Jan. 29, 1963 V. HORNSTEIN ETAL 3,075,719

METHOD OF AND APPARATUS FOR THE LONGITUDINAL CUTTING AND SUBSEQUENT WINDING OF A PAPER WEB

Filed Dec. 15, 1958 3 Sheets-Sheet 1

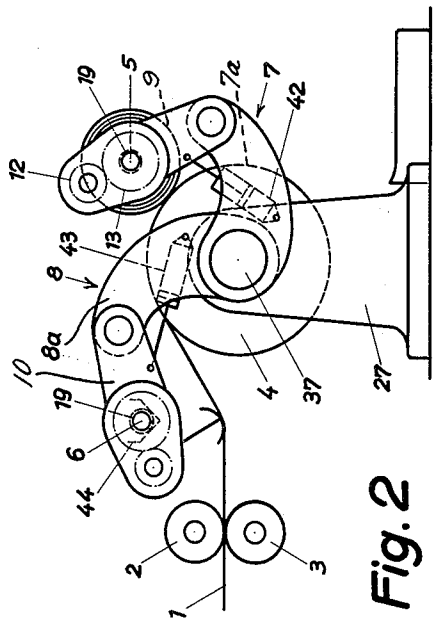


Fig. 2

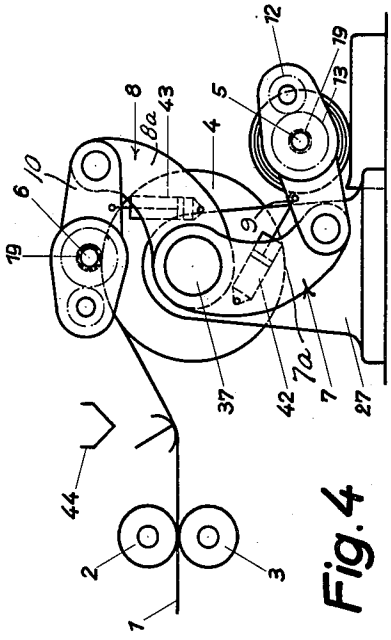


Fig. 4

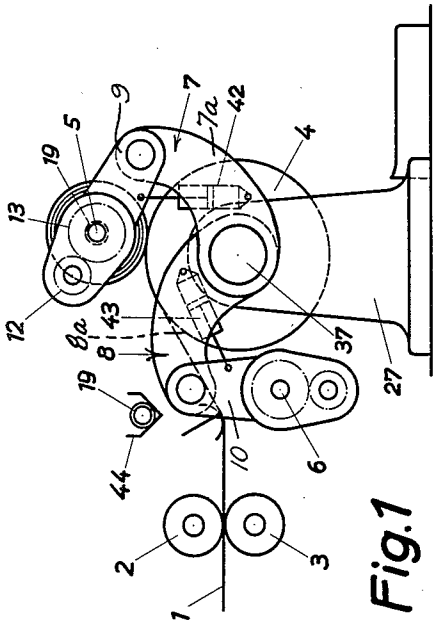


Fig. 1

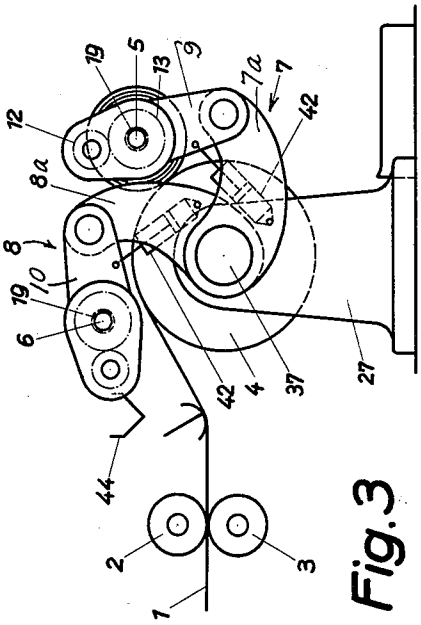


