June 28, 1927. 1,633,595

H. LIEBECK

DEVICE FOR MAKING ROLLS OF PAPER

Filed Aug. 15, 1923

FIG. 1.

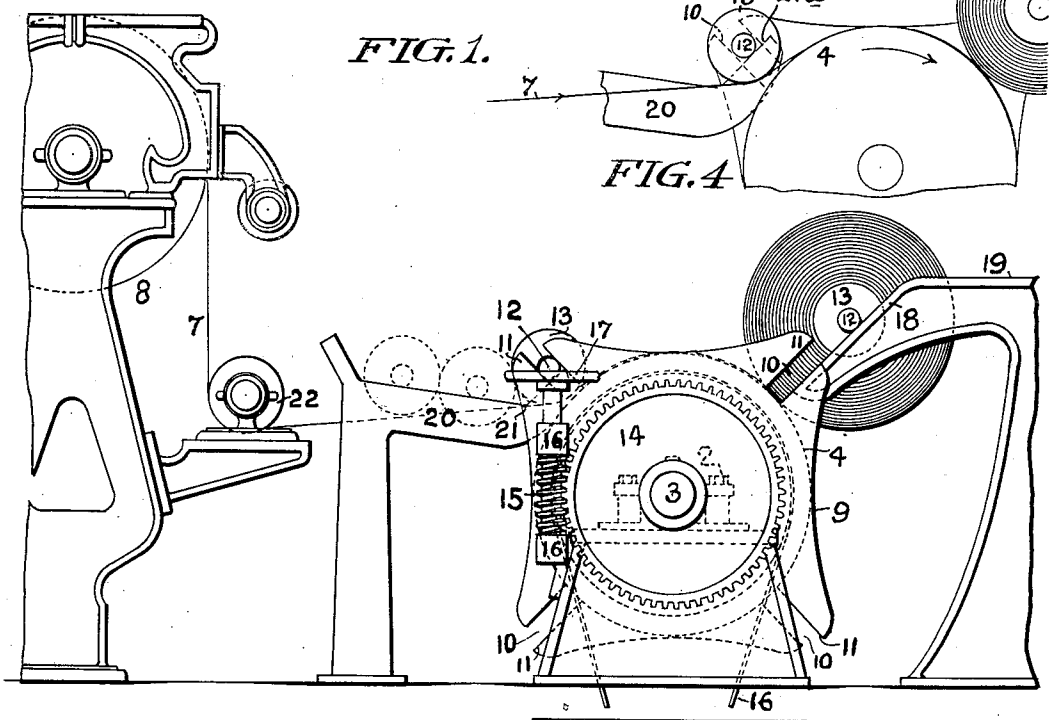


FIG. 4.

FIG. 2.

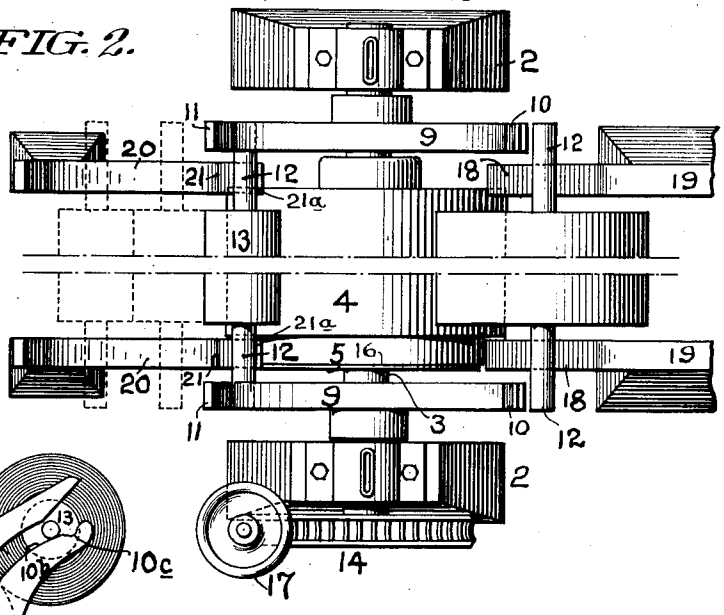
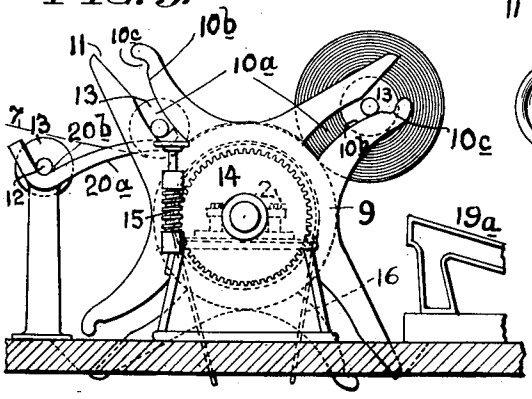


