Feb. 12, 1952 P. J. CHRISTMAN 2,585,226

WINDING APPARATUS

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Fig. 1

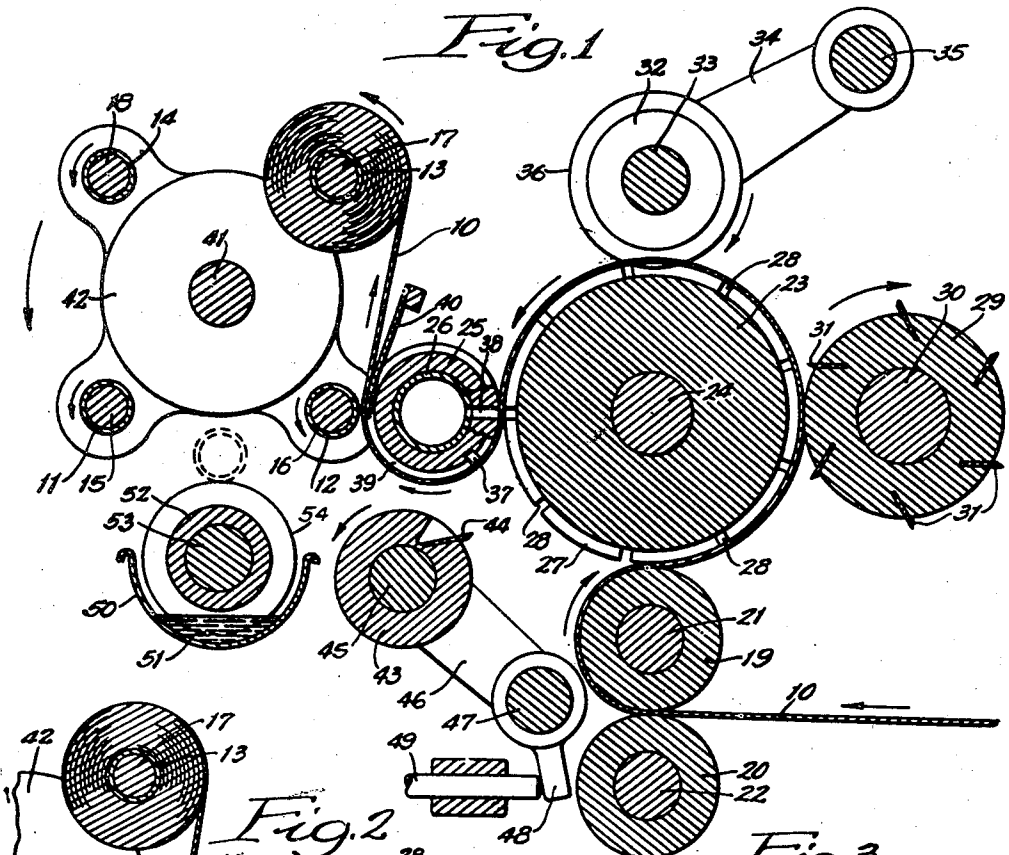


Fig. 2

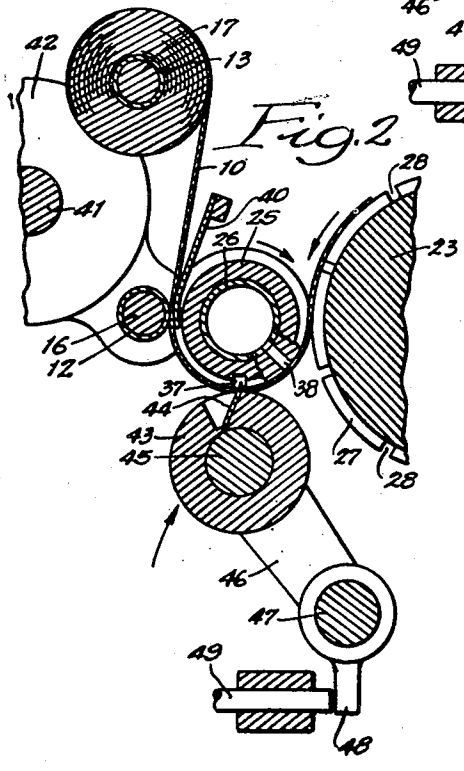
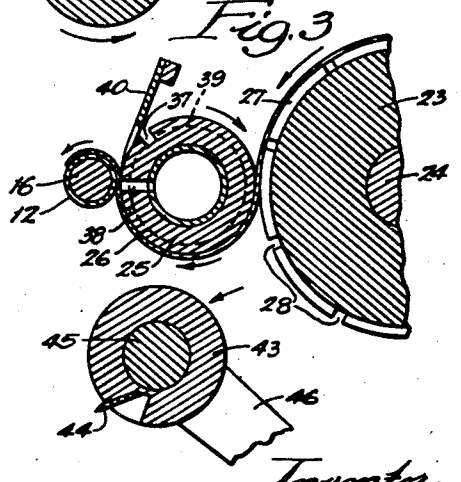