Fig. 3

Inventors
V. Hornstein
M. Schneider
B. Lenz
By Glascock Downing & Seibold Attys

Jan. 29, 1963 V. HORNSTEIN ETAL 3,075,719

METHOD OF AND APPARATUS FOR THE LONGITUDINAL CUTTING AND SUBSEQUENT WINDING OF A PAPER WEB

Filed Dec. 15, 1958 3 Sheets-Sheet 2

Fig. 5

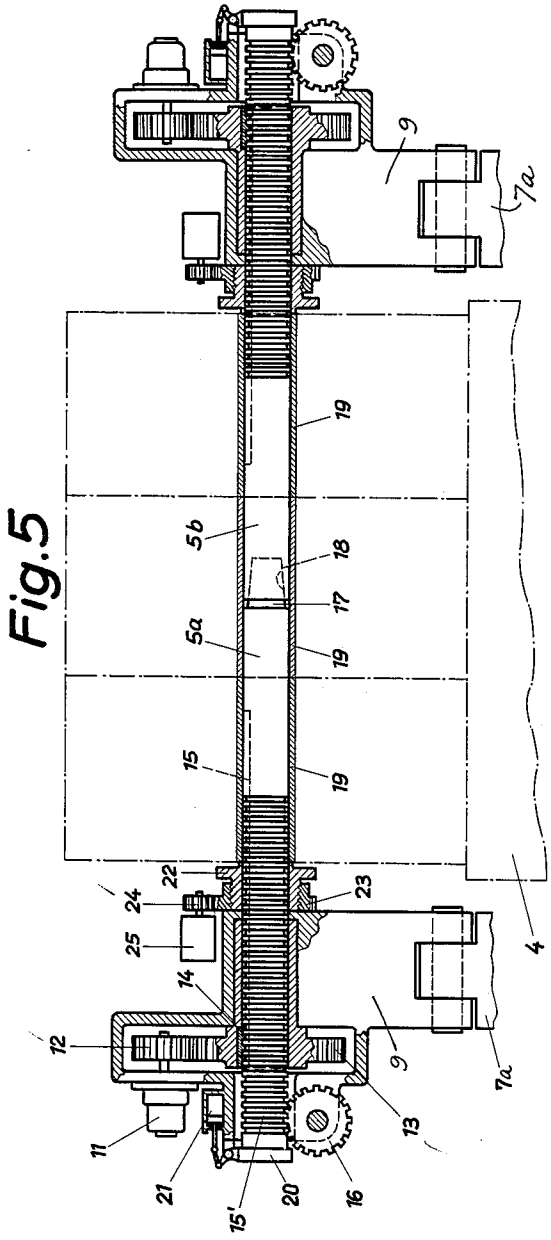
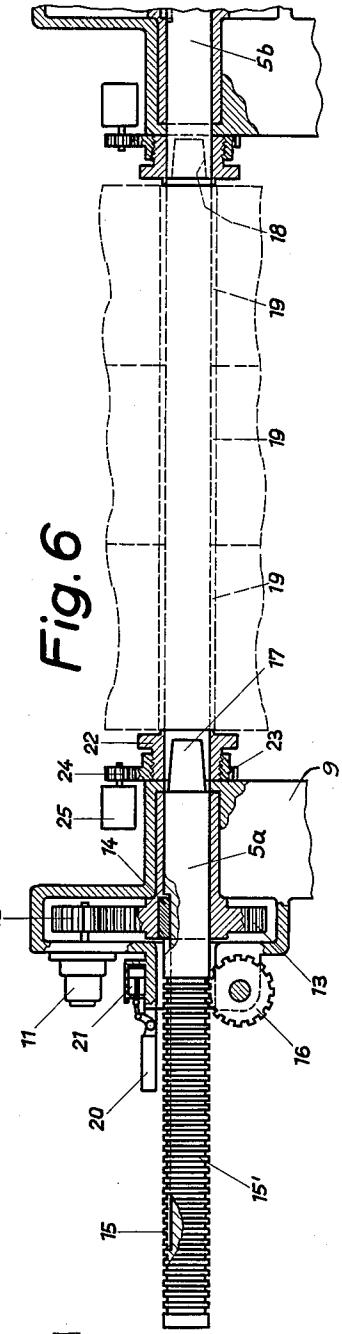