FIG. 3.



INVENTOR
Harry Liebeck.
BY
ATTORNEY.

Patented June 28, 1927. 1,633,595

UNITED STATES PATENT OFFICE.

HARRY LIEBECK, OF SWARTHMORE, PENNSYLVANIA, ASSIGNOR TO SCOTT PAPER COMPANY, A CORPORATION OF PENNSYLVANIA.

DEVICE FOR MAKING ROLLS OF PAPER.

Application filed August 15, 1923. Serial No. 657,535.

The object of my invention is to provide a winding device for winding a web of paper into roll form and especially adapted to the delivery end of paper making machines, and particularly that class of machines where the web is formed into rolls immediately after leaving the dryers.

My object is also to so construct the winding apparatus that it will automatically receive a mandrel while the paper web is being wound upon a second mandrel which automatically discharges itself when fully wound, whereby it is removed from the winding devices to a support to provide space to permit positioning the additional mandrel to which the paper web from the paper making machine is attached for winding a new roll of paper so that the several rolls of paper may be formed in succession without any interference with the running of the paper making machine.

More specifically considered, my invention consists of a rotating drum or cylinder combined with mandrel carrying means adjacent to its ends and circumferentially adjustable about the axis of the cylinder, said means adapted to receive a mandrel when in one position and to be readily guided thereon when adjusted to the winding position, the roll of paper upon the mandrel resting directly upon the surface of the revolving cylinder with a frictional contact and to insure a constant surface speed equivalent to that of the cylinder without positive gearing between the mandrel and cylinder, and guiding means for the mandrel as it becomes loaded with paper and whereby the increasing diameter of the paper roll pushes the mandrel out of the mandrel carrying means and delivers it to stationary supports, so that the mandrel carrying means may be further adjusted circumferentially to bring the new mandrel into the position formerly occupied by the mandrel which has been automatically removed with its roll of paper and thereby permit a new roll of paper to be formed.

My invention also consists of certain improvements in the construction of the device comprising certain organizations and combinations of parts which, together with the features above recited, are fully described hereinafter and more particularly defined in the claims.

Referring to the drawings: Fig. 1 is a side elevation of my improved winding machine shown in connection with the dryer end of a paper making machine; Fig. 2 is a plan view of the same; Fig. 3 is a side elevation of a winding machine corresponding to Fig. 1, but somewhat modified, and Fig. 4 is a diagrammatic side view of a portion of Fig. 1.

2 are bearings in which a horizontal shaft 3 is journaled, said bearings acting as a bearing for a revolving cylinder or drum 4 which is loosely journaled thereon and provided with a belt wheel 5 which may be driven by a belt 6, so that it is constantly rotating preferably at a surface speed equal to the surface speed of the web of paper 7 which leaves the dryer end 8 of a paper making machine or other source of paper web. Any other means for rotating the cylinder 4 may be employed in lieu of the belt 6 and belt wheel 5, if so desired.

