Nov. 9, 1926. 1,606,557

H. L. CARPENTER

METHOD OF AND MACHINE FOR MAKING LAMINATED DRUMS

Original Filed August 31, 1921 3 Sheets-Sheet 1

Fig. 1.

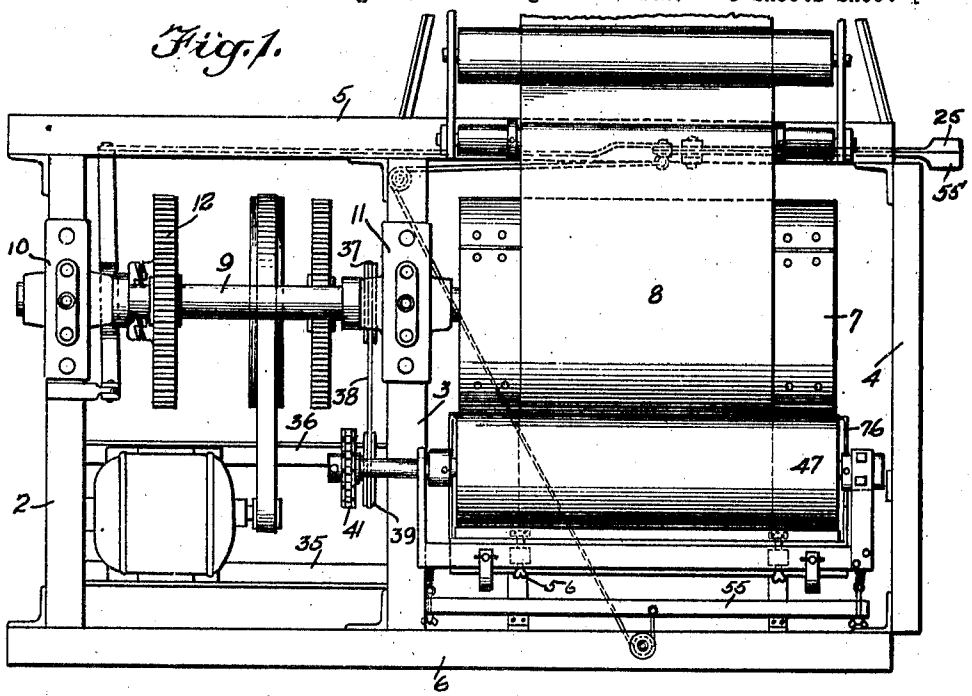
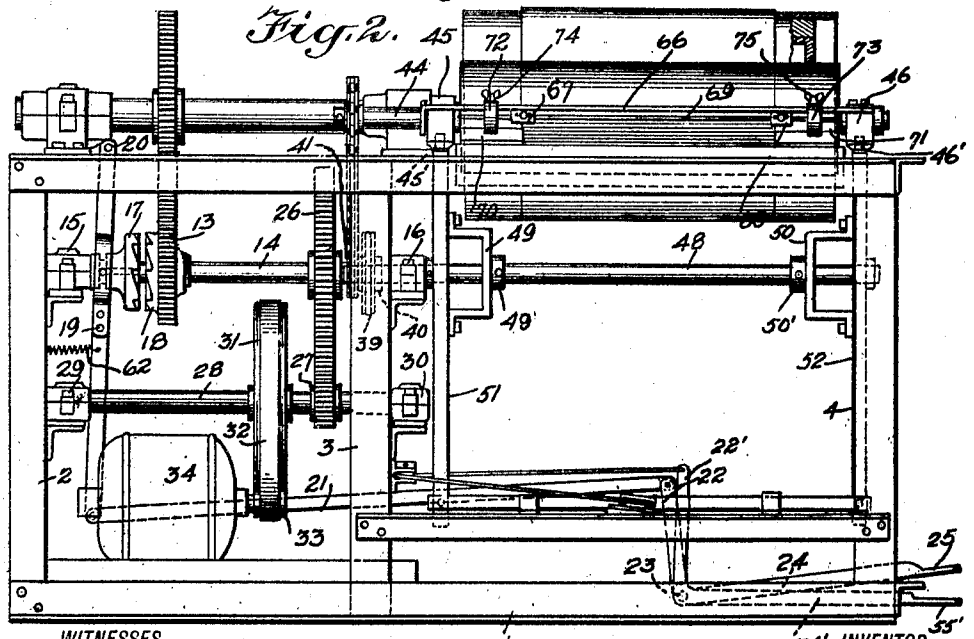


Fig. 2.



WITNESSES

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Fig. 3.

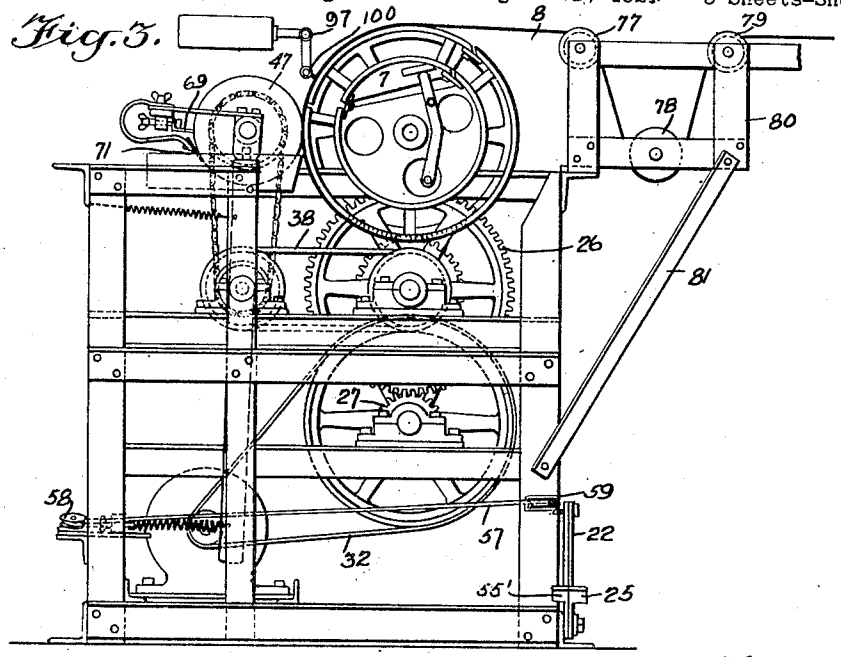


Fig. 4.