Fig. 3



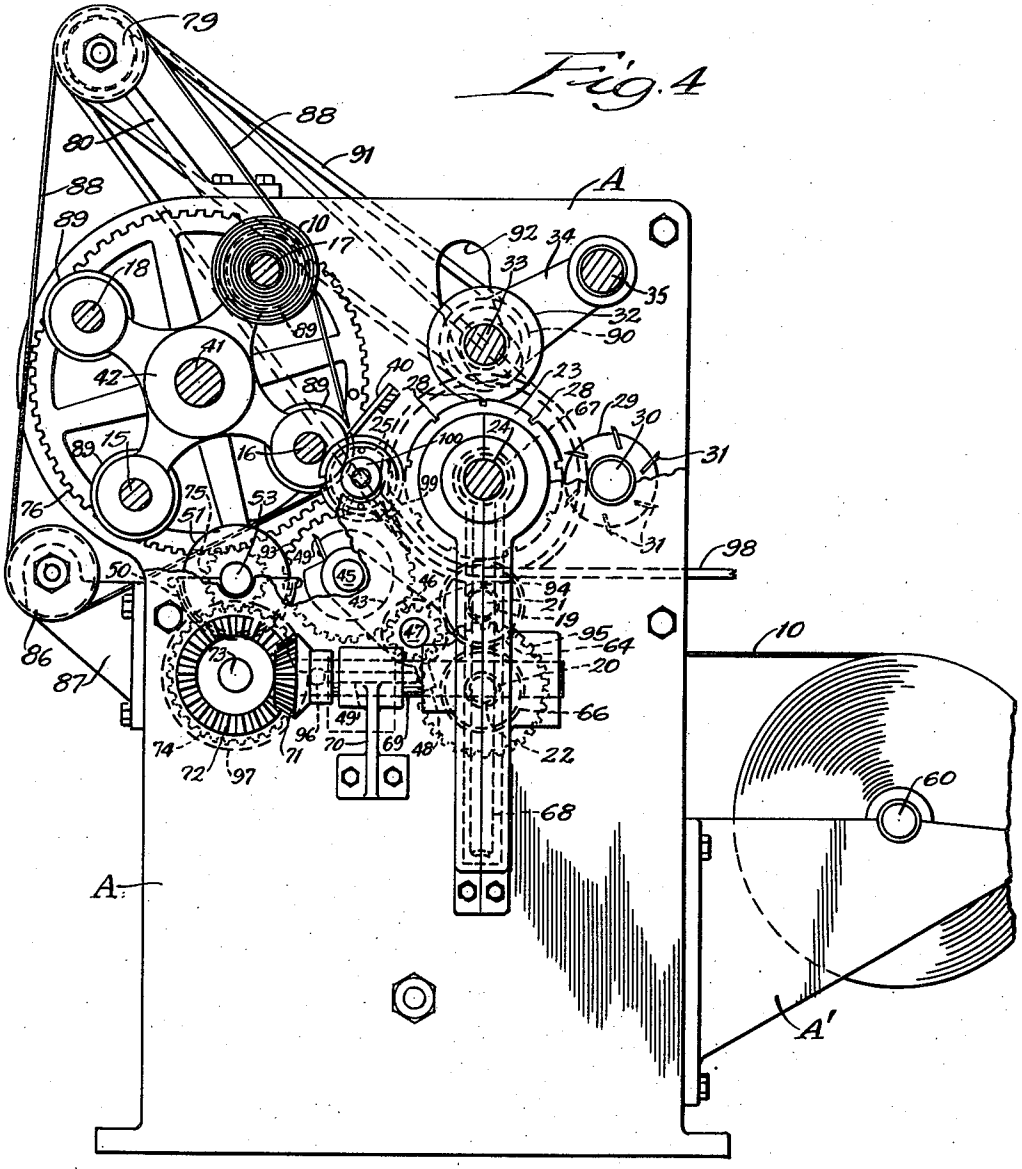
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WINDING APPARATUS

