered material, and is supported by pulleys 18 and 19, the latter of which is preferably made adjustable by a belt tightener 20 of the usual form. Rolls 21 carry the weight of the belt in both its upper and lower courses, they, as well as pulleys 18 and 19, being journaled in a frame 22. Spaced along this frame are superstructures 23, similar in construction so that a description of one will also describe the other. At the top of this superstructure are aligned bearings 24 and 25. Bearing 24 carries a short shaft 26 which has a rectangular recess in one end, over which a collar 27 slides to retain therein the squared end of an axle 28 upon which the wind-up roll 29 is mounted.

The other bearing 25 carries a somewhat longer shaft 30, similarly fitted with a recess and a collar 31. Slidingly keyed to an extension of shaft 30 are discs 32 having friction facings 33. Located between the discs, and free for rotation relative to the shaft except as restrained by the pressure of the discs against it, is a sprocket 34 con-

nected by a chain 35 with a sprocket 36 geared at 37 to a motor 38. A handwheel 39 is screwed onto a rod 40 passing through a hole in the shaft and anchored against withdrawal by an enlargement 41, the handwheel bearing on the end of the outside disc 32 through a spacing collar 42. By turning the handwheel the pressure of the friction discs against the sprocket can be varied. Power for the winding up of the calendered material and the liner comes from motor 38, which is operated at a speed sufficient to turn sprocket 34 slightly faster than the speed with which the speed of delivery of the material will permit roll 29 to rotate. This both compensates for the varying diameter of roll 29 as the material is wound on it and exerts a constant tension on the material. Either one or the other of the wind-up rolls 29 may be put into action by tightening the proper handwheel 39.

The liners 43 are fed from spools 44 supported on hooks 45. After passing under a spreader bar 46 they go around rolls 47 and 48 to the wind-up roll. The calendered material, instead of passing around these same rolls on its way from belt 17 to the wind-up, passes around rolls 49 and 50, joining the liner on roll 48. It has been found in practice that this manner of handling eliminates wrinkling of the material that occurs when it is allowed to follow the liner around all the rolls. As shown at the right in Fig. 3, the liner lies practically flat between roll 48 and the wind-up spool 29 before the web of calendered material is led to that wind-up unit. As will be described below, the leading end of the web is led from the belt up around rolls 49 and 50 and tucked into the bite of the liner where it starts around roll 29. By the arrangement of rolls described the end of this web can be laid on the flat portion of the liner between roll 48 and the wind-up spool, and, the wind-up having previously been started by turning handwheel 39, will be started in its winding smoothly and without any necessity of manually tucking the end of the web into place. This both saves labor and results in a much smoother laying of the web.

The two cooling rolls are connected together by gearing 51 and to the pulley 18 by a drive chain 52. Power for this part of the mechanism is derived from a motor 53, coupled through a reduction gearing 54 and a chain 55 with a sprocket on the shaft of one of the cooling drums. In order that the speed of the cooling drums and the wind-up feed belt shall be synchronized at all times with the speed with which the material is delivered from the calender, an automatic control device is coupled to motor 53. This automatic control is operated by the floating roll 14 which is free for vertical motion in guideways 56 and has fixed to it a chain 57 (Figs. 2 and 4), passing over a sprocket 58 and counterbalanced by a weight 59. This sprocket is fixed on the shaft of a rheostate 60, the operation and effect of which will be considered in connection with the electrical system now to be described.

In the electrical control devices I have made special provision for synchronizing the speed of the calender and the speed of the wind-up conveyor, and also have provided a simply operated device for slowing down the motors for driving both of these instrumentalities when it is necessary to cut the web of calendered material in changing from one wind-up roll to another. By the combination of apparatus which I have provided and by the several control devices it is unnecessary to stop the calender on account of changing wind-up rolls, the severance of the material and its transference from the full spool to a fresh one being accomplished while the web is still traveling. This is of great importance in saving time and in avoiding the defective work and expense incident to frequent stoppages. Particularly will my invention find use in the making of weftless cord fabric, in which a web or sheet of unconnected parallel cords are joined together by a matrix sheet of rubber. In this case the cords are supplied in continuous lengths, and with care in the feeding of rubber the calender can be operated without stoppages during an entire shift. Much better quality of product, especially in the matter of variation in thickness of the rubber deposit, will result than with the old system requiring frequent halting of the calendering.

