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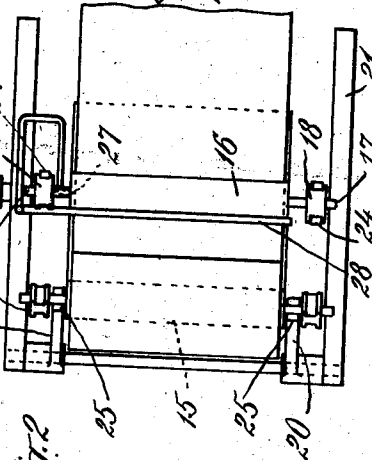
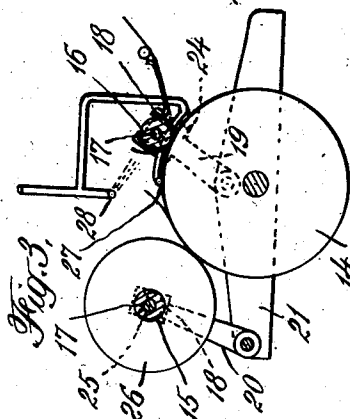
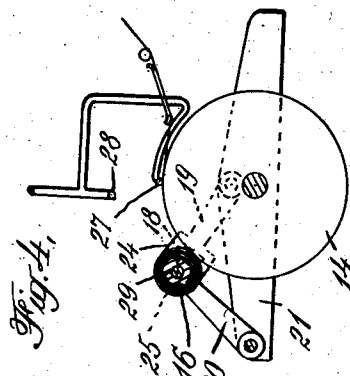
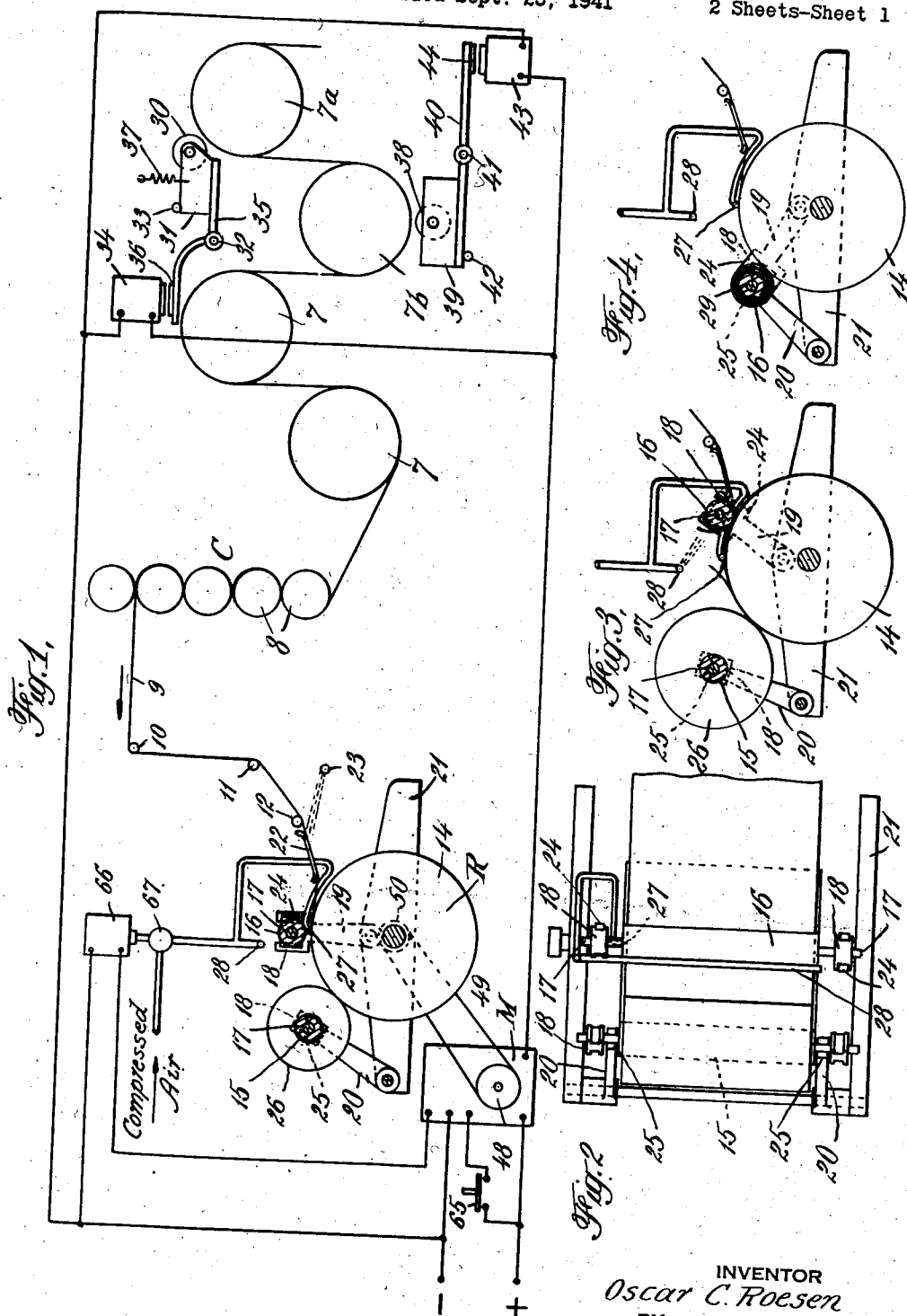
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2,379,495