Fig. 6



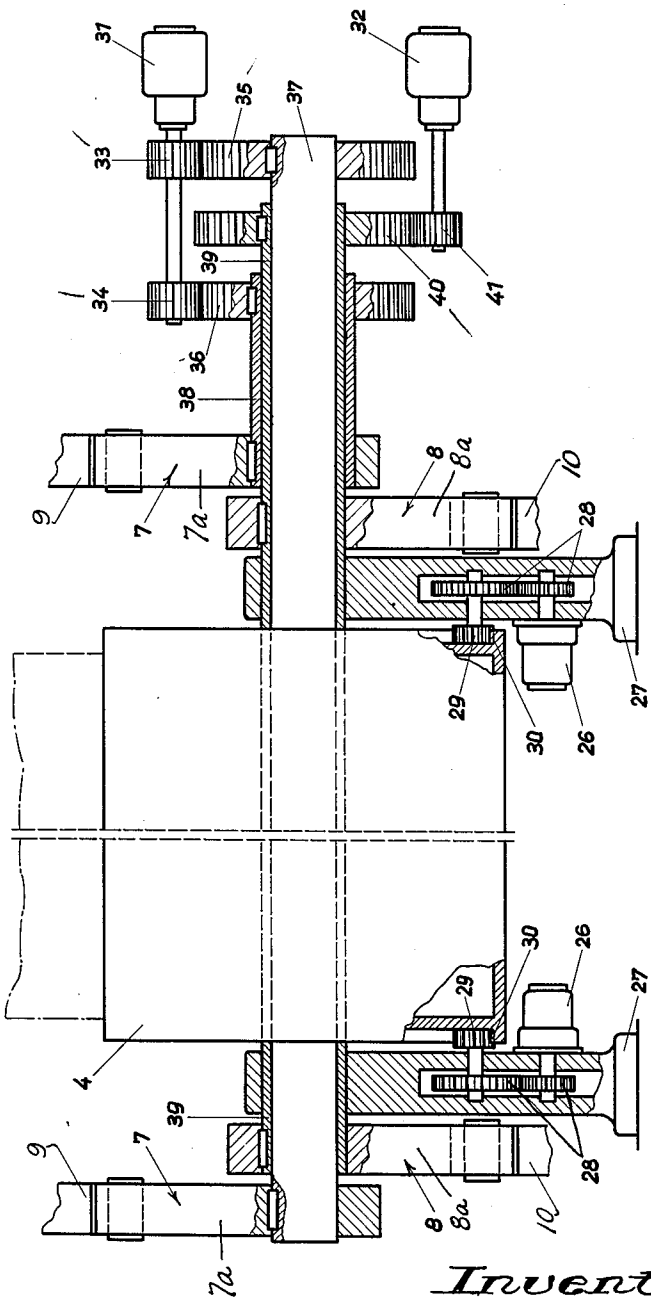
Inventors
V. Hornstein
M. Schneider
B. Lenz
By Glascock Downing Seebold Attys.

Jan. 29, 1963 V. HORNSTEIN ETAL 3,075,719

METHOD OF AND APPARATUS FOR THE LONGITUDINAL CUTTING AND SUBSEQUENT WINDING OF A PAPER WEB

Filed Dec. 15, 1958 3 Sheets-Sheet 3

Fig. 7



Inventors
V. Hornstein
M. Schneider
B. Lenz
By Glascock Downing & Seebold
Attys.