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Fig. 4



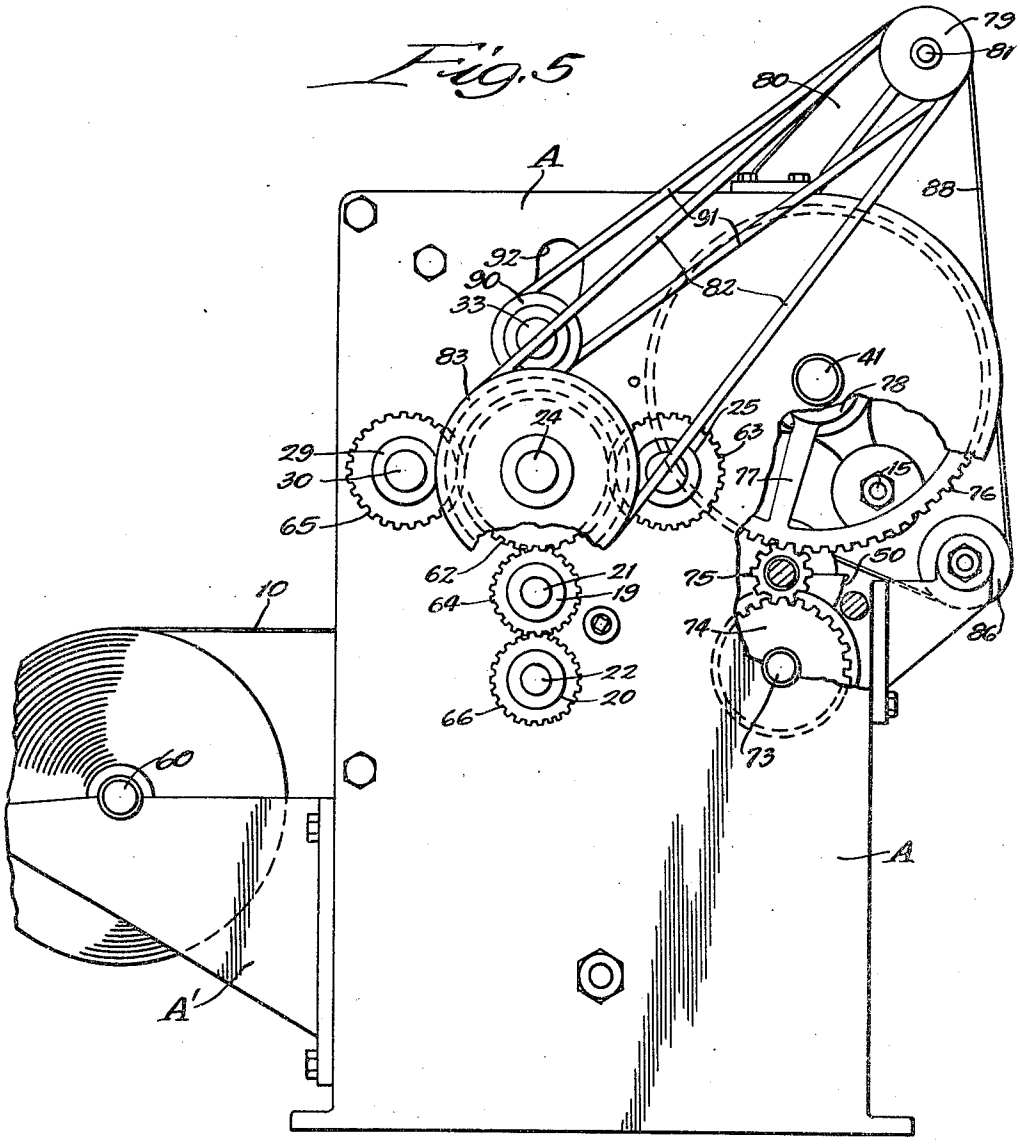
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WINDING APPARATUS