APPARATUS FOR THE APPLICATION OF ADHESIVE TO WEBS

Filed Sept. 23, 1941

2 Sheets-Sheet 1



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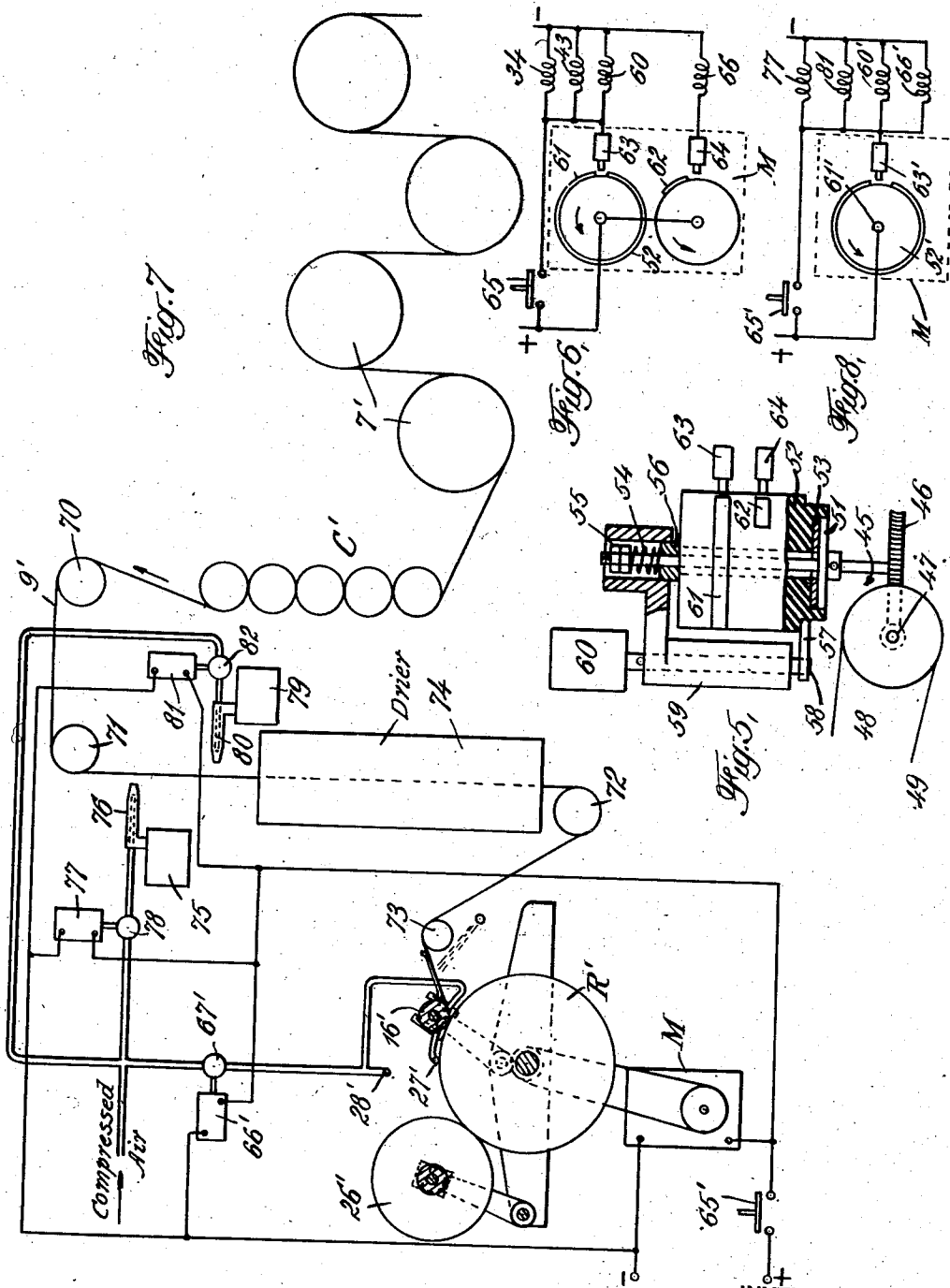
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APPARATUS FOR THE APPLICATION OF ADHESIVE TO WEBS