United States Patent Office

3,075,719

Patented Jan. 29, 1963

3,075,719

METHOD OF AND APPARATUS FOR THE LONGITUDINAL CUTTING AND SUBSEQUENT WINDING OF A PAPER WEB

Victor Hornstein, Dusseldorf-Lohausen, and Max Schneider and Bernhard Lenz, Dusseldorf, Germany, assignors to Jagenberg-Werke Akt. Ges., Dusseldorf, Germany

Filed Dec. 15, 1958, Ser. No. 780,320
Claims priority, application Germany Dec. 18, 1957
7 Claims. (Cl. 242—65)

This invention relates to the cutting and winding of paper webs and more particularly to a method of and apparatus for the longitudinal cutting and subsequent winding of a paper web moving directly from a paper making machine.

The production of paper rolls to be processed on printing machines or other type paper processing machines generally comprises rewinding the paper rolls made in the paper making machine on carrier or transfer rolls with the rolls being cut into workable sizes for subsequent processing. One objection of this type of procedure resides in the necessity of performing an additional rewinding operation and in the use of a carrier or transfer roller which serves solely for this purpose. In addition, such procedure results in a diameter limitation for the paper rolls produced on the carrier or transfer rollers, since the rewinding is accomplished on a shaft of thin cross-section, which, due to its deflection does not allow an effective load relief of heavy rolls for maintaining the rigidity constant. A disadvantageous result of this factor is that a frequent change of rollers in the paper processing machine is required. The relatively thin winding shaft has the additional disadvantage that due to the relatively narrow winding, the last layers of the roll cannot be processed.

It is also known in the art to position a longitudinal cutting means forward or ahead of a winding mechanism directly connected with the paper making machine, with the cutting means severing the wide paper web emanating from the machine into narrow webs, which latter are wound simultaneously on several winding shells or sleeves supported or mounted separately from each other.

These known assemblages are objectionable in that due to the free winding of the paper web, the roll tightness cannot be controlled in the desired degree and no assurances are given for a continuity of the winding procedure. Additionally, the necessary components required and the servicing of such components are quite complex and the quality of the paper rolls thereby produced does not allow an immediate further processing on printing machines.

An important object of this invention is to overcome the above and other drawbacks present in the art.

To accomplish the above and other advantageous objects, the invention broadly includes the steps of subdividing a paper web emanating from a paper making machine into individual webs of lesser width and winding the subdivided webs continuously upon adjacent shells or sleeves, which shells or sleeves are carried in groups on a single winding shaft and are moved into winding position sequentially, or one after another.

One of the advantages of the present invention is that with the elimination of the additional rewinding step and with the maintenance of continuity or uniformity of the winding operation immediately following the production of the web, paper rolls will leave the machines having a width and diameter accuracy meeting the requirements of printing machines.

More specifically, the winding of the paper web is effected after the web passes through the cutting unit for severing the web longitudinally, with the cutting unit located ahead of the winding means in such a manner that a shell or sleeve group consisting of a plurality of individual shell components arranged on a single winding shaft is automatically moved into winding position and moved out of winding position following the winding of the web thereon to allow a subsequent shell or sleeve to be brought into position for a new winding operation and the length of each individual shell or sleeve corresponds to the width of the individual paper web determined by the adjustment of the cutter unit, whereby upon the end of each winding operation, the paper rolls which are ready for further processing are ejected by groups.

To achieve the desired results, the invention includes a continuously operating winding apparatus consisting of a supporting or backing roller serving to support the winding roll and at least two winding shafts arranged in parallelism and controlled for movement independently of each other with such shafts being adapted to receive the shell or sleeve groups. The winding shafts are carried by toggle lever means controlled for movement independently of one another in such a fashion as to permit a change in the position of the angle of rotation of the winding shafts in respect to their common axis of rotation as well as a change in the radial distance of the winding shafts from the axis of rotation.

More particularly, the ends of the toggle lever means which support one of the winding shafts are disposed upon a common axle or shaft and the common axle or shaft also providing the axis of rotation of the supporting or backing roller on which the winding roll is supported during the winding operation.

