Dec. 1, 1959 R. W. PHELPS 2,915,255

PAPER MACHINERY

Filed May 19, 1955

FIG-1

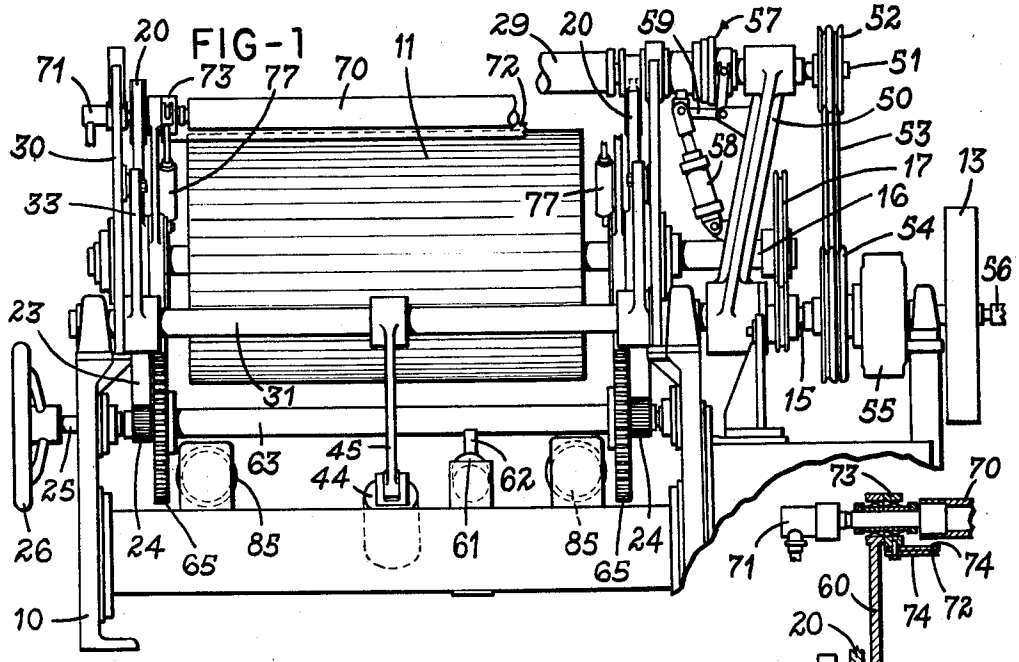


FIG-2

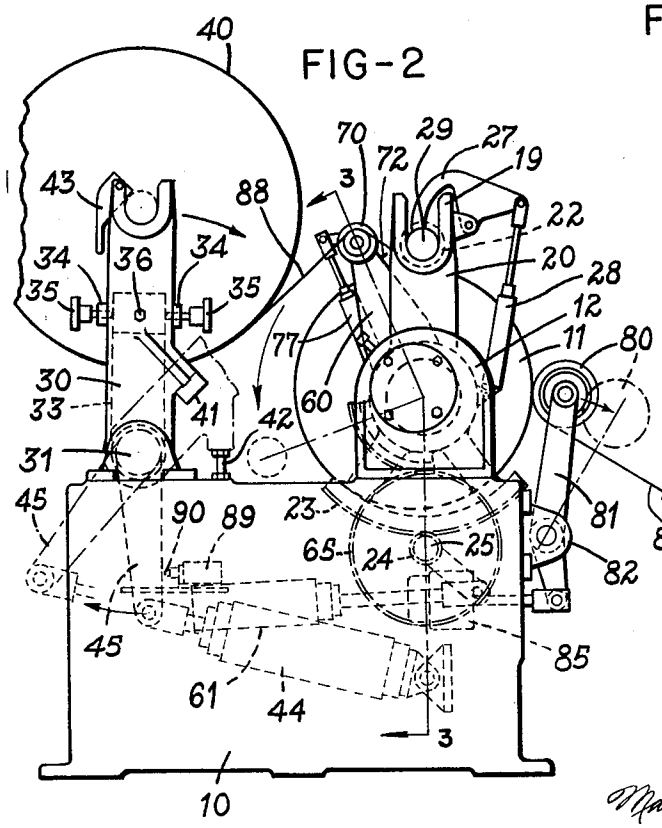


FIG-3

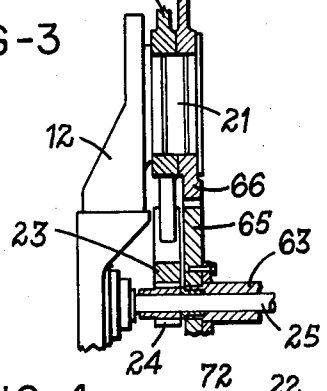
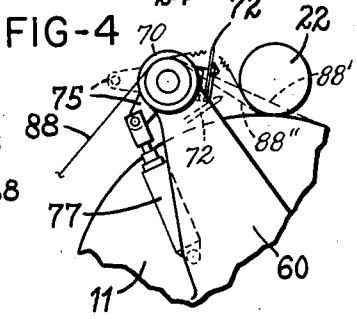


FIG-4



INVENTOR.

RICHARD W. PHELPS

BY

Marshall, Bubel, French & Bugg

ATTORNEYS

United States Patent Office 2,915,255 Patented Dec. 1, 1959

2,915,255

PAPER MACHINERY

Richard W. Phelps, Fulton, N.Y., assignor to The Black-Clawson Company, Hamilton, Ohio, a corporation of Ohio

Application May 19, 1955, Serial No. 509,575

8 Claims. (Cl. 242—56)

This invention relates to continuous winding apparatus for web materials, and more particularly to such apparatus capable of winding plastic web materials as well as paper and the like.

The invention is directed particularly to continuous winding apparatus of the surface driven type wherein each successive new roll is started against a driving drum while carried by primary supports and is then transferred to secondary supports to complete winding of the roll while remaining in driven surface engagement with the drum. The major concern of the invention is the control of the transfer of the web from a complete roll to a new core to provide a smooth and even start on the new core without reduction in speed or loss of tension in the web.

It is a primary object of the present invention to provide apparatus of the drum driven type for continuously winding web materials wherein the mechanism for transferring the advancing web from a full roll to a new core includes a guide member such as a guide roll mounted for movement from a retracted position to an advanced guiding position located between the new core and the full roll and in spaced relation with the core such as to cause partial enveloping of the new core by the web, and wherein the actual transfer of the web is effected by a severing member operable in the space between the core and the guide member in such manner as to sever the unsupported web in this space and to cause the resulting leading end of the web to start winding on the core.