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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE APPLICATION OF
ADHESIVE TO WEBS

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Application September 23, 1941, Serial No. 411,960

8 Claims. (Cl. 91-18)

This invention relates to the preparation of webs of paper or like flexible sheet material for splicing or replacement, and more particularly concerns improvements in the application of adhesive or other coatings to the surfaces of such webs while continuously winding them into rolls for use by web-consuming apparatus.

Among other operations, the present invention is useful in the application of adhesive, and in certain cases adhesive-repellent coatings, to one or both surfaces of that portion of the paper or other web which lies at or adjacent the central core of a web roll. I have heretofore devised a method and apparatus for splicing the web running from an expiring web roll to the leading end of the web on a new roll which involves the use of adhesive, and in some cases adhesive-repellent coatings, on areas adjacent the inner or core end of the web roll. The method and apparatus so devised are disclosed in detail in my copending application Serial No. 403,515, filed July 22, 1941, entitled "Web roll changing," now Patent No. 2,320,656. In accordance with that disclosure, adhesive layers of a special type are located respectively at the outer or leading end of the web and at or adjacent the inner or core end of the web on each roll. The outer or leading end adhesive layer may be readily applied to the new web roll after it is wound up, either by applying the adhesive directly to the web on the roll, or by splicing to the leading end of such web a short web section carrying the desired adhesive layer. The complementary adhesive layer at or adjacent the inner or core end of the web roll cannot be applied or attached after the roll is wound up.

Paper web rolls are customarily formed by winding the web emerging from the calender or other final finishing device of a paper-making machine onto suitable cores, the web being severed when each roll reaches the desired size and the severed end of the web being started on a new core without interrupting the continuous movement of the web. In some cases, the web rolls are similarly wound from master rolls of greater diameter or axial length than that desired in the rolls used on the printing press or other web-consuming apparatus. In either case, it is essential to convenient handling and economical production that the movement of the unwound web and the roll winding operation be carried on continuously and at a high speed of web travel.

In accordance with the present invention, it is proposed to provide an improved apparatus for applying adhesive or other layers to webs while they are being continuously wound into web rolls,

such layers being applied at points or areas adjacent the inner or core ends of the rolls and without interrupting the continuous rapid movement of the webs to the roll-winding mechanism. The invention further embraces the application of adhesive-repellent coatings to such webs in predetermined relation to the adhesive layers so applied. The invention contemplates the application of adhesive layers and, in some cases, adhesive-repellent layers, to the web in timed relation to the starting of each roll-winding operation whereby such layers may be disposed at predetermined positions with respect to the inner or core ends of the rolls. Other objects, features and advantages of the invention will become apparent as the description thereof progresses.

In describing the invention in detail, reference will be made to the accompanying drawings in which typical embodiments of apparatus involving the invention and capable of carrying out the improved method have been illustrated.