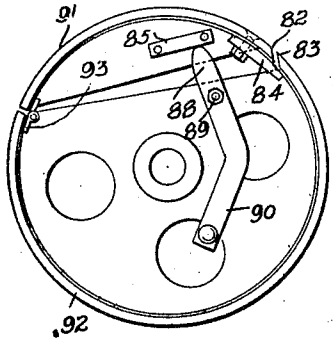


Fig. 5.

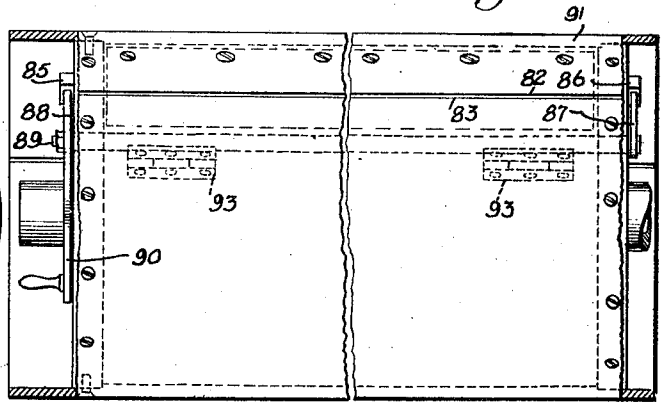


Fig. 6.

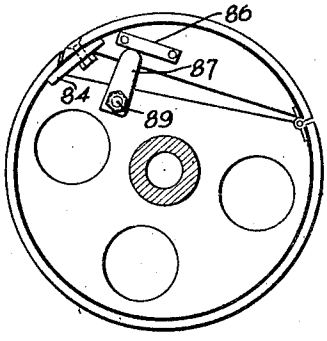
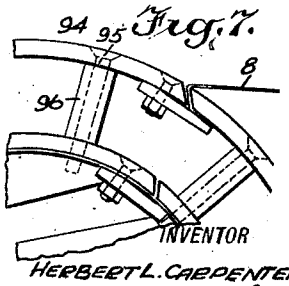


Fig. 7.



WITNESSES

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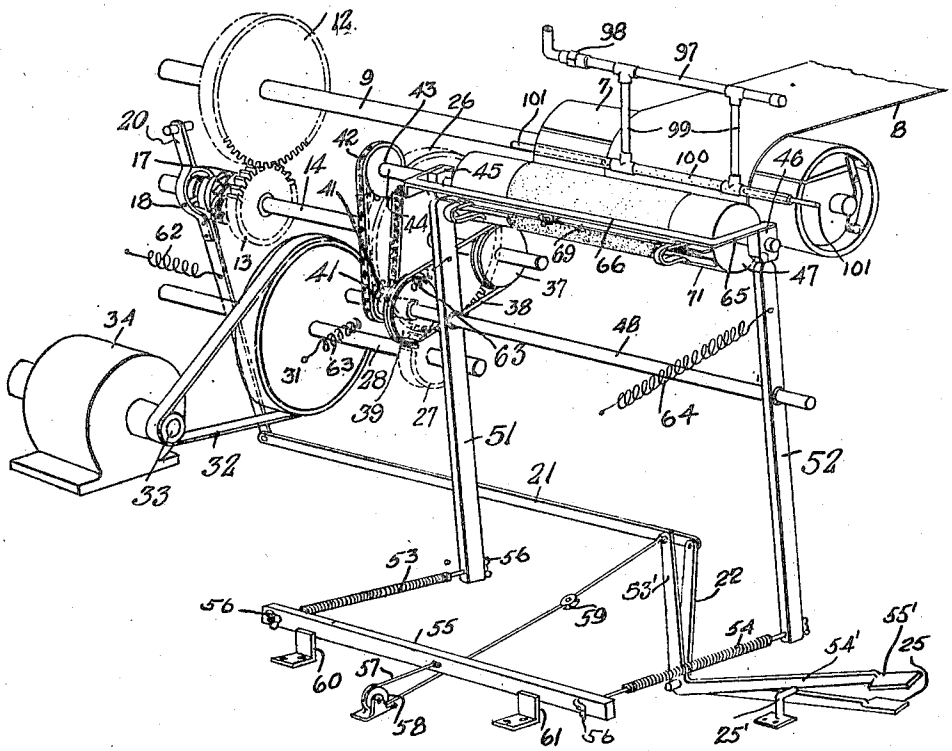
Nov. 9, 1926. 1,606,557

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METHOD OF AND MACHINE FOR MAKING LAMINATED DRUMS

Original Filed August 31, 1921 3 Sheets-Sheet 3

Fig. 8.



WITNESSES

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Patented Nov. 9, 1926. 1,606,557

UNITED STATES PATENT OFFICE.

HERBERT L. CARPENTER, OF BROOKLYN, NEW YORK.

METHOD OF AND MACHINE FOR MAKING LAMINATED DRUMS.

Application filed August 31, 1921, Serial No. 497,211. Renewed April 10, 1926.

This invention relates to a method of and machine for winding and forming laminated drums, particularly paper drums, which may be used in containers of cylindrical or other hollow form.

An object of the invention is to provide a machine in which the paper will be wound true in the form of a drum without the need of any further adjustment than the initial adjustment of the laminated material on the machine.

Another object resides in the provision of means whereby adhesive is constantly and uniformly applied between the layers or laminations and an outside surface suitably coated with the adhesive, which may be a waterproof material or not as desired.