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Fig. 5



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WINDING APPARATUS

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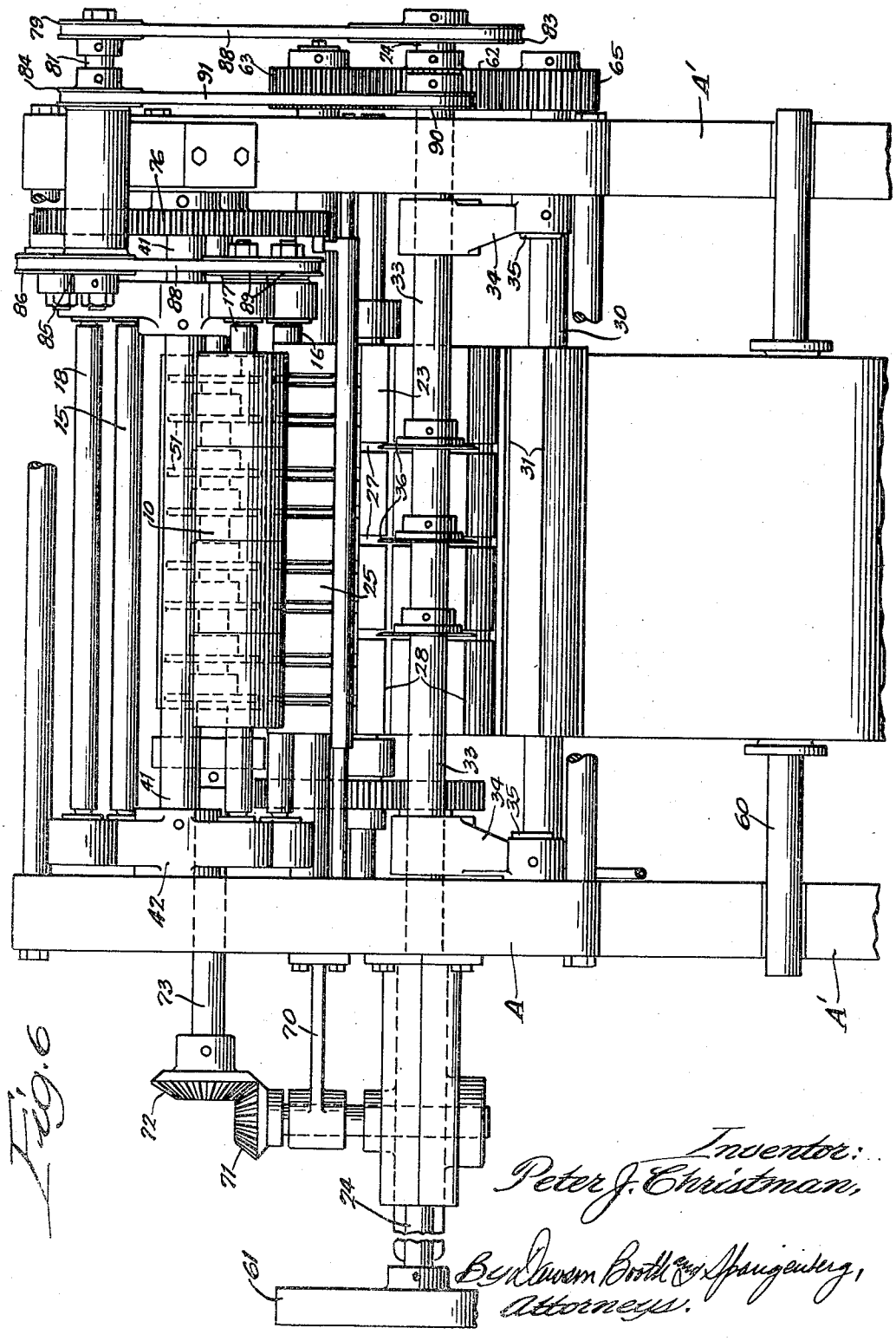


FIG. 6

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UNITED STATES PATENT OFFICE

2,585,226

WINDING APPARATUS

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Application March 21, 1946, Serial No. 655,920

6 Claims. (Cl. 242—56)

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This invention relates to a winding apparatus, and more particularly to a non-stop automatic transfer winding apparatus. The present application has been filed in place of my abandoned application Serial No. 468,332.