Secured to the shaft 3 at the opposite ends of the cylinder or drum 4 are arranged mandrel carrying frames 9 which are provided with radial guide slots 10, preferably four in number, arranged equidistant about the axis of the shaft. As shown, it is desirable that the guide surface 11 on one side of the slot shall be prolonged beyond the end of the guide surface on the other side of the slot in each instance, the purpose for which will presently appear. The depth of the slots 10 should be sufficient to receive the journals 12 of the mandrels 13, when the latter are resting upon the surface of the cylinder 4, as will be understood by reference to Fig. 1. The shaft 3 is provided at one end with a worm wheel 14, the latter meshing with a worm 15 journaled in stationary bearings 16 and provided with a hand wheel 17, by which it may be rotated. It will now be understood that by adjusting the worm wheel 14, the shaft 3, together with its mandrel supporting frames 9, will be adjusted about the axis of the drum 4, so that a mandrel received in one of the radial slots, as indicated in Fig. 1, may be transferred through an arc of 90° to a position adjacent to the stationary guides 18 in connection with the supports 19 for the mandrel when carrying a roll of paper. By employing a worm and worm wheel as a means for adjusting the mandrel carrying frame 9, it is manifest that the said frame will be held in any position of adjustment which it may as-

sume and, therefore, when the paper roll is being wound upon the mandrel, as at the right hand upper part of Fig. 1, the drag on the paper web will not disturb the position of the mandrel supporting frame.

20 are two fixed guides for supporting additional mandrels to be fed to the winding apparatus, the guiding rails of said frames being preferably inclined slightly in a downward direction toward the winding frames, so that a mandrel will automatically roll toward the slotted portions of the frames 9 as said frames are adjusted. The end of the frames 20 adjacent to the cylinder are extended upwardly to form notches to receive the journals 12 of the mandrel and support the mandrel in such position that, as the frame 9 is adjusted in the direction of the arrow (Fig. 4), the journals of the mandrels will pass over the short guide of the slot 10 and be received upon the extended guide 11 thereof, and thus be lifted and fed into the slot in an automatic manner as the frames are adjusted to the position definitely shown in Fig. 1. The mandrel thus supported will not be rotating in contact with the surface of the drum, but is supported by the guide 20 (Fig. 4), and as it is in contact with the paper web, it will be performing a guiding function. Later it will act to operate immediately upon the paper web to wind it into roll form. When the completed roll is removed to the supports 19 and the frames 9 are further adjusted, the next mandrel is received from the guide frames 20 and carried over to the position occupied by the former mandrel. The mandrel is then rotated continually, first by direct contact with the cylinder, and secondly, by contact of the roll of paper which is being formed about it. It is manifest, that the speed of rotation of the mandrel gradually lessens as the paper roll increases in diameter, this lessening of speed being desirable when the mandrel is being automatically lifted and guided up the inclined guides 18 of the stationary supports.

In positioning the roll winding means in relation to the paper making machine, it will be observed that the paper is guided under a roller 22 at such an elevation, that as the paper web passes from the said roller to the winding cylinder or drum 4 (where the mandrel is located upon which the paper is being wound), said web is guided against the under surface of the other mandrel which is held in the mandrel supports 20 preliminary to being brought into position for making the paper roll, it being thus guided to the surface of the cylinder or drum 4 preceding the formation of the roll 13^a of paper.

It will also be understood that while the winding devices are shown in connection with the dry end of a paper making machine, the said devices may receive paper from any other source, such as when a large roll of paper is to be divided into secondary rolls of less diameter; and similarly, the general construction of my improvement may be employed in cases where a wide web of paper is slitted into narrower webs and the narrower webs are wound as individual rolls, although they might be wound on the same mandrel or upon cores on the same mandrel shaft, as will be readily understood by those familiar with paper manufacture.

In the construction shown in Fig. 1, it will be noted that the mandrels are fed down an incline into the slot of the mandrel supporting means, and on the other hand, the mandrel having the paper roll thereon is delivered upward over an inclined guiding support, and while this is desirable, it is not essential to the spirit of my invention, as will be understood by reference to the modified construction shown in Fig. 3.