A further object resides in the provision of means whereby the pressure applied to the material being wound is regulated in a predetermined manner and thereafter operates automatically in proportion and in accordance with the variations of working conditions in the machine.

A still further object resides in the provision of means whereby any variation in the thickness of the paper, or variation in the exact trueness of the winding drum, or any impurities in the adhesive, will be automatically accounted for in the operation of the winding drum and the adhesive roller to permit the fabric to be wound true and the adhesive and pressure to be applied uniformly regardless of these irregularities.

Another object resides in the provision of means whereby drums of different diameters, lengths and cross-sectional shapes, may be readily wound on the one machine, and whereby to change the parts of the machine to accommodate one drum or another involves a minimum expenditure of time and labor.

A further object resides in the provision of means whereby after a drum has been wound and formed it may be very readily and quickly removed from the machine.

A still further object resides in the provision of means whereby the application of adhesive to the selected parts of the material on the winding drum can be achieved.

Another object resides in the particular construction and arrangement of parts which are hereinafter described and claimed and shown in the accompanying drawings.

It has been found that in winding and forming cylindrical laminated fabric drums by machinery, the fabric having once been disposed accurately in the machine will not necessarily be wound accurately and true unless the application of pressure on the fabric as it is being wound on the winding drum, and the regulation of adhesive with the pressure, are maintained uniform and yet at the same time capable of yielding or of being flexible to respond to variations in the characteristics both of the paper and the adhesive. Furthermore, it is necessary to continuously rotate the adhesive regulating roller, whether it is engaging with the winding drum or not, but when it is engaging with the winding drum a yielding connection between it and the power shaft is established, so that in effect the linear speed of the adhesive pressure roller is the same as the linear speed of the winding drums with which it is in contact. It is to be understood that in this machine the proper function of the pressure roller is not only to regulate the thickness of the adhesive on the winding drum but also to insure the true rolling of the paper or fabric. In other words, the adhesive may be actually applied to the winding drum by some other means than through the medium of this roller without departing from the spirit of the invention.

It has been found particularly needful to the success of the operation of this machine that the flexible characteristics of the adhesive regulating and pressure-applying roller should be such that the roller not only can be brought into heavy pressure contact with the winding drum but also that the adhesive roller be so flexibly mounted that its axis can assume angular positions with respect to the surface line and axis of the winding drum. By thus permitting either end of the adhesive roller to yield in accordance with the overcoming of regulated and predetermined resistance, an automatic and accurate allowance for the above-mentioned variable characteristics of the adhesive and the paper is made, whereby the paper will run absolutely true at the edges and will, therefore, not necessitate trimming, and the adhesive will be applied regularly over the entire surface between laminations. This is true even though the collapsible winding

drum may not be in exact and true circular form or not exactly true on its outside surface, due to the collapsible mechanism and to the method of supporting the winding drum at one end only.

The invention is illustrated in the drawings of which—

Figure 1 is a plan view of the machine;

Figure 2 is a front elevation;

Figure 3 is a side elevation;

Figure 4 is an end view of the winding drum;

Figure 5 is a side elevation of the winding drum;

Figure 6 is a side elevation of another end of the winding drum;

Figure 7 is a detail view of the winding drum showing the auxiliary winding surface applied thereto; and

Figure 8 is a diagrammatic perspective view of the machine.

As shown in the drawings, the preferred form of the invention comprises a machine having a base or bed frame 1 with vertically extending supporting members 2, 3 and 4 and horizontal top frame members 5 and 6. These members may be of any material and any shape, the proportions and dimensions of this frame being a matter of good mechanical design rather than being an essential part of the invention.

On this machine I provide a winding drum 7 on which any suitable laminated material 8, such as paper, can be wound to form laminated drums. This winding drum 7 is mounted on the end of a shaft 9 which is journalled in bearings 10 and 11 on the frame members 2 and 3. It will be noted that the shaft 9 extends across the top of the frame and that the right-hand end of the winding drum, as viewed in Fig. 1, is free, so that the drum 7, by means not shown, may be drawn or taken off of the shaft 9 as desired. This provides ready means for replacing one drum with another when necessary. On the shaft 9 is provided a gear 12 keyed thereto. This gear is adapted to mesh with another gear 13. This gear 13 is mounted loosely on a shaft 14, the shaft 14 being suitably journaled in brackets 15 and 16 attached to the frame members 2 and 3. A clutch member 17 is keyed to the shaft 14 and is adapted to be engaged with the corresponding member 18 on the face of the gear 13, whereby the gear 13 may be made to rotate with the shaft 14. The movable clutch member 17 is adapted to be operated by a suitable connection with a lever 19 pivoted at 20 on the frame member 2 and at its lower end connected to a link 21 which in turn is connected to one end 22 of a bell crank lever pivoted at 23. The other end 24 of the bell crank lever is provided with a foot pedal 25 whereby the pedal when depressed will cause the engagement of the clutch members 17 and 18, and may be locked in the operating position under a latch bar 25′.

Keyed to the shaft 14 I also provide a gear 26 which meshes with a pinion 27 on the shaft 28. This shaft 28 is journaled in brackets 29 and 30 connected to the frame members 2 and 3. The shaft 28 is provided with a pulley 31 keyed thereto. A belt 32 connects the pulley 31 with a small pulley 33 on the shaft of a motor 34. This motor may be suitably mounted on channel bars 35 and 36 and in any desired manner connected to the frame members 2 and 3.