In the drawings:

Fig. 1 is a diagrammatic and simplified elevation of apparatus suitable for applying web coatings and winding web rolls in accordance with the invention;

Fig. 2 is a plan view of the winding device of Fig. 1;

Figs. 3 and 4 are respectively elevations illustrating the winding device of Fig. 1 in different operating positions;

Fig. 5 is a diagrammatic elevation, partly in section, of a timing device for use in the apparatus of Figs. 1 and 7;

Fig. 6 is a wiring diagram showing the electrical connections of the apparatus of Fig. 1;

Fig. 7 is a diagrammatic and simplified elevation of a modified form of apparatus embodying the invention; and

Fig. 8 is a wiring diagram showing the electrical connections of the apparatus illustrated in Fig. 7.

The present invention contemplates the application of a coating from a fixed point to at least one surface of a rapidly moving web running to a roll-winding device, and so synchronizing the application of such coating with the transfer of the web on the winding device from a completed roll to the core of a new roll that the section of the web bearing the coating lies at or adjacent the inner or core end of the roll. The invention further contemplates drying the coating on the moving web by the application of heat from stationary means while the web is running to the winding device. In the preferred application of the in-

vention, one coating comprises an adhesive, and it is preferably applied to that surface of the web which becomes the inner surface thereof on the wound roll. In certain cases, an adhesive-repellent coating is applied to the web surface opposite that bearing the adhesive, and in a preferred form of the invention, the repellent coating extends slightly beyond the adhesive coating toward the core end of the web on each roll.

Referring to Fig. 1, I have illustrated at 7 the usual drying drums of a paper-making machine which may be of the Fourdrinier type. The paper web is formed in a known manner in the machine, and is dried to its final moisture content on the heated drums 7 from which it passes to a calender C comprising a stack of interengaging rolls 8 between which the web passes for the purpose of finishing its surface. The rapidly moving web 9 issuing from the calender C is guided by suitable rollers 10, 11 and 12 to a roll-winding device designated as a whole as R. The web 9 travels along the under surface of a guide plate 22 and is held in contact therewith by an air blast from a nozzle 23. This device may take any suitable form and generally is so designed that it winds the web 9 into a succession of web rolls of the desired size, severing the web running to a substantially completed roll and starting the severed end on a core to begin the winding of a new roll without interrupting or delaying the rapid and continuous movement of the web.

The winding device shown for the purpose of illustrating the present invention is a device generally known in the art as a Pope rewinder. Since its detailed construction is well known, the device will not be illustrated and described in all detail herein. Its detailed construction and operation are disclosed in United States Patent to Pope No. 1,248,542, dated December 4, 1917.

As shown in Figs. 1, 2, 3 and 4, the winding device R includes an under roll 14 which is suitably driven at a speed such that its peripheral velocity is equal to or slightly greater than the velocity at which the web 9 is delivered from the calender C. Two core rolls 15 and 16 successively cooperate with the under roll 14 to wind web rolls thereon. Each core roll 15 and 16 has journals 17 extending through journal boxes 18 at each end thereof. Two separately operable frames are provided for the core rolls, a starting frame comprising the arms 19, pivoted at a point above the axis of the under roll 14, and a running frame comprising a pair of arms 20, pivotally connected to the bed frame 21 at one side of the under roll 14. The arms 19 have bifurcated ends 24 constructed to receive the journal boxes 18, and the arms 20 have recesses 25 for receiving and carrying the roll core journals 17 as shown in Figs. 1, 2 and 4.

In operation, while a web roll 26 is being wound on one of the core rolls 15 whose journals 17 are carried by the running frame arms 20, a second core roll 16 is placed in the starting frame arms 19 and disposed in waiting position as shown in Fig. 1. When the roll 26 has reached the required size, the frame arms 19 are swung back in the direction from which the web 9 is fed to the starting position in which the core roll 16 engages the moving web backed by the under roll 14 and is accelerated to web speed (Fig. 3). The web 9 is then severed at a point between the core rolls 15 and 16 by suitable means such as a blast of compressed air issuing from a nozzle 27 and directed beneath the edge

of the web carried on the under roll 14, and this air blast, aided if necessary by air from an auxiliary nozzle 28 extending transversely of the web, starts the severed web end around the rotating core roll 16 and so initiates the winding of a new roll 29. The wound roll 26 on the core 15 is then removed and the starting frame arms 19 are swung in the direction of web travel until the journals 17 of the core 16 rest in the recesses 25 of the running frame arms 20, as shown in Fig. 4. As the new roll 29 builds up, the journal boxes 18 are lifted from the bifurcated ends 24 of the starting frame arms 19 and these arms are swung back to receive a new core roll in preparation for the next web transfer operation, thus completing the cycle.