An additional object of the invention is to provide continuous winding apparatus of the drum driven type as outlined above for web materials wherein a knife member for severing the web is carried by the movable guide member for preliminary movement with the guide member between its retracted and advanced positions and is then movable with respect to the guide member through the space between the guide member and the new core to carry out its severing and web directing steps.

Another object of the invention is to provide a continuous drum driven winder for web materials in which the web transferring mechanism is brought to its advanced position before actuation of the knife in order to enable the operator to check conditions before the web is cut, and also in which the stroke of the knife is both quick and short to minimize shock and to complete the web transfer with minimum possibility of developing fold-back or other uneven conditions at the start of the roll.

It is also an object of the invention to provide a winder generally as outlined above wherein the actual severing of the web is caused by the movement of the new core into engagement with the drum and the resulting deflection of the web into engagement with the knife.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing—

Fig. 1 is a rear elevational view of a continuous winder constructed in accordance with the invention and with some of the parts broken away for increased clarity;

Fig. 2 is a side elevation looking from right to left in Fig. 1 with the drive removed;

Fig. 3 is an enlarged fragmentary section on the line 3—3 of Fig. 2; and

Fig. 4 is an enlarged fragment of Fig. 2 illustrating the positions of certain of the parts at the precise instant of severing the web for the start of a new roll.

Referring to the drawing, which illustrates a preferred embodiment of the invention, the continuous winder shown in Figs. 1 and 2 is generally of the Pope type and includes a base frame **10** on which a continuously rotating driving drum **11** is mounted by means of bearings in brackets **12**. The drive for the drum is indicated at **13** and is transmitted to a drive shaft **15** mounted at the back of the frame, and the drum shaft **16** is in turn connected with drive shaft **15** by means of the chain drive indicated generally at **17**.