On the shaft 14 to the right of gear 26 I provide a pulley 37 over which a belt 38 is disposed. This belt connects with another pulley 39 mounted on a hub 40 at the other end of which is a sprocket 41. Over this sprocket extends a chain 42 the other end of which connects with a larger sprocket 43. This sprocket 43 is mounted on a shaft 44. This shaft is journaled in bearing blocks 45 and 46. Between these journaled boxes an adhesive and pressure roller 47 is disposed. The hub 40 is mounted loosely for rotation on a crossbar or shaft 48 which is journaled in suitable brackets in the frame members 3 and 4. Between the frame members 3 and 4 a pair of bearing brackets 49 and 50 are attached to vertical bars 51 and 52 and have apertures through which shaft 48 extends and on which shaft these vertical bars and brackets are free to move. In Fig. 2 the small pinned sleeves 49′ and 50′ fastened to shaft 48 are placed in their proper position to prevent the vertical rods and brackets from moving away from their proper position on shaft 48, this shaft being held stationary in the frame. These brackets are adapted respectively to support vertically extending bars 51 and 52. These bars are provided with apertures through which the shaft 48 extends, and at their upper end are suitably connected with pivoted bearings 45′ and 46′ to the bearing blocks 45 and 46 supporting the shaft 44 and the winding drum 7. These vertical bearings on which the bearing blocks 45 and 46 rest are necessary to prevent cramping of the ends of shaft 44 in the blocks when one end of the roller 47 moves back independently of the other. The lower ends of the bars 51 and 52 are connected respectively and separately to springs 53 and 54. These springs at their other ends are connected to a common actuating bar 55. The adjustment of the springs 53 and 54 may be accomplished by means of winged nuts 56. A connection or cable 57 is attached to the bar 55 and extends over pulleys 58 and 59, and at its other end is connected to the upper end of a portion 53′ of a bell crank lever 54′. This bell crank lever 54′ has on its outer end a foot pedal 55′ which is also adapted to be hooked on to the latch 25′.

The two pedals 25 and 55′ are disposed closely adjacent each other so that they may be operated by one foot movement, if so desired, so that the clutch and the pressure roll can be operated at the same time or separately, as desired. As seen particularly in Fig. 8, therefore, whenever the foot pedal 25 is depressed the clutch member 17 is moved into engagement with the clutch member 18 and at the same time, if the pedal 55′ is simultaneously depressed, a bar 55 is pulled back against the brackets 60 and 61 which are mounted on the frame.

In the operation of the device the operator, by depressing the pedal 55′ will force the roller 47 against the drum 7. If the operator finds that the paper is rolling true, no adjustments are necessary. If the operator finds, however that the paper is running off true, to one side or the other, he can properly manipulate the wing nuts 56 connected to the springs 53 and 54 so as to increase or decrease the pressure applied to the ends of the roller 47, and as this pressure is increased or decreased the paper, if it is rolling off true, can be brought back to roll true.

With regard to the theory upon which the pressure roller operates across the mandrel and the fibre which is being wound up into a drum, my conception of the theory is as follows: When a roller of material is being wound into a shell under the pressure system, whereby the shell is wound over a mandrel under heavy pressure, and the slightest difference in the thickness of the fibre across the sheet will cause the thickness of the laminated shell at one edge to be greater than at the other, thus causing the fibre to wind off. With my invention, whereby the pressure along the surface of contact between the pressure roller and the mandrel can be regulated, it is possible to reduce the pressure where the fibre is thinner and increase the pressure where the fibre is thicker. This actually compresses the fibre at the points where the pressure is greater and simultaneously reduces the thickness of the coating of adhesive. Where the pressure is lighter the fibre is not compressed and simultaneously a heavier coating of adhesive is allowed to flow between the laminations, tending to swell the fibre. The combination of these conditions can, by the proper regulation of the pressure, cause the laminated shell, even under heavy pressure, to be of exactly the same thickness throughout, thereby causing it to roll true with clean uniform edges.

The clutch member 17 is held normally out of engagement with the clutch member 18 by means of a spring 62, and the bars 51 and 52 are held with their upper ends and, consequently, the adhesive roller 47, turned back away from the winding drum 7 by means of springs 63 and 64.

A U-shaped metallic frame 65 is rigidly connected at one end to the bearing block 46 in any suitable manner, and at the other end is adapted to be loosely mounted on the shaft 44 adjacent the bearing block 45 to permit of relative movement between this end of the frame and the bearing block 45. This frame has a portion 66 extending rearwardly along the edge of the adhesive roller 47 but spaced therefrom. Supported from this frame 65 are adjustable blocks 67 and 68 adapted to support a scraper 69 which extends across the entire length of the adhesive roller 47. Auxiliary scrapers 70 and 71 disposed adjacent each end of the adhesive roller 47 are supported by springs 72 and 73 from the portion 66 of the frame 65. These springs 72 and 73 may be adjusted along the length of the portion 66 by means of wing nuts 74 and 75. This scraper 69 is ordinarily disposed a little distance from the drum 47 and regulates the thickness of applications of the adhesive on the roller 47. On the other hand, the scrapers 70 and 71 are generally disposed closely against the surface of the drum 47 so as to scrape all the adhesive from the drum 47 along those portions of its area which do not contact with the paper 8. Beneath the drum 47 I provide and support in any suitable manner an adhesive trough 76 into which the drum 47 dips constantly. It will be noted that as long as the motor 34 is rotating, the drum 47 is moving regardless of whether the winding drum 7 is in operation or not. This operation is provided so that the adhesive has no time to dry on the drum 47, it being constantly in rotation and dipping into the fresh adhesive. It will be observed, therefore, that as one end of the roller 47 moves with respect to the face of the drum 7 its bearing block is permitted to turn on the end of the supporting bar and the scraper frame 65 remains in proper and uniform relation with the pressure roller, so that the scrapers may always be accurately spaced from the surface of the roller and yet permit the flexible movement of either end of the pressure roller. This accurate relative alignment is achieved by reason of the fact that only one end of the scraper frame is rigidly fixed with relation to the pressure roller.

As shown in Fig. 3 particularly, the paper 8 extends between tension pulleys 77, 78 and 79 suitably journaled in a frame 80 supported on a bracket frame 81 from the main frame of the machine.