In accordance with one aspect of the present invention, an adhesive coating is applied to one surface of the web 9 before or during its passage over the paper machine dryer rolls 7. As illustrated in Fig. 1, this may be accomplished by moving an adhesive roller 30, journaled in an adhesive fountain 31, into contact with the web 9 passing over the dryer roll 7a. The adhesive roller 30 and its fountain 31 may be carried by a lever support 35 pivoted at 32 and held in the retracted position against a stop 33 by a spring 37 or equivalent means. Any suitable means such as the solenoid 34 acting on the armature 36 fixed to the lever support 35 may be employed to move the adhesive applying roller 30 into contact with the web 9 on the dryer roll 7a.

Where the web to be coated is a paper web for use in printing presses, it is generally preferred to apply thereto a self-sticking adhesive such as a rubber cement. Adhesives of this type are described in detail in my copending application Serial No. 403,515, now Patent No. 2,320,656 referred to above. As there explained, these self-sticking adhesives have the properties of adhering tenaciously to the paper or other web when applied thereto in liquid form, but when dried do not adhere to an uncoated web surface. The dried self-sticking adhesive coatings cohere tenaciously with similarly applied and dried coatings.

A web carrying a dried coating of self-sticking adhesive may be wound into a roll without adherence between the coated surface and the uncoated surface of the superimposed layers. Since adhesives other than the described self-sticking adhesive may be used, and in any case to positively insure against adhesion between adjacent roll layers after storage for considerable periods, it is frequently advisable to apply an adhesive-repellent coating to the opposite surface of the web 9 from that carrying the adhesive coating. The adhesive repellent may comprise paraffin or any other suitable known wax or wax-like composition, and it may be applied in solution in a suitable solvent and dried in the paper machine dryer or otherwise.

Since the adhesive coating is applied to the web surface which becomes the inner surface of each layer on the roll, the adhesive repellent must cover the opposite web surface over a length of web extending beyond the adhesive coating toward the core end of the web on each roll, and this overlap or lead of the repellent coating beyond the adhesive coating must be sufficient to form at least one turn of the roll. This arrangement insures that the entire surface of the roll is covered with web bearing the adhesive repellent before the adhesive coated portion of the inner web surface is wound thereon.

As shown in Fig. 1, the adhesive repellent, in solution, is applied to the web by a roller 38 journaled in a fountain 39 carried by a lever support 40 pivoted at 41 and resting on stop 42 when retracted as shown. A solenoid 43 acting on an armature 44 on the lever support 40 is provided to move the repellent-applying roller 38 into contact with the web 9 on the dryer roll 7b.

In accordance with the invention, application of the adhesive coating and, where a repellent is used, application of the repellent coating, is so controlled with respect to the shifting of the web to a new core that these coatings are extended along web areas at or adjacent the inner or core end of the web forming each roll. To this end, a web-measuring device of suitable construction is employed to govern the coating applying and web shifting operations. Various forms of measuring devices may be used, and a typical form is diagrammatically illustrated at M.

Referring to Fig. 5, the device M includes a central shaft 45 driven through reduction gearing from a suitable shaft which rotates in timed relation with the movement of the web 9. The shaft 45 shown carries a worm wheel 46 driven by a worm 47 connected through a pulley 48 and a belt 49 with a pulley 50 on the shaft of the under roll 14 of the winding device R (Fig. 1). A disc 51 is fixed to the shaft 45 and a drum 52 of insulating material surrounding but loose on the shaft 45 rests on a loose friction disc 53 engaging the disc 51. A spring 54 compressed between a nut 55 on the shaft 45 and a collar 56 engaging the top of the drum 52 compresses the friction disc 53 between the lower end of the drum 52 and the upper face of the disc 51. A radially extending arm 57 is fixed to the drum 52 and is at times engaged by a plunger 58 carried in the stationary frame 59 of the device whereby rotation of the drum is prevented. A solenoid 60 is arranged when energized to lift the plunger 58 and so release the arm 57 to permit the drum 52 to be rotated by the shaft 45. Thus the drum 52, when released, turns at a speed determined by the rate of progress of the web 9. The drum 52 carries one or more peripheral contact segments 61 and 62, and stationary contacts 63 and 64 are suitably disposed to respectively engage these segments during rotation of the drum. The contact segments 61 and 62 are electrically connected to the frame of the device through suitable sliding contacts on the shaft 45, not shown.