The primary arms **20** include yoke portions **19** at their outer ends for supporting each successive new core **22** and are mounted on boss portions **21** of the brackets **12** for swinging movement eccentrically of the drum axis. This movement is effected and controlled by segments **23** at the lower ends of the primary arms which mesh with pinions **24** on a shaft **25** extending across the front of the frame and carrying a hand wheel **26** at the control side of the winder. Each primary arm **20** also carries a pivotally mounted finger **27** operated by a small air cylinder **28** for holding the core shaft **29** for each new core in the yoke portions **19** to aid in obtaining initial pressure engagement of the core against the drum.

A pair of secondary arms **30** receive the new core from the primary arms after the web is winding thereon and support the roll during completion of its winding. These secondary arms are supported by a rock shaft **31** which is mounted at the back of the frame **10** coaxially with the drive shaft **15**. The connection between each secondary arm **30** and the rock shaft **31** is adjustable and comprises a crank arm **33** pinned or keyed to the rock shaft and extending between a pair of inwardly turned ears **34** on the adjacent arm **30**. Adjusting bolts **35** are threaded through the ears **34** and engage the side edges of the associated arm **30** to adjust the angular relation between each arm **30** and its associated crank arm **33** in order to assure proper alignment of the arms and an accurately parallel relation between the surface of drum **11** and each winding roll carried by the arms **30**. Through bolts **36** may be employed to secure each arm **30** and its associated crank arm in adjusted position, one or both of these members being slotted to receive bolt **36** while providing for the relative adjusting movement thereof.

The secondary arms **30** are movable between the inclined position shown in broken lines in Fig. 2 and the erect position shown in full line in Fig. 2 in which they support the full roll **40** out of engagement with drum **11**. In their inclined position, bosses **41** on arms **30** rest on adjustable bolts **42** in the top of frame **10**, and latches **43** on the yoke portion of the upper end of each arm provide for direct entry of a core **22** but require manual release for removal of the core shaft. Movement of arms **30** to their erect position is effected and controlled by a fluid pressure cylinder **44** mounted in base **10** and having its piston rod connected to an arm **45** depending from rock shaft **31**.

A supplemental drive is provided for rotating a full roll supported in the erect position of the secondary arms **30** to control the tension in the web when the full roll is retracted out of contact with the drum before the web is severed and started on the new core. A supplemental arm **50** on rock shaft **31** supports a shaft **51** and pulley **52** connected by belts **53** with a drive pulley **54** which is carried by one member of an air clutch **55** on shaft **15** and is caused to rotate when clutch **55** is engaged, the

air connection for clutch 55 being indicated at 56. The pulley shaft 51 is in turn connected with each core shaft 29 in arms 30 by a jaw clutch 57 operated by an air cylinder 58 carried by arm 50 and operating through a bell crank 59. Since this drive is centered on the same axis as the arms 30, it is unaffected by swinging movement of the secondary arms.

The web severing and transferring mechanism provided in accordance with the present invention includes a pair of arms 60 mounted on the boss portions 21 of brackets 12 for swinging movement coaxially with the primary arms 20. Movement of arms 60 is effected and controlled by a double-acting pressure cylinder 61 mounted in the base and having its piston rod connected to a crank arm 62 secured to a sleeve 63 rotatable on shaft 25. At each end of sleeve 63 is a gear 65 meshing with a segment 66 carried by arms 60.

The arms 60 carry a guide roll 70 at their outer ends, and this guide roll may conveniently be formed of hollow construction and provided at its ends with rotary unions 71 for connection to a source of cooling fluid, as may be desired when the winder is employed by handling plastic film. A knife blade 72 is carried by collars 73 rotatably mounted at the ends of rolls 70, and since this knife may advantageously be electrically heated when the winder is used for plastic film, it is shown as mounted between insulating plates 74. Each of the collars 73 includes a projecting arm 75 by which it is connected to an air cylinder 77 having its opposite ends secured to the adjacent arm 60. Thus when pressure is applied in the outer end of cylinder 77 to retract its piston rod, the knife 72 will move in counterclockwise direction around the axis of roll 70 as viewed in Fig. 4.