With respect to the winding drum 7, it will be noted, particularly from Figs. 3, 4, 5, 6 and 7, that this drum is split along its length to provide slightly spaced abutting edge portions 82 and 83 which are cut at an acute angle. Within the drum, adjacent the slit and the edge 82, are disposed a plate or a plurality of plates 84 which extend across

the slit and are suitably bolted adjacent the edge 82. These function in a manner hereinafter to be described. This drum, merely by reason of its flexibility and by reason of being split, may be collapsed by any suitable mechanism adapted to draw the edge 82 downwardly, as viewed in Fig. 4, away from the edge 83. In this manner the average diameter of the drum is reduced sufficiently to permit the wound drum or cylinder thereon to be removed very readily. The plates 84, of which there may be a plurality provided along the length of the drum between the edge 82, are provided to prevent the edge 82 from moving outward beyond the edge 83. In other words, when these plates are contacting with the inner plates of the drum beneath the edge 83, the drum has assumed substantially its proper curvature, as illustrated in the drawings, a true circle. On the ends of the winding drum 7, I provide cam plates 85 and 86 suitably connected thereto, which are adapted to be engaged by cam levers 87 and 88 connected to the shaft 89 which extends through the winding drum 7. This shaft, at one end, is provided with an operating handle 90 whereby the cam levers 88 may be engaged with or disengaged from the cam plates 85 and 86. As viewed in Fig. 4, the handle 90 is in a position to cause the engagement of the lever 88 with the plate 85 and the corresponding engagement of the cam lever 87 with the plate 86. In this engaged position the plates 84 are in their normal position bearing against the under face of the drum adjacent the edge 83, and the drum in this condition is in a true circular form.

As shown in the drawings, and as comprising one preferred form of the invention, the flexibility of the drum is provided not only by splitting it, as above mentioned, but by making it of two sections 91 and 92 which may be connected together by hinges, such as 93, a plurality of which may be provided throughout the length of the adjacent hinged edges of these two sections. However, it is to be understood that the drum may be made of material flexible enough to give at the edges 82 and 83 without being made of two independent hinged sections as shown. When the handle 90 is properly moved, the levers 87 and 88 release the plates 85 and 86, whereby the edges 82 and 83 draw apart to collapse the drum and reduce the average diameter sufficiently to permit the removal of the cylinder readily therefrom. By this means I have provided a cylinder which is readily collapsible and yet when in its normal operative position is absolutely true and strong. As shown in Fig. 7, the end of the paper 8 can anywhere be fed in between the edges 82 and 83 and gripped between the under face of the drum and the plates 84. When the handle 90 is moved to its operative position, the end of the paper is thus firmly locked; and when the drum is completed, the turned-over end of the paper will readily slip out with the drum.

In the event that I desire to wind drums of different diameters, it becomes necessary to provide a simple and readily applicable attachment whereby these drums may be wound. I may provide different, separate drums which can be mounted on and removed from the shaft 9 as above mentioned, but I prefer to use the attachment shown in Fig. 7. This attachment comprises an auxiliary drum 94 of the desired diameter which is also split similar to the drum 7. This auxiliary drum 94 is slipped on over the drum 7 and is provided with a plurality of bolts or set screws 95 which extend from the drum 94 to the drum 7 and engage in any suitable predetermined apertures therein. These set screws extend through bores in spacing sleeves or spacer bars 96, of which there is one for every set screw. These spacing sleeves 96 are of the exact length to position the auxiliary drum 94 the proper diametrical distance from the drum 7. It becomes, therefore, merely necessary to align the apertures in the sleeve with the apertures in the drum and to tighten up the set screws 95 in order to attach the auxiliary drum to the normal drum 7.

I have, therefore, provided an attachment which may be made in many sizes, whereby this machine can be adapted to wind and form cylinders of diameters varying over a wide range. I have also provided means whereby the paper or other laminated material is firmly and accurately gripped by the winding drum. I have provided means whereby the winding drum, either with or without the attachment, can be very quickly and easily collapsed to permit of the withdrawal of the cylinders therefrom. I have also provided an adhesive and pressure roller the end portions of the axis of which are independently and pivotally mounted and connected to resilient pressure producing means in such manner that each end of this roller may be forced against the winding drum with any desired and predetermined pressure independent of the other end. By reason of this accurate and independently regulated pressure-applying means, the adhesive and pressure roller will not only yield as a whole but will oscillate yieldingly due to variations in the quality or thickness of the paper and variations in the consistency of the adhesive, so that although one end may momentarily move away from the winding roll, nevertheless, substantially the whole roller is still in effective action. It is found that this oscillating flexible contact is the only one which will accurately and truly produce a lami-

nated wound cylinder without the necessity of trimming up the edges thereof after winding and in which the adhesive is applied and the laminations are connected firmly and uniformly throughout their entire length.

By reason of the fact that the sprocket 41 is mounted on the pivotal point for the bars 51 and 52, and in view of the fact that the sprocket 43 is mounted on the same shaft 44 with the adhesive roller 47, the power transmission between the motor 34 and the adhesive roller is uninterrupted regardless of the movements of the adhesive roller. Furthermore, the belt connection between the power system and the adhesive roller permits the adhesive roller to be moved at any desired speed when it is turned away from the winding drum 7 but causes it to move with the same linear speed as the winding drum 7 when in contact therewith by reason of the slippage of the belt 38. In this manner the pressure is properly applied and the adhesive is consistent throughout. In other words, the pressure at each end of the adhesive roller may be regulated and varied regardless of the pressure applied at the other end of the adhesive roller. This regulation is determined by the circumstances and conditions of operation of the machine and also by reason of the characteristics of the particular material being wound and adhesive being applied. It will also be noted that whenever the clutch members are engaged that the adhesive roller may be simultaneously brought into contact or engagement with the winding drum 7.