A further characteristic of the invention resides in the fact that each winding shaft supporting the shell or sleeve groups is defined by two halves or sections detachably connected at the midpoint of the winding axle with each half or section being axially movable whereby it is possible to withdraw the sections from the opposite ends of the shells or sleeves to release the fully wound roll and to thereafter insert the halves or sections into empty shells or sleeves for the initiation of a new winding operation and to bring the shells and sleeves into the winding position.

An additional important characteristic of the invention is that drive motor means for effecting the rotation of the winding shafts and for effecting the axial movement of the shaft halves or sections are carried by the arms of the toggle lever means which support the winding shafts.

Other objects and advantages of the invention will appear hereinafter and while there is shown and described the preferred embodiment of the invention, it will be understood that we do not limit ourselves to such preferred embodiment, but that various changes or modifications may be made therein without departing from the spirit of the invention as set forth in the claims appended hereto.

Referring to the drawings:

FIGURES 1 to 4 illustrate diagrammatically in side elevation the present winding apparatus with the components being shown in different operating positions;

FIGURES 5 and 6 are elevational views partly in cross section showing the mounting and the drive of the winding shaft and of the shaft halves or sections and;

FIGURE 7 is an elevational view partly in cross section showing the drive of the supporting roller and of the toggle lever means on which the winding shaft halves or sections are mounted.

A paper web 1 moving directly from the paper making machine (not shown) is first moved through a longitudinal cutting means of known type such as adjustable upper disk knives 2 and opposed knives 3 and such knives or cutters serve to divide the wide paper web 1 into a plurality of narrow paper webs.

The winding assembly which is located adjacent the

cutting means (FIGURES 1 to 4) generally includes a supporting or backing roller 4 mounted for rotation in vertical standards 27, and winding shafts 5 and 6 mounted in toggle lever means 7 and 8. The toggle lever means 7 and 8 include arms 7*a*, and 9 and 8*a* and 10 respectively and the arms 7*a* and 8*a* are carried by the means constituting the axis of rotation of the roller 4 as will be later more fully described, while the arms 9 and 10 support the mountings and the driving for the winding shafts 5 and 6. As perhaps more clearly shown in FIGURES 5 and 6 it will be seen that the arm 9 of the toggle lever means 7 carries the drive means for effecting the rotary movement of the winding shaft 5 and that the shaft 5 comprises shaft halves or sections 5*a* and 5*b*, which sections are axially movable. The mounting on the arm 9 is such that the rotary movement and the axial movement of the shaft sections 5*a* and 5*b* can be effected independently of each other and for this purpose, a drive motor 11 is secured in a suitable fashion to the arm 9 with the mounting being in the nature of a housing. A gear wheel 12 coupled to the drive shaft of the motor meshes with a gear wheel 13 which functions to transmit rotary movement to the shaft 5. A key 14 fastened in the bore of the gear wheel 13 engages a groove 15 in the winding shaft 5, which allows an axial displacement of the respective sections 5*a* and 5*b* of the shaft 5.

To accomplish such axial movement, a portion of each of the sections 5*a* and 5*b* is defined as a rack 15', which meshes with a pinion 16, whose drive motor (not illustrated) is also mounted on the housing portion of the arm 9. To connect the shaft sections 5*a* and 5*b*, it will be seen that the adjacent inner ends of the sections are provided with a conical projection or extension 17 and a conical bore or recess 18 respectively, with the projection and bore constituting a detachable connection between such sections. By virtue of the axial movement effected by the pinions 16, the sections 5*a* and 5*b* are either withdrawn from shells or sleeves 19 on which the paper webs are fully wound (FIGURE 6) or are inserted into the shells 19 to allow the paper webs to be wound thereon, in the manner to be later set forth.

To secure the axial location of the axial sections 5*a* and 5*b* during the winding operation, there is provided a movable thrust bearing 20 which abuts the front or outer face of the correlated shaft section and is actuated by means of a hydraulic cylinder 21 operably connected thereto. The tightening of the shells or sleeves 19 on the shaft 5 is achieved by means of a locking ring 22 at each end of the shells. An adjusting ring 23 is provided with external gear teeth which mesh with a gear 24 driven by a motor means 25. The ring 23 is provided with an internal thread which cooperates with an external thread on the ring 22. The ring 22 is provided with a smooth bore and is slidable axially on the shaft section 5*a*, and held against rotation by any suitable means.