An object of the invention is to provide a machine for winding a web of paper on successive cores in a continuous and automatic operation. Another object is to provide in a continuous winding operation, mechanism for automatically severing a web of paper and transferring the leading end of the severed web to another core. Yet another object is to provide in a winding machine, means for automatically severing the web of paper at predetermined intervals.

Another object of the invention is to provide means for retaining the leading end of a severed web of paper on a feed roll until the leading end is delivered to another core and thereafter automatically releasing the leading end from the feed roll. A further object is to provide in a winding machine, mechanism for applying an adhesive to a paper core and thereafter applying the leading end of a severed web to the adhesive-coated core. Other features and advantages will appear from the following specification and drawings, in which:

Fig. 1 is a fragmentary transverse sectional view of the apparatus of the invention; Fig. 2 is a fragmentary detail transverse sectional view of the apparatus showing the severing of the web of paper; Fig. 3 is a fragmentary detail transverse sectional view showing the application of the leading end of the severed web of paper to a core; Fig. 4, an end view of the machine or apparatus employed with my invention; Fig. 5, a broken view similar to Fig. 4 but showing the opposite end of the machine; and Fig. 6, a broken plan view of the machine or apparatus.

In the embodiment of the invention described herein, and as shown best in Figs. 1, 2 and 3, a paper web 10 of any suitable type is wound on cores 11, 12, 13 and 14 on the mandrels 15, 16, 17 and 18 respectively. If desired, the paper web may also be slit longitudinally and perforated transversely in the winding operation.

The paper web 10 is passed between a pair of draw rolls 19 and 20 on shafts 21 and 22 respectively, the draw rolls being rotated by any suitable power means. The draw rolls 19 and 20 may be of any suitable or conventional construction and receive between them the web of paper.

From the draw rolls 19 and 20, the web of paper passes to a bed roll 23 on the shaft 24 and passes around the bed roll 23 in the direction

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indicated by the arrows in Fig. 1 of the drawing to the feed roll 25 on the tube or shaft 26. The bed roll 23 may be equipped with annular circumferential grooves, such as the groove 27, and with transverse slots or grooves 28 extending longitudinally of the roll.

Adjacent the bed roll 23 is a roll 29 on the shaft 30 carrying perforating knives 31. The rolls 23 and 29 are so arranged with respect to each other that the perforating knives 31 pass through the paper web on the roll 23 and into the longitudinal grooves 28 on the bed roll 23, thereby providing spaced perforations in the paper web.

A slitting roll 32 on the shaft 33 is also disposed adjacent the bed roll 23. The shaft 33 may be mounted on the arm 34 on the shaft 35 so that the roll 32 may be swung to and from a position of engagement with the web 10 on the bed roll 23. The slitting roll 32 is equipped with an annular slitting knife 36 which passes through the web 10 on the bed roll 23 and into the annular groove 27 of the bed roll 23.

Also adjacent the bed roll 23 is the feed roll 25 which receives the web from the bed roll 23. The feed roll 25 is provided with a recess 37 longitudinally disposed with respect to the roll and with a suction opening 38, by means of which suction may be applied to the periphery of the roll 25. The roll 25 may also be equipped with annular circumferential grooves, such as the groove 39, and with a stripper 40.

The shaft 41 carries a turret 42 which supports the shaft or mandrels 15, 16, 17 and 18 and the cores 11, 12, 13 and 14 carried thereon. The turret frame 42 is slowly rotated when the machine is in operation. Any suitable mechanism, such as a conventional gear drive, may be used for rotating the turret 42. When the turret 42 is rotated, the mandrels 15, 16, 17 and 18 and the cores carried thereby are successively brought into position adjacent the roll 25, this position being the web-winding position in which the web is transferred from the roll 25 to the adjacent core.

Any suitable conventional means may be used for rotating the mandrels 15, 16, 17 and 18.

A roll 43, carrying a projecting knife 44, is disposed opposite the feed roll 25. The roll 43 is mounted on a shaft 45 which is supported by an arm 46 rotatably mounted on a shaft 47. A dog 48, depending from the arm 46, may be engaged by a suitable cam 49 which causes rotation of the arm 46 about the shaft 47 and shifts the roll 43 from the position shown in Fig. 1 wherein the roll 43 is spaced away from the feed

roll 25 to the position shown in Fig. 2 where the roll 43 is in position immediately adjacent the feed roll 25. Any suitable mechanism may be used for actuating the arm 46 to shift the position of the roll 43 and the knife 44 carried thereby. The mechanism, which may be conventional, should be synchronized with the rotation of the turret 42 so that the roll 43 is shifted to the position shown in Fig. 2 when an empty core is moved to web-winding position.