A pressure roll 80 is provided for controlled movement into and out of engagement with the web against the drum 11 to aid in controlling the tension in the web. This pressure roll 80 is carried by a pair of lever arms 81 pivoted in brackets 82 at the front side of the frame 10, and the lower ends of arms 81 are connected to the piston rods of a pair of air cylinders 85 mounted in the frame 10. These cylinders provide for movement of the roll 80 between the normal pressure position shown in full lines in Fig. 2 and the retracted position shown in dotted lines in Fig. 2 which the roll occupies during threading of a new web to the winder.

In the operation of this winder, the roll 40 is carried by the secondary arms 30 during the major portion of its winding, with the arms 30 being inclined toward the drum so that the roll rests against the drum for driving thereby, and the position of the arms 30 therefore gradually approaches the vertical as the diameter of the roll increases. If desired, the clutches 55 and 57 may be engaged to provide a helper drive to the mandrel of the winding roll. During this stage of the winding operation, the primary arms 20 are moved sufficiently in clockwise direction from the position shown in Fig. 2 to hold the new core 22 out of engagement with the web, and if desired, adhesive may be applied to this new core in preparation for the web change.

The controls for the several air cylinders in the winder may be of conventional design and arrangement, and they are therefore not shown. It is desirable, however, to operate the cylinder 61 for arms 60 in timed relation with the movements of the secondary arms 30, and a control valve 89 for cylinder 61 is mounted in the base in position for operation of its control plunger 90 by arm 45 in the vertical position of arms 30. In the normal position of valve 89, when its plunger 90 is not depressed by arm 45, arms 60 will occupy the position indicated in dotted lines in Fig. 2 to hold the guide roll 70 in its retracted position.

When winding of the full roll 40 is almost completed and the change to the new core is to be made, the first step is to operate cylinders 44 to shift the secondary arms 30 to their vertical position shown in Fig. 2 and thus to retract the roll 40 out of engagement with the drum. If clutches 55 and 57 were not already in engagement, they should be engaged prior to retraction of arms 30 in order to drive roll 40 through its core shaft 29 for properly maintained web tension. As soon as arms 30 reach their limit vertical position, arm 45 will operate valve 89 to cause cylinder 61 to bring arms 60 to their advanced full line position in Fig. 2, thus completing preparation for the roll change. It will be apparent that with arms 60 in their advanced position and primary arms 20 still retracted, the web path is clear of the new core and also of the retracted knife 72 because of the position of the guide roll 70 as indicated by the dotted line 88' in Fig. 4.

The primary arms 20 are then brought to their full line positions shown in Fig. 2, which will cause the new core to be brought into engagement with the web 88 against the drum and driven for acceleration to web speed, and at the same time the guide roll 70 will direct the web away from the drum in the space between the new core and the full roll and thus cause partial enveloping of the new core by the web, as indicated by the line 88'' in Fig. 4. Then the operator actuates the knife by operating the cylinders 77, and the knife swings in counterclockwise direction as viewed in Figs. 2 and 4 through the space between the guide roll and the new core, thus severing the web 88 and directing its severed leading end generally around the new core, as indicated in Fig. 4, to start the web winding thereon.

After the roll change has thus been completed, the full roll is removed from the secondary arms 30, and they are returned to their lowered position indicated in broken lines in Fig. 2. As soon as arms 30 move from their raised position, valve 89 will be released to cause cylinder 61 to shift arms 60 to their lowered position, and during this interval, the new roll is winding in the primary arms. As soon as its diameter has increased sufficiently, it will ride out of the yokes at the upper ends of the primary arms and roll into the similar yokes in the secondary arms. The winding will then continue in the secondary arms, while the primary arms are again retracted to receive the next new core.