The control circuits for the apparatus of Fig. 1 are generally illustrated in that figure and shown in detail in Fig. 6. A suitable source of control energy, indicated by the positive and negative signs, is connected through a push button 65 across the terminals of the solenoids 34 and 43 of the adhesive and repellent applying devices, and across the solenoid 60 of the measuring device M. When the roll winding operation has reached the point where one roll, say 26, has been wound to the desired size and a new core 16 is in starting position on the frame arms 19, the operator depresses the push button 65 thus energizing the solenoids 34, 43 and 60. Energization of the solenoid 60 lifts the plunger 58, releasing the arm 57 whereupon the drum 52 of the measuring device starts to rotate. The initial movement of the drum 52 moves the segment 61 into engagement with the stationary contact 63, completing a circuit around the push button 65 and so maintaining the solenoids 34, 43 and 60 energized despite release of the push button by

the operator. Energization of the solenoids 34 and 43 moves the adhesive and repellent applying rollers 30 and 38 into contact with opposite surfaces of the web 9 in the dryer, the coatings are applied to the web and dried thereon by the dryer rolls 7a, 7b and 7, and the coated web passes through the calender C to the winding device R.

The drum 52 of the measuring device turns as indicated by the arrows in Fig. 6 during the above described operations, and when the coated web section reaches or approaches the under roll 14 of the device R, the contact segment 62 engages the stationary contact 64 and completes a circuit energizing a solenoid 66 which acts when energized to open an air valve 67. The valve 67 admits compressed air from a suitable source to the nozzles 27 and 28, thus severing the web 9 and starting the severed end around the new core 16. In this manner, the portion of the web that has been coated with the adhesive and repellent is disposed at or adjacent the core end of each roll. After the required length of web has been coated, the contact segments 61 and 62 disengage the corresponding stationary contacts 63 and 64, whereupon the solenoid 60 is de-energized, the plunger 58 drops and further rotation of the drum 52 is arrested by engagement of this plunger with the arm 57. De-energization of the solenoids 34 and 43 causes the adhesive and repellent applying rollers 30 and 38 to move out of contact with the web 9 and so terminates the coating operation.

The length of web which is coated may be varied by suitably altering the extent or rate of movement of the drum contact segments in the measuring device M, and the shifting of the web to a new core may be timed to precede or follow termination of the coating operation by rearrangement of the measuring device contacts in a manner apparent to those skilled in the art.

In accordance with a modification of the invention, the adhesive and repellent coatings are applied to the web after it leaves the paper machine calender and before it enters the winding device. Such an arrangement is illustrated in Fig. 7, and a modified form of electrical circuit which may be used with this arrangement is shown in Fig. 8. The dryer rolls 7', calender C', winding device R' and measuring device M' of this modification are constructed and operate in the manner explained above in connection with the corresponding elements of the apparatus of Fig. 1.

The web 9' issued from the calender C' passes over idler rolls 70, 71, 72 and 73 and passes through a dryer 74 between the rolls 71 and 72. The dryer may comprise a suitable housing surrounding the web and heated by air currents, steam coils or electric heating devices in a known manner.

The coating or coatings may be conveniently applied to the web 9' after it leaves the calender C' by spraying devices. As illustrated in Fig. 7, the adhesive may be sprayed from a reservoir 75 through a nozzle 76 under control of a solenoid 77 which when energized opens a valve 78 and supplies compressed air to the nozzle 76. The adhesive repellent, when used, may be similarly applied to the opposite surface of the web 9' from a reservoir 79 having a spraying nozzle 80 controlled by a solenoid 81 similarly acting on an air valve 82. The adhesive and repellent nozzles 76 and 80 are spaced longitudinally of the web 9' so that the repellent coating extends closer to

the core end of the web than does the adhesive coating, for the purpose explained above.