The knife 44 on the roll 43, when brought to the position of Fig. 2, severs the web on the feed roll 25 and is received within the recess 37 in the roll 25.

The suction means, which communicates with the suction opening 38 in the roll 25, is also synchronized with the movement of the roll 43 so that when the web 10 on the roll 25 is severed by the knife 44, the suction means operates to secure the leading end of the severed web to the feed roll 25. Suitable means may also be provided for releasing the suction means when the leading end of the severed web reaches a position adjacent the empty core, as seen in Fig. 3. The position of the feed roll shown in Fig. 3 is the position at which the suction means may be released.

Beneath the turret 42 may be placed a container 50 containing a liquid adhesive 51. A roll 52 on the shaft 53 is equipped with annular projections 54 which dip into the liquid adhesive 51 and engage the empty core which is carried past the roll 52 by the turret. In this manner, a layer of adhesive is applied to portions of the empty core before it reaches web-winding position.

For the purpose of clarity, the invention has been described up to this point by reference to Figs. 1, 2 and 3. The complete mechanism for the operation of the parts already referred to is shown in Figs. 4, 5 and 6 and a description of the parts shown in these figures will now be given.

In the construction shown particularly in Figs. 4, 5 and 6 A designates a base or frame in which the various operating parts are mounted; and A' designates a bracket providing a journal for the shaft 60 on which the paper web 10 is carried in the form of a roll.

The main drive shaft 24 is mounted within the casing A for rotation and it is equipped with a drive wheel 61 which may be belt-driven or gear-driven, as desired. The shaft 24 extends through the casing and at opposite end of the casing from the drive wheel 61 is equipped with a gear 62 which meshes with a gear 63 on shaft 26, with gear 64 on shaft 21, and with gear 65 on shaft 30. Gear 64 meshes with gear 66 on shaft 22. By the means just described. the bed roll 23, the knife roll 29, the feed roll 25, and the draw rolls 19 and 20 are driven.

Means are also provided for rotating the turret 41 and the mandrels 15, 16, 17 and 18. In the illustration given, the shaft 24 is provided with a worm 67 meshing with a worm gear 68 mounted on the cross shaft 69. The cross shaft 69 is shown supported mainly by a bracket member 70 carried by casing A. A pinion gear 71 is carried by one end of the cross shaft 69 and meshes with bevel gear 72. The gear 72 is fixed upon shaft 73 mounted within casing A, and at its opposite end carries the gear 74. Gear 74 drives through the pinion 75, as shown more clearly in Fig. 5, the large gear 76 having spokes 77 connecting it with a hub 78 fixed to shaft 41. The turret shaft 41 is therefore directly driven through the gear connections described by the main shaft 24.

Means are provided also for driving the mandrels 15, 16, 17 and 18 independently of the turret shaft 41. A pulley 79 is mounted upon a bracket 80 supported by casing A, as shown more clearly in Fig. 5, and is fixed to shaft 81. The pulley 79 is driven by belt 82 which also engages the large pulley 83 carried by shaft 24. Shaft 81 carries fixed thereto spaced pulleys 84 and 85. Pulley 85 is connected to a pulley 86 supported therebelow on bracket 87, as shown best in Fig. 4, by means of the belt 88. The belt 88 also extends about the hubs or pulleys 89 carried by each of the mandrels 15, 16, 17 and 18. As indicated in Fig. 4, the pulleys 89 of the mandrels 16 and 17 are simultaneously engaged by the belt 88. As the turret shaft 41 rotates, it brings the pulleys or drums 89 of the succeeding mandrels into contact with the belt 88. By this means, the mandrels are driven at a much faster speed and independently of the slowly-rotating shaft 41.