If desired, the sequence of operation can be varied by operating the cylinders 77 before the primary arms are shifted to the roll starting position. In this event, the roll change will be effected automatically as soon as the primary arms move toward the drum, since the operation of bringing the new core against the web and the drum will alter the web path between the core and the guide roll 70 sufficiently to draw the web across the edge of the knife for severing. This mode of operation is especially advantageous with materials requiring a pressure sensitive adhesive on the new core, since it assures a quick and even start of the new roll as soon as the adhesive coated core surface comes firmly into contact with the web and the drum. It is of course necessary for this procedure that the stroke of knife 72 stop in a location between the positions 88' and 88'' of the web shown in Fig. 4 in order to prevent premature cutting of the web, and if it is desired to utilize this procedure consistently, the cylinders 77 can be eliminated, and the knife 72 firmly secured to the arms 60 in such relative locations.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary supporting means on said frame for receiving and supporting a new core during starting of the winding of the web thereon,

secondary supporting means on said frame for receiving successive new cores from said primary supporting means after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said secondary supporting means to retract said full roll out of engagement with said drum while maintaining winding of the web thereon to provide an unsupported length of the web extending from said drum to said roll, a guide member mounted on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position engaging said unsupported length of the web, means cooperating with said primary supporting means to bring a new core therein into driven contact with said drum through said unsupported portion of the web between said guide member and said drum to accelerate said new core to web speed while causing partial enveloping of said new core by the web, knife means carried by said guide member for movement therewith, means supporting said knife means on said guide member for movement relative thereto between said guide member and said drum and between said guide member and said new core, and means for effecting said movement of said knife means relative to said guide member following said movement of said guide member to said advanced position and said engagement of said new core with the web to cause said knife means to sever said web between said guide member and said new core and thereby to cause the resulting severed leading end of the web to start winding on said rotating new core.

2. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary supporting means on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary supporting means on said frame for receiving successive new cores from said primary supporting means after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said primary supporting means to bring a new core therein into driven contact with said drum through the web traveling to said full roll in said secondary supporting means to accelerate said new core to web speed, means cooperating with said secondary supporting means to retract said full roll out of engagement with said drum, supplemental drive means for rotating said retracted roll through the core thereof to maintain the tension in the web, a guide member mounted on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position spaced from said new core wherein said guide member engages the opposite side of the web from said new core and causes partial enveloping of said new core by the web in advance of severing of the web, knife means carried by said guide member and movable relative thereto for severing the portion of the web in the space between said guide member and said new core to cause the resulting severed leading end of the web to start winding on said rotating new core and means for effecting operation of said knife means relative to said guide member following said movement of said guide member to said advanced position.

3. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary arms on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary arms on said frame for receiving successive new cores from said primary arms after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said secondary arms to retract said full roll out of engagement with said drum while maintaining winding of the web thereon to provide an unsupported length of the web extending from said drum to said roll, a guide member mounted on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position engaging said unsupported length of the web, means cooperating with said primary arms to bring a new core therein into driven contact with said drum through said unsupported portion of the web between said guide member and said drum to accelerate said new core to web speed while causing partial enveloping of said new core by the web, knife means carried by said guide member for movement therewith, means supporting said knife means on said guide member for movement relative thereto between said guide member and said drum and between said guide member and said new core, and means for effecting said movement of said knife means relative to said guide member following said movement of said guide member to said advanced position and said engagement of said new core with the web to cause said knife means to sever said web between said guide member and said new core and thereby to cause the resulting severed leading end of the web to start winding on said rotating new core.

4. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary supporting means on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary supporting means on said frame for receiving successive new cores from said primary supporting means after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said secondary supporting means to retract said full roll out of engagement with said drum while maintaining winding of the web thereon to provide an unsupported length of the web extending from said drum to said roll, a guide member comprising a guide roll mounted on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position engaging said unsupported length of the web, means cooperating with said primary supporting means to bring a new core therein into driven contact with said drum through said unsupported portion of the web between said guide roll and said drum to accelerate said new core to web speed while causing partial enveloping of said new core by the web, a knife carried by said guide roll for movement therewith, means supporting said knife means on said guide member for movement relative thereto between said guide roll and said drum and between said guide member and said new core, and means for effecting said movement of said knife relative to said guide roll following said movement of said guide roll to said advanced position and said engagement of said new core with the web to cause said knife to sever said web between said guide roll and said new core and thereby to cause the resulting severed leading end of the web to start winding on said rotating new core.

5. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary arms on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary arms on said frame for receiving successive new cores from said primary arms after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said secondary arms to retract said full roll out of engagement with said drum while maintaining winding of the web thereon to provide an unsupported length of the web extending from said drum to said roll, a guide member comprising a guide roll mount-

ed on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position engaging said unsupported length of the web, means cooperating with said primary arms to bring a new core therein into driven contact with said drum through said unsupported portion of the web between said guide roll and said drum to accelerate said new core to web speed while causing partial enveloping of said new core by the web, a knife carried by said guide roll for movement therewith, means supporting said knife means on said guide member for movement relative thereto between said guide roll and said drum and between said guide member and said new core, and means for effecting said movement of said knife relative to said guide roll following said movement of said guide roll to said advanced position and said engagement of said new core with the web to cause said knife to sever said web between said guide roll and said new core and thereby to cause the resulting severed leading end of the web to start winding on said rotating new core.

6. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary arms on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary arms on said frame for receiving successive new cores from said primary arms after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means for shifting said secondary arms to retract said full roll out of engagement with said drum, a guide roll mounted on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position spaced above the upper surface of said drum to deflect upwardly the portion of the web traveling from said drum to said full roll, severing means movable with said guide roll to an advanced position spaced between said guide roll and a new core in said primary arms and adjacent the path of travel of the web from said drum to said advanced position of said guide roll, and means cooperating with said primary arms to bring said new core therein into driven contact with said drum through said portion of the web between said drum and said guide roll and thereby to deflect said portion of the web downwardly into severing engagement with said severing means and at the same time to accelerate said new core to web speed and thereby to cause the resulting severed leading end of the web to start winding thereon.

7. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary arms on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary arms on said frame for receiving successive new cores from said primary arms after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said primary arms to bring each new core therein into driven contact with said drum through the web traveling to said full roll in said secondary arms to accelerate said new core to web speed, means for shifting said secondary arms to retract said full roll out of

engagement with said drum, supplemental drive means for rotating said retracted roll through the core thereof to maintain the tension in the web, a guide roll mounted on said frame for movement between said drum and said retracted full roll from a retracted position out of contact with the web to an advanced position spaced from said new core wherein said guide roll engages the opposite side of the web from said new core and causes partial enveloping of said new core by the web in advance of severing of the web, a knife carried by said guide roll for movement with respect thereto in the space between said guide roll and said new core in said advanced position of said guide roll, and means for causing said movement of said knife after said movement and enveloping action of said guide roll and generally in the direction of rotation of said new core to sever the portion of the web in said space and to cause the resulting severed leading end of the web to start winding on said rotating new core.

8. A continuous winder for web material comprising a base frame, a single driving drum on said frame to receive said web material thereon, primary arms on said frame for receiving and supporting a new core during starting of the winding of the web thereon, secondary arms on said frame for receiving successive new cores from said primary arms after the web is winding thereon and for supporting each successive new core during completion of the winding of a full roll thereon, means cooperating with said primary arms to bring each new core therein into driven contact with said drum through the web traveling to said full roll in said secondary arms to accelerate said new core to web speed, means for shifting said secondary arms to retract said full roll out of engagement with said drum, supplemental drive means for rotating said retracted roll to maintain the tension in the web, a third pair of arms pivotally mounted on said frame and carrying a guide roll for swinging movement around said drum and between said drum and said retracted full roll, means for swinging said arms to carry said guide roll from a retracted position below the web to an advanced position spaced between said new core and said retracted full roll and in engagement with the opposite side of the web from said new core to cause partial enveloping of said new core by the web, a knife carried by said third arms for pivotal movement with respect thereto in the space between said guide roll and said new core, and means for causing upward pivotal movement of said knife in said space in said advanced position of said guide roll to sever the portion of the web between said new core and said guide roll and to cause the resulting severed leading end of the web to start winding on said rotating new core.

References Cited in the file of this patent

UNITED STATES PATENTS

610,329	Meisel	Sept. 6, 1898
2,095,123	Carkhuff	Oct. 5, 1937
2,619,298	Aulen	Nov. 25, 1952

FOREIGN PATENTS

136,399	Great Britain	Dec. 18, 1919