For the purpose of the easy cutting of the paper which is being wound into a drum, the clutch, by being operated by separate pedal, can be released without withdrawing the pressure roll upon the winding drum. This thereby stops the winding drum without releasing the pressure roller, although the complete operation of both pedals will either release or engage both the clutch and the pressure roller. This separate operation is useful when the paper is being run from the roll and it is desired to cut it off close to the machine. In this case it is important that the adhesive and the pressure rolls remain in their pressure relation, in contact, so that the winding drum can again be started and finish the laminated drum without any interruption of the adhesive on the surface of the paper. This is particularly true since it is necessary to roll the winding drum an additional revolution so that the adhesive can be applied to the outside coat.

The provision of the above-mentioned mechanical features and their combination with each other to perform the functions described, has resulted in a machine comparatively simple in construction and operation, inexpensive to manufacture and operate, and on which many sizes of drums can be quickly and efficiently made with a minimum of adjustment of the parts during operation and attention on the part of the operator.

In Fig. 8 I have shown a pipe 97, swiveled at 98 and suitably supported in any manner, from which depending pipes 99 extend to a perforated pipe 100. This perforated pipe 100 extends along parallel to the surface of the winding drum and is provided with a plurality of apertures through which adhesive may flow on to the paper. An adjustable rod or plug 101 is disposed in each end of the pipe 100 to control the width of apertures permitted to remain open in accordance with the width of the paper being cut and wound. By this simple device I can provide a separate adhesive applying means independent of the roller 47, the major purpose of which roller is to regulate the pressure being applied to the paper and the thickness of the adhesive thereon. This separate adhesive-applying means may also be used for applying a heavy coating of waterproof adhesive on the outside of the completed drum or cylinder.

What I claim is:

1. A winding drum for winding cylindrical containers of sheet material, which comprises a pair of sections hinged together to form a substantially cylindrical drum, a plate on the end of one section, an operating member on the end of the other section adapted when moved into operative position to contact with the plate and move the section on which the plate is mounted into an expanded position whereby the drum presents substantially a true cylindrical surface, said member when operated in another predetermined manner permitting the section on which the plate is mounted to collapse, whereby the cylindrical containers formed on the drum may be readily removed.

2. A collapsible winding drum, which comprises a pair of hollow hinged sections having edges adapted to lie adjacent each other when the sections are aligned to present a cylindrical surface, end faces on each of said sections, cam plates on the end faces of one section, cam levers on the ends of the other section, a shaft extending through said section and connecting said levers, and an operating handle connected to said shaft to move the levers to engage the plates. whereby the section on which the plates are mounted is held in its expanded position on the said section adapted to collapse when the cam levers are removed from engagement with the cam plates.

3. An attachment for winding drums which comprises an auxiliary hollow shell of larger diameter than the drum, said drum

and shell having apertures adapted to be aligned, spacing bars disposed between the shell and the drum in alignment with the apertures, and means passing therethrough to connect the shell with the drum.

4. An attachment for winding drums which comprises an auxiliary hollow shell of larger diameter than the drum, said drum and shell having apertures adapted to be aligned with each other, spacing bars attached to the inner face of the shell in alignment with the apertures therein, and connecting screws or bolts extending through the bars from the shell and the drum to connect the same.

5. A machine for winding cylindrical shells of sheet material, which comprises a collapsible winding drum, a yieldable adhesive regulating and pressure roller adapted to apply a considerable pressure, sufficient to create a strong, compact, laminated body structure, means permitting the movement of either end of the roll away from the winding drum independent of the other end of the roll, and means for regulating the pressure to control the true winding of the paper whereby the necessity for trimming the edges of the shells may be eliminated.

6. A machine for winding hollow cylinders of sheet material into a compact, strong body portion, which comprises a winding drum, an adhesive regulating and pressure roller adapted to bear against the winding drum with a considerable amount of pressure supports for the ends of said pressure roll, said supports being mounted for movement of each end thereof independent of the other end, means for holding the roll normally away from the winding drum, means for moving the roll against the winding drum, and means permitting the movement of one end of the roll away from the drum independent of the other end and independent of the position of the means which move the roll against the drum, this control permitting regulation of the true winding of the paper in spite of the great pressure with which the paper is compressed.

7. A winding machine which comprises a winding drum, an adhesive regulating and pressure roll adapted to bear thereagainst with a considerable amount oi pressure, sufficient to pack the layers of paper firmly into a strong body portion, said roll being supported at each end, means permitting the movement of either end of the roll away from the drum independent of the other end, and means for regulating the pressure at the ends of the roll against the drum so that the true winding of the paper can be controlled, whereby the necessity for trimming the edges of the body portion after it is wound is eliminated.

8. A machine comprising an adhesive-applying roller, a scraper extending across the face of the roller and spaced a predetermined distance therefrom to regulate the thickness of the adhesive, and additional scrapers located at either end of the roller and extending partly thereacross and contacting with the roller to scrape the adhesive therefrom, whereby the width of the adhesive left on the roller is regulated to a predetermined extent.

9. A winding machine comprising a winding drum, adhesive regulating and pressure roller normally adapted to be disposed thereagainst, means supporting said roller for yieldable and independent movement of each end of the roller, and means for regulating the pressure whereby the true winding of the material can be controlled to eliminate the necessity for trimming the edges of the material after they are made.

10. A winding machine comprising a winding drum, a pressure and adhesive roller adapted to bear thereagainst, the axes of the roller and the drum lying normally in parallel lines, a pivoted support for each end of the roller, each of said supports extending at right angles to said axes, and springs connected to the pivotal supports adapted separately and independently to hold the ends of the roller against the drum.

11. A winding machine comprising a winding drum, a pressure and adhesive roller adapted to bear thereagainst with its axis in the plane of the axis of the drum, pivoted levers adapted to support the ends of the roller, said levers extending downward at right angles to the axes of the drum and roller, springs connected to the lower ends of the levers and adapted separately and independently to press the ends of the roller against the drum, an actuator bar connected to the other end of said springs, and means for moving the bar in one direction or the other to apply the roller to or move the roller from the drum.