Fig. 3 shows the general construction of the apparatus to be the same as in Fig. 1, but the radial slots for receiving the journals of the mandrels are somewhat different in specific construction and similarly, the supports for the mandrel by which they are delivered to the mandrel carrying frame and the manner in which they are discharged from the frame when the paper is wound upon them is also somewhat different. In this case, the radial slots are curved, as at 10^a, and while one of the guiding edges of the slot is extended beyond the other, as at 11. (corresponding to Fig. 1), the other guiding edge 10^b of the slot has near its end a notch 10^c. The supports 20^a for the mandrels which are to be delivered to the adjustable mandrel supporting frame 9, instead of forming a straight incline downward toward the cylinder 4, are arranged on an incline upwardly, as at 20^a, and these guides near their outer ends are provided with depressed portions 20^b forming sockets in which the journals of the mandrel are received and whereby the mandrel is positioned at a distance from the cylinder, as will be clearly understood by reference to Fig. 3. It will now be understood that as the frame 9 is adjusted in the direction of the arrow, the long arm 11 will pass under the journal of the mandrel and will cause it to roll inward toward the cylinder at the same time having its weight largely supported upon the upwardly curved guides 20^a until it occupies the position indicated. It will also be understood that the other uppermost guide slot 10^a to the right of the axis of the cylinder, will be similarly provided with a mandrel which, during the course of the operation, will be largely wrapped with the paper roll, as shown, and during the wrapping operation, the mandrel will be pushed outward gradually in the slot and the journals thereof will ultimately fall into the recessed portion 10^c, and the in-

cline of said portions will move the mandrel quickly just far enough to remove the pressure of the paper on the cylinder 4, which will arrest the further winding. The frames 9 and their shaft 3 may then be adjusted in the direction of the arrow to lower the mandrel with the paper roll formed thereon until it will roll out of the recesses 10^c and be received upon the guides 19^a which, being inclined, will cause the paper roll to roll away from the winding devices. At the same time, the new mandrel 13 will be brought to the new position by the adjustment of the worm and worm wheel and the paper web would be severed and attached to the new mandrel, preliminary to a new roll of paper being wound thereon. In this case, gravity insures the discharge of the paper roll, whereas in Fig. 1, the increasing diameter of the paper itself was employed to cause the mandrel to ride up on the guides when removing the paper roll automatically from the support. In respect to the other guide 20^a, the mandrel is moved along the same before being in the full custody of the mandrel supporting frames 9, but in this case, the mandrel is pushed along the guides 20^a by the arms of the mandrel supporting frame 9 instead of rolling toward the cylinder by gravity. It is manifest, however, that a guide, such as 20 of Fig. 1, may be used with this modified form of apparatus if so desired.

In the general construction and operation, the devices of Figs. 1 and 3 are similar in the main.

The special function of the curvature of the edge 10^b of the slot 10^a is to gradually decrease the angle of the slot to a horizontal as the roll increases, with the result that the weight of the roll and mandrel upon the surface of the drum 4 gradually decreases as the weight of the roll increases, so that the friction and pressure upon the cylinder 4 remains substantially constant for all wound roll diameters. By reason of this, the crushing strain upon the paper roll is maintained at a minimum and hence no damage is done to the paper by the increasing weight of the roll itself.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable, and while I have in the present instance shown and described the preferred embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that I do not restrict myself to the details, as the same are susceptible of modification in various particulars without departing from the spirit or scope of the invention.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a machine of the character stated, the combination of a revolving cylinder, an adjustable frame providing guides at each end of the cylinder for supporting mandrels upon which paper webs are to be wound and adjustable about a horizontal axis, said guides having radial guide surfaces whereby the mandrel may move outwardly in said guides as the paper roll increases in diameter by its action in pressing upon the revolving cylinder, detachable mandrels having journaled ends engaging the guides, means for adjusting the mandrel supporting frame about its axis and holding it in positions of adjustment whereby the mandrels may be supported at a higher elevation than the axis of the cylinder and press toward the surface of the cylinder by gravity, and means at the discharge side of the cylinder and independent of the adjustable mandrel supporting frame having inclined guides in alinement with the mandrel guides on the adjustable frame for automatically receiving and supporting the mandrel with the paper roll thereon after it leaves the adjustable supporting frame.