In order to drive the slitting roller shaft 33, the shaft 33 is provided with a pulley 90 and a belt 91 connects the pulley 90 and the pulley 84 on shaft 81. It will be noted that shaft 33 is free to swing upon the pivoted arm 34 within the arcuate slot 92 provided within the frame wall A. The knife roll 43 carried by shaft 45 is provided with gear 93, as shown best in Fig. 4. Gear 93 meshes with the pinion gear 94 which, in turn, meshes with the gear 95 carried by shaft 22. Shaft 45, which is pivotally mounted on the arm 46, may thus swing about the pivot 47 and simultaneously be operated through the intermediate connecting gear 95. The arm 47 is provided with a counterbalance weight or dog 48 adapted to be engaged at timed intervals by the cam member 49 which is equipped with a roller end 96. The weighted dog 48 more than counterbalances the weight of the knife roll and the light gears 93 and 94 and tends normally to swing the knife roll 43 to the upper position shown in Fig. 2. A cam 97 carried by the shaft 73 has a raised portion adapted to engage the end of the cam shaft 49 so as to swing the dog outwardly and thus tilt the knife roll downwardly, as illustrated in Fig. 1. When the raised portion on cam 97 is retracted, the weights of the member 48 causes the arm 46 and roll 43 to swing upwardly to the position shown in Fig. 2.

Any suitable means may be provided for supplying suction to the passage 38 in the roll 25. In the illustration given, a suction line 98, from any suitable source of suction. leads to a casing 99, as shown best in Fig. 4. The small passage or chamber within 99 communicates with a slot extending through the pipe 26 and roll 25 so that there is open communication between the pipe 98, the passage within casing 99, and the slot through the members 25 and 26 during the portion of the movement of the roll 25 in which the passage 38 is in engagement with the paper web 10. The pipe or cylinder 26 is closed at each end with a cap 100, as illustrated best in Fig. 4.

In operation, the rotation of the draw rolls 19 and 20 moves the web 10 between these rolls, from whence it passes to the bed roll 23. The rotation of the rolls 29 and 32 in conjunction with the bed roll 23 forms spaced transverse perforations and longitudinal slits in the paper. The slitted perforated paper passes from the bed roll 23 to the feed roll 25 and thence, as seen in Fig. 1, to the paper core 13 on the mandrel 17.

The turret 42 may rotate slowly and continuously in the direction indicated by the arrows in Fig. 1 and as the winding of the web 10 on the core 13 is completed, the core 13 on the mandrel

17 will be shifted to the position shown in Fig. 1, and the core 12 on the mandrel 16 will be shifted to web-winding position as seen in Fig. 1. At this point, the cam 49 is actuated to shift the roll 43 toward the roll 25 so that the knife 44 engages the web 10 and severs the web on the roll 25. The suction applied through the opening 38 secures the leading end of the severed web to the roll 25 until the leading end of the web engages the empty core 12. At this point, as seen in Fig. 3, the suction is released and the web is wound on the core 12 until the core 12 on the mandrel 16 is gradually filled with the paper and is shifted from web-winding position. At this point, the empty core 11 on the mandrel 15 will have been shifted to web-winding position, and the same operation of severing the web and applying it to the empty core will occur.

The adhesive, which is applied to the empty core as it passes the roll 52, serves to secure the leading end of the web to the core when the end is brought into engagement therewith. The annular projections 54 on the roll 52 are engaged in alignment with the annular recesses 39 in the feed roll 25 so that no adhesive from the core will engage the feed roll 25.

As seen particularly in Figs. 2 and 3, the knife 44 is received within the recess 37 of the feed roll 25 and then moves out of the recess as the roll 43 continues to rotate and is shifted away from the feed roll 25. As illustrated in Fig. 3, the roll 43 is shifted back to its original position after the web is severed.

With this device, the web 10 is fed continuously into the machine and is automatically transferred from one core to another in the winding operation. The entire operation is automatic and the winding is continuous.

Although the invention has been described in connection with a particular embodiment, it will be apparent that many modifications and changes may be made without departing from the spirit and scope of the invention.