In FIGURE 7, there is illustrated the means for imprinting rotary movement to the supporting or backing roller 4 and for the swinging movement of the toggle lever means 7 and 8. A drive motor 26 is suitably mounted on each standard 27 below the roller 4 and the drive shaft of each motor is coupled to gear wheels 28 constituting a gear train mounted in a recess provided in each standard with the gear wheels 28 operably connected to a pinion 29 located exteriorly of each standard and which pinions mesh with an internal gear 30 provided on the supporting roller 4. Manifestly, actuation of the motors 26 will impart rotary movement to the roller 4 through the respective gear trains, pinions 29 and gears 30.

To control the movements of the two pairs of toggle lever means 7 and 8 which as previously mentioned are swingable independently of each other, there are provided two additional drive motors 31 and 32, whose speed of rotation is conveniently geared down by means of a worm drive. The shaft of the motor 31 carries gear wheels 33 and 34 which mesh respectively with gears 35 and 36. The gear 35 is keyed adjacent one end of a shaft 37 and the other end of the shaft 37 has keyed thereto one of the toggle lever means 7. The gear wheel 36 is keyed to a hollow shaft 38 and the other toggle lever means 7 is keyed to the opposite end of the shaft 38. The shaft 38 is mounted on a second hollow shaft 39, which is concentric to the shaft 37. Both toggle lever means 8 are keyed to the hollow shaft 39 and one end of the shaft 39 supports gear 40, which meshes with gear wheel 41 carried by shaft of the motor 32. It will further be seen that the supporting roller 4 is rotatably mounted on the hollow shaft 39.

The angular position of the arms 9 and 10 in relation to the arms 7*a* and 8*a* respectively, which changes during the course of operation, is determined by a hydraulic cylinder means 42 and 43 respectively.

While the mode of operation of the invention is believed apparent from the foregoing description, it may be briefly summarized as follows:

Referring to FIGURE 1 in which a substantially fully wound paper roll is mounted on the winding shaft 5, while the winding shaft 6 is in inoperative position, the winding shaft 5 moves to the position shown in FIGURE 2 by means of the swinging of the toggle lever means 7. Simultaneously, the halves or sections of the winding shaft 6 which are identical to the sections 5*a* and 5*b* are by means of axial shifting moved sufficiently far apart that the ends thereof can, during further swinging of the toggle lever means 8 be moved laterally past the margins of the paper web 1.

By virtue of the swinging movement of the toggle lever means 8, in conjunction with the relative movement of the arms 10 effected by the hydraulic cylinder means 43, the shaft 6 is moved into the zone of a shell or sleeve group 19 located in a trough or receptacle 44. By virtue of the initiation of the axial shifting of the winding shaft sections towards each other, these sections are inserted into the opposite ends of the shell or sleeve group 19 and thereafter, the shell or sleeve group is raised from the trough and positioned against the periphery of the supporting or backing roller 4. The paper web 1 is now separated by means of air pressure in a known fashion whereby the separated edge of the web extending in the direction of movement curves about the shell or sleeve group 19 so that in the further course of operation the web leaving the paper machine will be wound upon the winding shaft 6.

The roll carried by the winding shaft 5 which is now fully wound is deposited on a suitable base by means of the swinging of the toggle lever means 7 as illustrated in FIGURE 4, while the winding shaft 6 is moved into the positive winding position by the swinging of the toggle lever means 8. Thereafter, the fully wound roll is released by the withdrawal of the sections 5*a* and 5*b* of the winding axle 5 from both ends of the shells 19 and subsequently the winding shaft 5 assumes the inoperative position until the beginning of the new working cycle or the position occupied by the winding shaft 6 in FIGURE 1.