12. A winding machine comprising a winding drum, power means, power-transmitting connections between said means and the drum, a clutch in said connection, means for engaging and disengaging said clutch, a pressure and adhesive roller adapted to be applied to the drum with a considerable degree of pressure, sufficient to form a strong, compact drum of laminated material, means for applying the roller to the drum with this heavy pressure, the last two means adapted to be actuated simultaneously, whereby the roller is applied to the drum when the power is connected to the drum to start the same.

13. A winding machine comprising a winding drum, a power means, power-transmitting means therebetween, an adhesive-regulating and pressure roller adapted to bear against the drum with a heavy pressure, sufficient to form a firm, compact,

strong body portion of laminated material, power-transmitting connections between the roller and the power means, a clutch disposed in the power-transmitting connection between the drum and the power means, means for operating the clutch, a support for the roller, and means for applying the roller to the drum, said last two mentioned means adapted to be operated simultaneously, whereby the roller is moved against the drum when the power-transmitting connection between the drum and the power means is established.

14. A winding machine comprising a winding drum, a power means, power-transmitting means therebetween, an adhesive-regulating roller, power-transmitting connections between the roller and the power means, a clutch disposed in the power-transmitting connections between the drum and the power means, means for operating the clutch, a support for the roller, means for applying the roller to the drum, said last two mentioned means adapted to be operated simultaneously, whereby the roller is moved against the drum when the power-transmitting connections between the drum and power means are established, and means in the connections between the roller and the power means whereby the power connection will slip and maintain the linear speed of the roller substantially equal to the linear speed of the drum against which it bears.

15. A winding machine comprising a winding drum, a power means, power-transmitting means therebetween, an adhesive- and pressure-regulating roller, power-transmitting means between the roller and power means, the linear speed of the roller being different than the linear speed of the drum, and means in the connections between the roller and the power means to permit slippage when the roller is in contact with the drum and the linear speed tends to differ from that of the drum.

16. A winding machine comprising a winding drum, a power means, power-transmitting connections therebetween, a clutch in said connections, means for engaging and disengaging the clutch, an adhesive- and pressure-applying roller, and connections between the roller and the power means for driving the roller, part of said connections between the roller and the power means comprising a belt which is adapted to slip under predetermined conditions and prevent the linear speed of the roller differing from the linear speed of the drum.

17. A winding machine comprising a winding drum, adhesive-applying means, an adhesive-regulating and pressure roller bearing against the drum with a heavy pressure, sufficient to form a strong, compact shell of laminated material, and means for regulating the pressure at different points along the surface of contact between the drum and the roller whereby the true winding of the material can be effected to eliminate the necessity for trimming the edge of the shell after it is finished.

18. A machine for making laminated drums, which comprises a winding drum, a pressure and adhesive-applying roller adapted to bear against the drum with a heavy pressure, sufficient to form a firm, compact, strong shell of laminated material, means for engaging and disengaging the pressure roller with the winding drum, supplemental means for applying adhesive to the drum, and means for regulating the pressure at different points along the surface of contact between the drum and the roller whereby the true winding of the material is effected to eliminate the necessity for trimming the edges of the shell after it is made.

19. A machine for winding laminated cylinders, which comprises a winding drum, an adhesive-regulating and pressure roller adapted to bear against the drum with a heavy pressure, sufficient to form a firm, compact, strong body portion of laminated material, means for engaging and disengaging the pressure roller from the drum, means for applying adhesive to the pressure roller whereby it is applied under pressure to the drum, supplemental means for applying adhesive to the drum, and means for regulating the pressure at different points along the surface of contact between the drum and the roller to effect the true winding of the material and eliminate the necessity for trimming the edges of the body portion after it is made.

20. A winding machine comprising a winding drum, adhesive regulating and pressure roller adapted to bear thereagainst with a heavy pressure, sufficient to form a firm, compact, strong body portion of laminated material, a source of power, means for connecting the winding drum with the source of power, means for applying the pressure roller to the drum, and separate means for operating said connecting means and said pressure roller applying means, each of said operating means adapted to operate simultaneously or independently.

21. A winding machine which comprises a winding drum, a pressure roller adapted to bear thereagainst with a heavy pressure, sufficient to form a firm, strong, compact body portion of laminated material, a source of power, connections between the source of power, the roller and the drum, a clutch for connecting the drum to the source of power, flexible means for engaging and disengaging the roller, a mechanism connected to the clutch, and a second mechanism connected to the flexible roller-operating means, each of said mechanisms normally disposed so that they may be operated simultaneously.

22. A machine which comprises a pressure roller, a surface against which said roller is adapted to bear, means for supporting the ends of the roller for independent movement, a frame associated with said roller and adapted to support a device to be accurately adjusted with respect to the surface of the roller, and means for mounting said frame in connection with the roller whereby the flexible movement of either end of the roller may be achieved while still retaining a uniform and accurate relation between the frame, the devices on said frame, and the roller.

23. A machine which comprises a pressure roller, a surface against which said roller is adapted to bear, means for mounting the ends of the roller for independent movement, a scraper frame associated with said roller, a scraper device thereon adapted to be accurately adjusted with respect to the surface of the roller, a shaft on which said roller is mounted, said shaft being suitably supported by said supporting means, one end of said scraper frame loosely embracing said shaft and the other end of the scraper frame being fixed to the roller supporting means whereby the flexible movement of either end of the pressure roller may be achieved while still retaining an accurate relation between the frame, the scraper and the pressure roller.

24. A machine comprising a pressure roller, a surface against which said roller is adapted to bear, a shaft extending from each end of said roller, a bearing block embracing each end of said shaft, a pivoted support for each bearing block, a swivel connection between the bearing blocks and their pivoted support, a scraper frame associated with said roller, one end of said frame being fixed to the respective bearing block, the other end of said frame loosely embracing the shaft of the roller whereby the independent movement of either end of the roller can be achieved while retaining the accurate relation between the frame and the pressure roller.