The main power line 61 passes through a double pole switch 62. One branch of the line, here indicated for convenience as the positive, is connected in series with the armature 63 of the motor driving the calendar, a starting resistance 64, and a contactor 65 back to the negative side of the line. Connected in shunt across the armature is the field coil 66, placed in series with a variable resistance 67. When the contactor 65 is closed, the calender motor will operate at a speed controllable by the resistance 67. The solenoid 68 of the contactor, by the energizing of which the latter is closed, is in series with a limit switch 69 mounted at the lower end of the path of roll 14. If, for any reason, the wind-up apparatus does not operate fast enough to take care of the output of the calender, the roll 14 will descend until it strikes against the limit switch 69, opening the circuit through solenoid 68 and thereby breaking the circuit through the contactor. This not only stops the calender motor by opening its armature circuit, as above described, but also stops the motor 53 which operates the wind-up conveyor and

the cooling rolls. The connections for this purpose are referred to below. When the motors are thus stopped the roll 14 is of course left resting on the limit switch 69, and in order to restart the motors a push button switch 70 is provided, acting merely to short circuit the limit switch and remake the circuit through solenoid 68.

Motor 53 is controlled by a circuit passing through a double pole switch 71 receiving its current by way of contactor 65, so that opening the circuit through the latter will also open the circuit through motor 53. From switch 71 one branch of the line, here shown for convenience as the negative, divides. One division goes through the solenoid 72 of a contactor 73 and through a limit switch 74, arranged at the upper end of the path of travel of the roll 14. If, for any reason, the speed of the wind-up conveyor exceeds the speed of the calender, roll 14 will be elevated until it strikes limit switch 74, breaking the circuit through the solenoid 72 and opening the contactor itself. Since the main circuit through the latter passes through the armature 75 of the motor 53, it will be obvious that the pressure of roll 14 on limit switch 74 will stop the wind-up motor until the calender delivers enough material to drop the roll out of range of the switch. Restarting of the motor is in this case automatic, but one of the motors being stopped and continued operation of the remaining motor serving automatically to correct the condition which caused the stoppage.

Another branch of the negative side of the line leads from switch 71 through the field coil 76 of the motor 53, and normally through the variable field rheostat 60 back to the positive side. It is this rheostat that is controlled as above described by the vertical motion of roll 14. If the roll is elevated by excess of speed of the wind-up belt as compared with the calender, the rheostat will be moved in a direction to cut out a part of the resistance in series with the field, thereby increasing the field strength and slowing down the wind-up motor. If the roll lowers by reason of an accumulation of material between the calender and the wind-up, as would be the case if the wind-up speed were too slow, the contrary action will take place and motor 53 will be speeded up. It will be found in practice that very soon after the starting of the apparatus roll 14 will find a level at which the speeds of the calender and wind-up motors are synchronized, and that thereafter the roll will fluctuate in position only slightly.

It was pointed out above that it was desirable to have the speed of travel of the web reduced temporarily during the period when it is being cut and transferred from one wind-up spool to the other. This slowing down is very simply accomplished by the control devices which will now be described. In series with the positive side of the main line and with a series of normally open push button switches 77, is the solenoid 78 of a double contactor 79, 80. The switches 77 are in parallel with each other so that closure of any one of them will close the circuit through the contactor solenoid. Their duplication is merely for convenience in being able to operate the slow-down control from any one of several points. Contactor 79 is in series with a circuit which, when the contactor is closed, short-circuits the rheostat 60; while contactor 80 is similarly connected with resistance 67. By pressing either push switch 77 the resistances previously in the fields of the calender and the wind-up motors will be cut out, and the motors thereby slowed down. If the two motors do not run at sufficiently equal speeds under these conditions they can be roughly synchronized by a fixed resistance in the field of one of them, so that for the short time—a matter of a few seconds only—when the push switch 77 is held down, no great change will be made in the amount of the web accumulated between the calender and the wind-up.