In operating the apparatus of Fig. 7 the push button 65' is depressed when a roll 26 is completed, whereupon the solenoids 77, 81, 60' and 66' are energized. Energization of the solenoids 77 and 81 initiates application of the adhesive and repellent coatings. Energization of the solenoid 60' releases the measuring device drum 52' so that the contact segment 61' engages the stationary contact 63' and completes a holding circuit for all the solenoids. Energization of the solenoid 66' opens the air valve 67' and admits compressed air to the nozzles 27' and 28', thus severing the web 9' and starting the severed end around a new core 16'. Since the coating applying nozzles 76 and 80 are disposed at a point adjacent the winding device, the transfer of the web to a new core simultaneously with the initiation of coating application disposes the coatings close to the core end of the web. If the size of the dryer 74 or other structural considerations necessitate location of the coating sprays at any considerable distance from the winding device, the shifting of the web to a new core can be delayed for a predetermined length of the web run after initiation of coating by employing the control arrangement shown in Fig. 6 and described above.

From the foregoing description it will be seen that by employing the described apparatus, one or more coatings may be applied to and dried on web surfaces in predetermined relation to the core end of a web roll during winding thereof, and without interrupting or retarding either the production of the web or the winding operation.

I claim:

1. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, means adjacent the web running to said winding device for applying a layer of coating material to at least one surface of said web, means for both operating said web transferring means and initiating the operation of said coating applying means and means controlled in accordance with the movement of said web for terminating the operation of said coating applying means after a predetermined length of the web has been coated.

2. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, means adjacent the web running to said winding device for applying a layer of coating material to at least one surface of said web, means disposed adjacent the path of said web between said coating applying means and said winding device for drying the coating on said web, means for both operating said web transferring means and initiating the operation of said coating applying means, and means controlled in accordance with the movement of said web for terminating the operation of said coating applying means after a predetermined length of web has been coated.

3. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to

start winding a new roll, means adjacent the web running to said winding device for applying a layer of adhesive to one surface of said web, means for simultaneously operating said web transferring means and initiating the operation of said adhesive applying means, and means controlled in accordance with the movement of said web for terminating the operation of said adhesive applying means when a layer of adhesive has been applied to a predetermined length of said web.

4. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, means adjacent the web running to said winding device for applying a layer of adhesive to one surface of said web, means for measuring the length of web passing through said apparatus, means for simultaneously initiating the operation of said adhesive applying means and of said measuring means, and means operated by said measuring means for operating said web transfer means when adhesive has been applied to a predetermined length of the web and for discontinuing operation of said adhesive applying means when adhesive has been applied to another predetermined length of said web.

5. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, separate means adjacent opposite sides of the web running to said roll winding device and relatively spaced longitudinally of the web for respectively applying adhesive and adhesive-repellent coatings to opposite web surfaces, means for both operating said web transferring means of said winding device and initiating operation of said coating applying means, and means controlled in accordance with the movement of said web for terminating the operation of said coating applying means after a predetermined length of the web has been coated.

6. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, separate means adjacent opposite sides of the web running to said roll winding device and relatively spaced longitudinally of the web for respectively applying adhesive and adhesive-repellent coatings to opposite web surfaces, means for measuring the length of web passing through said apparatus, means for simultaneously operating said web transferring means, initiating operation of said coating applying means and starting said measuring means, and means controlled by said measuring means for discontinuing operation of said coating applying means after application of coatings to a predetermined length of the web.

7. In apparatus of the character described, in combination, a web source, a roll winding device receiving a continuously moving web from said source and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, separate means adjacent opposite sides of the web running to said roll winding device and relatively spaced longitudinally of the web for respectively applying ad-

hesive and adhesive-repellent coatings to opposite web surfaces, means for measuring the length of web passing through said apparatus, means for simultaneously initiating operation of both of said coating applying means and starting said measuring means and means controlled by said measuring means for operating said web transferring means when coatings have been applied to a predetermined length of web and discontinuing operation of both of said coating applying means when coatings have been applied to another predetermined length of said web.

8. In apparatus of the character described, in combination with the dryer section of a paper web making machine, a roll winding device receiving a continuously moving paper web from

said dryer section and including means operable to transfer the moving web from a finished roll to a core to start winding a new roll, means adjacent the web passing through at least a part of said dryer section for applying a coating to at least one surface of said web, means for measuring the length of web passing through said apparatus, means for simultaneously initiating operation of said coating means and starting said measuring means, and means controlled by said measuring means for operating said web transferring means when the coated web reaches said roll winding device and for discontinuing operation of said coating applying means after a predetermined length of the web has been coated.

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