25. A collapsible winding drum which comprises a split cylinder having edges adapted to lie adjacent each other, cam plates on the ends of one section of the drum, cam levers on the ends of the other section adapted to co-operate with the cam plates to hold the sections in alinement, a shaft extending through said drum and connecting said levers, and an operating handle connected to said shaft to move the levers simultaneously and engage the plates whereby the section on which the plates are mounted is held in alinement with the other sections.

26. A machine for winding cylindrical shells of sheet material, which comprises a winding drum, a yieldable adhesive regulating and pressure-applying roller bearing thereagainst with a heavy pressure sufficient to form a firm, compact, strong body portion of laminated material, means for creating a pressure between the roll and the drum, and means for regulating said pressure at different points along the surface of contact, whereby the true winding of the material can be regulated to eliminate the necessity for trimming the edges of the shells after they are wound.

27. A machine for winding cylindrical shells of sheet material, which comprises a winding drum, adhesive regulating and pressure roller bearing thereagainst with a heavy pressure, sufficient to form a firm, compact, strong body portion of laminated material, means for supporting the pressure roller for yieldable movement whereby either end may move with respect to the drum independent of the other end, means for applying said pressure through said roll to the drum, and means for regulating said pressure at different points along the surface of contact between the roll and the drum to effect the true winding of the material and thereby eliminate the necessity for trimming the edges of the shells after they are wound.

28. A machine for winding sheet material in the form of a cylinder having outer edges, which comprises a winding drum, adhesive regulating and pressure-applying roller adapted to bear against the drum with a heavy pressure, sufficient to form a firm, strong, compact body portion of laminated material, means for supporting the roller for yieldable movement on its axis, and means for regulating the pressure exerted through the roller to effect the true winding of the material and eliminate the necessity for trimming the edges of the cylinder after it is wound.

29. A winding machine which comprises a winding drum, adhesive regulating and pressure roller bearing thereagainst with a heavy pressure, sufficient to form a firm, strong, compact body portion of laminated material, means for creating said pressure between the roll and the drum, and means for adjustably regulating the pressure at different points between the roller and drum along their surfaces of contact to effect the true winding of the material and eliminate the necessity for trimming the edges of the body portion thus formed.

30. A device for regulating the movement of sheet material between two rolling surfaces, which comprises a drum over which the material passes, a pressure roller bearing thereagainst with a very heavy pressure whereby the flow of material therethrough can be controlled only by the variations in the pressure, means for creating said pressure between the roller and the drum, and

means for regulating said pressure to vary at will the pressure of the roller on the drum at different points throughout their surfaces of contact to effect the true passage of the material.

31. A collapsible attachment for winding drums, which comprises a split, hollow auxiliary shell of larger diameter than the drum and adapted to be slipped over a collapsible drum, spacing means disposed between the shell and the drum, and means for connecting the shell and the drum.

32. An attachment for collapsible winding drums, which comprises a split, hollow auxiliary shell of larger diameter than the drum and adapted to be slipped thereover, and spacing means disposed between the shell and the drum.

33. The combination with a collapsible winding drum, of a split auxiliary shell to be disposed over the winding drum, spacing means disposed between and connecting the drum and the shell, and means for collapsing the drum and the shell to remove the material wound on the shell.

34. A machine for winding shells of sheet material, which comprises an adhesive-applying roller, means extending across the face of the roller and held at a predetermined distance therefrom to regulate the thickness of the adhesive, and additional means located at either end of the roller and extending partly thereacross, said last-mentioned means contacting with the roller to remove adhesive therefrom whereby the width of the adhesive left on the roller is regulated to a predetermined extent.

35. A winding machine, comprising a winding drum, a pressure and adhesive-applying roller adapted to bear thereagainst, the horizontal axes of the roller and drum lying normally in parallel lines, a pivoting support for each end of the roller, and means connected to the pivoting support adapted separately and independently to hold the ends of the roller against the drum.

36. A winding machine which comprises a winding drum, a power-transmitting means therebetween, an adhesive and pressure regulating roller, power transmitting means between the roller and the power means, and means in the connections between the roller and the power means to regulate the slippage in the power-transmitting means to maintain the same linear speed of the faces of the roller and the drum when in pressure contact with each other.

37. A winding machine comprising a winding drum, an adhesive-applying means, an adhesive-regulating and pressure roller bearing against the drum with heavy pressure sufficient to form a strong, compact shell of laminated material, means for supporting the regulating and pressure roller for independent yieldable movement at either end, and means for obtaining and regulating different pressures along the surface of contact between the roller and the drum, whereby the true winding of the material may be controlled and eliminate the necessity for trimming the edges of the shell after it is wound.

38. A machine for winding laminated shells of sheet material, comprising a winding drum, a yieldable pressure roller bearing against the shell being wound, means for applying adhesive to the material being wound, and means for regulating the pressure along the surfaces of contact between the winding drum and the pressure roller to control the true winding of the shell being wound.

39. A machine for winding shells of sheet material, comprising a winding drum, a yieldable adhesive applying and pressure roller bearing against the shell being wound, and means for regulating the pressure along the surfaces of contact between the winding drum and the pressure roller to control the true winding of the shell being wound.

40. A machine for winding shells of sheet material, comprising a winding drum, a yieldable adhesive-applying pressure roller bearing against the shell being wound, and means for supporting said adhesive-applying pressure roller for independent yieldable movement at each end independently of the other end.

41. A machine for winding shells of sheet material, comprising a winding drum, a yieldable adhesive-applying and pressure roller to bear against the shell being wound, said adhesive-applying and pressure roller supported independently at each end and yieldable at each end independently of the other, and means for regulating the pressure of the roller at each end independently of the other end.

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