2. The invention according to claim 1, wherein further, an inclined supporting frame is arranged at the front or receiving part of the machine for automatically guiding and supporting a mandrel in position to be automatically received in contact with the cylinder and with its ends in the guides of the adjustable frame preliminary to its being raised and adjusted to position for receiving the web of paper while being wound into the finished roll.

3. The invention according to claim 1, wherein the adjustable frame is capable of complete revolution and is provided with a plurality of guides for the mandrels arranged in spaced relation about the axis of the adjustable frame whereby a plurality of mandrels may be supported thereby at one time.

4. The invention according to claim 1, wherein the guides on the mandrel supporting frame are formed as radial slots and in which one guiding edge of each of the slots is extended beyond the other, whereby said extended guiding edges pass under the journals of the mandrel for lifting and guiding them into the slots as the mandrel supporting frame is adjusted about its axis.

5. The invention according to claim 1, wherein further, the receiving and supporting means for receiving the mandrel with the roll of paper thereon are stationary and provided with upwardly inclined guiding edges in alinement with the radial guides of the adjustable mandrel supporting frames whereby the mandrels may be automatically passed from the custody of the radial guides and the frame in which they are formed to and upon the stationary receiving and sup-

porting means under the action of the increasing roll of paper formed about the mandrel, said upwardly inclined guiding edges extended in continuations having a downward inclination so that the paper rolls automatically under the action of gravity roll to a position clear of the adjustable frame and cylinder.

6. The invention according to claim 1, wherein the adjustable mandrel carrying frame and revolving cylinder having a common axis and the former is provided with a worm wheel by which it may be rotated about the axis of the cylinder, combined with a worm by which the worm wheel and the frame may be adjusted and held in adjusted position during the winding operations by the revolving cylinder.

7. A winding machine for winding webs of paper in roll form which consists of a rotating cylinder, combined with an adjustable frame circumferentially adjustable about the axis of the cylinder and having a plurality of guiding means thereon spaced about its axis and extending beyond the perimeter of the cylinder, means for adjusting the frame with a step by step motion and holding it fixedly in its adjusted positions, and a plurality of mandrels upon which the paper is to be wound each detachably supported at the same time in respective portions of the plurality of guiding means which are above the axis of the adjustable frame whereby they have capacity for rotating in contact with the revolving cylinder and free to move radially relatively thereto during the respective and successive winding of the paper web upon them.

8. The invention according to claim 7, wherein further, means are provided for automatically delivering a mandrel to the adjustable frame at one side of the axis of the cylinder and for receiving the mandrel with the paper roll upon it from the other side of the axis of the cylinder.

9. The invention according to claim 7, wherein further, the guiding means on the adjustable frame consists of curved slots projecting in a radial direction from the frame.

10. In a mechanism of the class described, in combination with a contact drum for propelling web material, a rotatable member for supporting a plurality of reels for simultaneous co-action with said drum, and means on said rotatable member for permitting movement of said reels away from said drum as the web material is wound on said reels.

11. In a mechanism of the class described, a contact drum, a reel adapted to be rotated and partially supported by co-action with said drum for winding web material thereon, and a rotatable member having a plurality of means thereon for guiding and supporting a plurality of reels for simultaneous co-action with said drum.

12. In a mechanism of the class described, a contact drum, a reel adapted to be rotated and partially supported by co-action with said drum for winding web material thereon, a rotatable member having a plurality of means thereon for guiding and supporting a plurality of reels for simultaneous co-action with said drum, and means for rotating said member continuously in one direction to bring successive reels into co-action with said drum.

13. In a mechanism of the class described, a driven contact drum of relatively large diameter, a rotatable support for simultaneously supporting and guiding a plurality of web winding reels and means for rotating said support to bring an empty reel into contact with said drum for winding web material upon said reel while a full reel is still in contact with said drum.

In testimony of which invention I hereunto set my hand.

HARRY LIEBECK.