I claim:

1. Winding apparatus comprising a frame, a plurality of spaced mandrels movably supported thereby, a hollow tubular paper core on each of said mandrels, said mandrels being rotatable, means for moving a first mandrel beyond web-winding position and simultaneously moving a second mandrel into web-winding position, a feed roll for delivering the web to the mandrel in web-winding position, said feed roll having a longitudinal groove in the surface thereof substantially parallel to the axis of the roll, a roll carrying a projecting knife disposed in adjacent relation to said feed roll, said knife being adapted to sever said web and pass into the recess in said feed roll at predetermined intervals, means for applying adhesive to portions of the paper core on the mandrel which is moving into web-winding position, said feed roll having recesses in alignment with said adhesive-applying means whereby the feed roll does not engage the portions of the core to which adhesive is applied, and means for retaining the leading end of the severed web on the feed roll until the feed roll is delivered to the core on the mandrel in web-winding position.

2. Winding apparatus comprising a frame, a plurality of spaced mandrels movably supported thereby, a hollow tubular paper core on each of said mandrels, said mandrels being rotatable, means for moving a first mandrel beyond web-winding position and simultaneously moving a second mandrel into web-winding position, a feed roll for delivering the web to the mandrel in web-winding position, means for severing said web at predetermined intervals, means for applying adhesive to portions of the paper core on the mandrel which is moving into web-winding position, said feed roll having recesses in alignment with said adhesive-applying means whereby the feed roll does not engage the portions of the core to which adhesive is applied, and means for retaining the leading end of the severed web on the feed roll until the leading end of the severed web is delivered to the core on the mandrel in web-winding position.

3. Winding apparatus comprising a frame, a plurality of spaced mandrels movably supported thereby, a tubular paper core on each of said mandrels, said mandrels being rotatable, means for moving a first mandrel beyond web-winding position and simultaneously moving a second mandrel into web-winding position, a feed roll for delivering the web to the mandrel in web-winding position, means for severing the web at predetermined intervals, a roller equipped with annular projections provided with liquid adhesive adapted to engage portions of the paper core on the mandrel which is moving into web-winding position to form lines of adhesive thereon, said feed roll having recesses in alignment with said adhesive-applying means whereby the feed roll does not engage the portions of the core to which adhesive is applied, and means for retaining the leading end of the severed core on the feed roll until the severed end is delivered to the core on the mandrel in self-winding position.

4. A winding apparatus comprising a frame adapted movably to support a plurality of spaced mandrels each adapted to receive a hollow tubular paper core, means for moving a first mandrel beyond web-winding position and simultaneously moving a second mandrel into web-winding position, a feed roll for delivering the web to the mandrel in web-winding position, said feed roll having a longitudinal groove in the surface thereof substantially parallel to the axis of the roll, a roll carrying a projecting knife disposed in adjacent relation to said feed roll, said knife being adapted to sever said web and pass into the recess in said feed roll at predetermined intervals, means for applying adhesive to portions of the paper core on the mandrel which is moving into web-winding position, said feed roll having recesses in alignment with said adhesive-applying means whereby the feed roll does not engage the portions of the core to which adhesive is applied, and means for retaining the leading end of the severed web on the feed roll until the feed roll is delivered to the core on the mandrel in web-winding position.

5. A winding apparatus comprising a frame adapted movably to carry a plurality of spaced mandrels each adapted to receive a hollow tubular paper core, said mandrels being rotatable, means for moving a first mandrel beyond web-winding position and simultaneously moving a second mandrel into web-winding position, a feed roll for delivering the web to the mandrel in web-winding position, means for severing said web at predetermined intervals, means for applying adhesive to portions of the paper core on the mandrel which is moving into web-winding position, said feed roll having recesses in alignment with said adhesive-applying means whereby the feed roll does not engage the portions of the core to

which adhesive is applied, and means for retaining the leading end of the severed web on the feed roll until the leading end of the severed web is delivered to the core on the mandrel in web-winding position.

6. A winding apparatus comprising a frame adapted movably to carry a plurality of spaced mandrels each adapted to receive a hollow tubular paper core, said mandrels being rotatable, means for moving a first mandrel beyond web-winding position and simultaneously moving a second mandrel into web-winding position, a feed roll for delivering the web to the mandrel in web-winding position, means for severing the web at predetermined intervals, a roller equipped with annular projections provided with liquid adhesive adapted to engage portions of the paper core on the mandrel which is moving into web-winding position to form lines of adhesive thereon, said feed roll having recesses in alignment

with said adhesive-applying means whereby the feed roll does not engage the portions of the core to which adhesive is applied, and means for retaining the leading end of the severed core on the feed roll until the severed end is delivered to the core on the mandrel in self-winding position.

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