This completes the description of the electrical control, except that it may be stated that it is preferred to so connect the rheostat 67 that when it is completely cut out the circuit through solenoid 68 will be broken and both motors stopped. This will place control of the entire apparatus in the hands of the calender operator. Other normally closed switches may be placed in this circuit if desired to still further facilitate the stoppage of the calender and wind-up when necessary. The control on rheostat 67 is provided by having the control circuit through solenoid 68 joined to plates 81. These plates are, in most positions of the rheostat handle 82, electrically coupled together through the handle, which has suitable contact members. When the handle is pulled down so as to cut the resistance entirely out of the circuit, however, these contacts pass beyond the ends of plates 81, opening the solenoid circuit and stopping both the calender and the wind-up motors.

The operation of the apparatus, which will for the most part be obvious from the description above, may now be considered briefly. The normal running of the apparatus, considering the web of calendered material as passing over the wind-up conveyor to that wind-up roll 29 shown at the left in Fig. 1, is entirely automatic, the manner of synchronizing the speeds of the calender and the wind-up being fully set forth above. When the left roll 29 is completed, that is, when the supply of liner leading to that roll

is nearly exhausted, one of the push switches 77 is operated, slowing down both the calender and the wind-up. Any suitable means may now be employed to sever the web of fabric at a point where both free ends thus formed will rest upon the conveyor 17. In the drawings I have illustrated, as a convenient device for this purpose, a bar 83 (Fig. 3) with a grooved top, somewhat longer than the web of material is wide, and conveniently rested during the normal operation of the apparatus upon a ledge 84. If, as soon as the belt is slowed down, this bar be forced up between the web and the conveyor, as shown in Fig. 3, a knife can be run down the slot, completely severing the material before the bar passes any substantial distance down the conveyor. The bar may be left undisturbed to fall off the far end of the conveyor, whence it may be returned to ledge 84. The trailing end of the severed material will simply continue around the left-hand wind-up roll, passing out of the way of the conveyor and the advancing end of the new section of the web upon it. This latter end is caught by the workmen as it emerges beyond the right-hand wind-up unit, passed around rollers 49 and 50, and laid upon the flat portion of the liner between roll 48 and spool 29. Full speed operation may now be resumed by releasing push switch 77, and the completed roll on the left-hand unit replaced by a new one at any time during the winding of the right-hand roll. Changing from the right-hand to the left-hand unit is accomplished in a similar way.

Having thus described our invention, we claim:

1. In combination, a calender, a delivery conveyor, a plurality of windup devices associated with the conveyor and adapted to receive calendered web material therefrom alternatively, separate drives for the calender and the delivery conveyor, separate means to vary the respective speeds of said drives to synchronize the speed of the conveyor with the speed of the delivery of material thereto and means acting independently of said synchronizing means to slow down both drives simultaneously.

2. In combination, a calender, a delivery conveyor, a plurality of windup devices associated with the conveyor and adapted to receive calendered web material therefrom alternatively, separate motors for driving the calender and the delivery conveyor, a variable resistance in the circuit of the calender motor to control the speed thereof, a variable resistance in the circuit of the conveyor motor to control the speed thereof, a floating take-up roll operating on the web between the calender and the conveyor to take up an excess of material accumulating between the calender and the conveyor, means connecting the take-up roll and the variable resistance in the circuit of the conveyor motor to automatically synchronize the speed of the conveyor with the speed of the delivery of material from the calender to the conveyor and a switch common to the circuits of both motors operable when closed to short circuit both variable resistances to thereby slow down both motors simultaneously.

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