The entire operation is suitably controlled at a central location and it is also within the scope of the invention, upon the apparatus reaching a specified winding roll diameter to actuate a preset control which regulates automatically the operation of the apparatus without the employment of personnel operated means.

What is claimed is:

1. An apparatus for winding paper webs moving from a paper making machine including a supporting roller mounted in the path of movement of the individual webs, shaft means mounting the roller for rotational movement, at least two winding shafts, a plurality of shells adapted to be carried by each winding shaft with said shells on each shaft constituting a group and the group being adapted to have the individual webs wound thereon, toggle lever means including a pair of arm means pivotal-

ly connected together, one of said arm means being carried by said shaft means, and the other of the arm means being operably connected to each winding shaft whereby each winding shaft is mounted for independent swinging movement, and means cooperable with each winding shaft to rotate each shaft and its shell group independently of the other winding shaft and its shell group.

2. The apparatus as claimed in claim 1, in which each of said shafts is defined by a pair of axially aligned sections and means cooperable with each section to move the sections either toward or away from each other to allow said shells to be placed upon or removed from the shafts.

3. The apparatus as claimed in claim 2, in which said cooperable means includes a rack on the shaft section, a pinion meshing with the rack and a motor for rotating the pinion.

4. The apparatus as claimed in claim 3 in which the means for rotating each shaft section includes a gear keyed to the shaft section and a motor driven gear wheel meshing with such gear.

5. The apparatus as claimed in claim 4 further including means for tightening said shells on each winding shaft, such tightening means being defined by an axially displaceable ring surrounding each shaft in proximity to the free face of each outermost shell, and power actuated means cooperable with each ring to force such ring against said free face.

6. An apparatus for winding paper webs moving from a paper making machine including a supporting roller mounted in the path of movement of the individual webs, shaft means mounting the roller for rotational movement, at least two winding shafts, a plurality of shells adapted to be carried by each winding shaft with said shells on each shaft constituting a group and the group being adapted to have the individual webs wound thereon, toggle lever means including a pair of arm means pivotally connected together, one of said arm means being carried by said shaft means, and the other of the arm means being operably connected to each winding shaft whereby each winding shaft is mounted for independent swinging movement, means operably connected with the other of the arm means for controlling the distance between each of said winding shafts relative to each other, and the distance of each winding shaft from the shaft means independently of each other, and means cooperable with each winding shaft to rotate each shaft and its shell group independently of the other winding shaft and its shell group.

7. An apparatus for winding paper webs moving from a paper making machine including a supporting roller mounted in the path of movement of the individual webs, shaft means mounting the roller for rotational movement, at least two winding shafts, a plurality of shells adapted to be carried by each winding shaft with said shells on each shaft constituting a group and the group being adapted to have the individual webs wound thereon, toggle lever means including a pair of arm means pivotally connected together, one of said arm means being carried by said shaft means, and the other of the arm means being operably connected to each winding shaft whereby each winding shaft is mounted for independent swinging movement, means operably connected with the other of the arm means for controlling the distance between each of said winding shafts relative to each other, and the distance of each winding shaft from the shaft means independently of each other, means cooperable with each winding shaft to rotate each shaft and its shell group independently of the other winding shaft and its shell group, each winding shaft including a pair of sections, means defining a detachable connection between adjacent ends of each of the sections, and drive means operably associated with each section to move said sections axially toward and away from each other whereby the shells may be placed upon or removed from the sections.

References Cited in the file of this patent

UNITED STATES PATENTS

1,340,981	Reinhardt	May 25, 1920
1,437,398	Cameron et al.	Dec. 5, 1922
1,764,322	Kutter	June 17, 1930
1,779,578	Anderson	Oct. 28, 1930
2,617,608	Carter	Nov. 11, 1952
2,619,298	Aulen	Nov. 25, 1952
2,717,037	Goodwillie	Sept. 6, 1955
2,777,644	Nicholson	Jan. 15, 1957

FOREIGN PATENTS

317,881	Great Britain	Aug. 26, 1929