United States Patent [19]

Schwarz

[11] **3,794,256**

[45] **Feb. 26, 1974**

[54] **PROCESS OF TRANSFERRING A TRAVELING WEB FROM A PULL ROLL TO AN EMPTY CORE**

[75] Inventor: **Kenneth Paul Schwarz,** Marshalltown, Iowa

[73] Assignee: **E. I. du Pont de Nemours and Company,** Wilmington, Del.

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[21] Appl. No.: **199,662**

[52] **U.S. Cl.** ..... **242/56 A**

[51] **Int. Cl.** **B65h 19/26**

[58] **Field of Search** ..... 242/56 A, 56 R, 64

[56] **References Cited**

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Primary Examiner—George F. Mautz
Assistant Examiner—Edward J. McCarthy

[57] **ABSTRACT**

In a process for continuously winding a web onto a core, the steps of transferring the web from a full roll to an empty core while significantly minimizing stub roll waste by advancing an empty positively driven core into the path of the traveling web so that the web partially wraps the empty core; deflecting the web to substantially increase the web wrap around the empty core; removing the driving torque from the empty core permitting the empty core to idle; severing the web near the surface of the empty core establishing a leading edge on the traveling web that follows the surface of the empty core as it idly rotates; and thereafter applying torque to positively drive the empty core forming a new roll.

4 Claims, 10 Drawing Figures

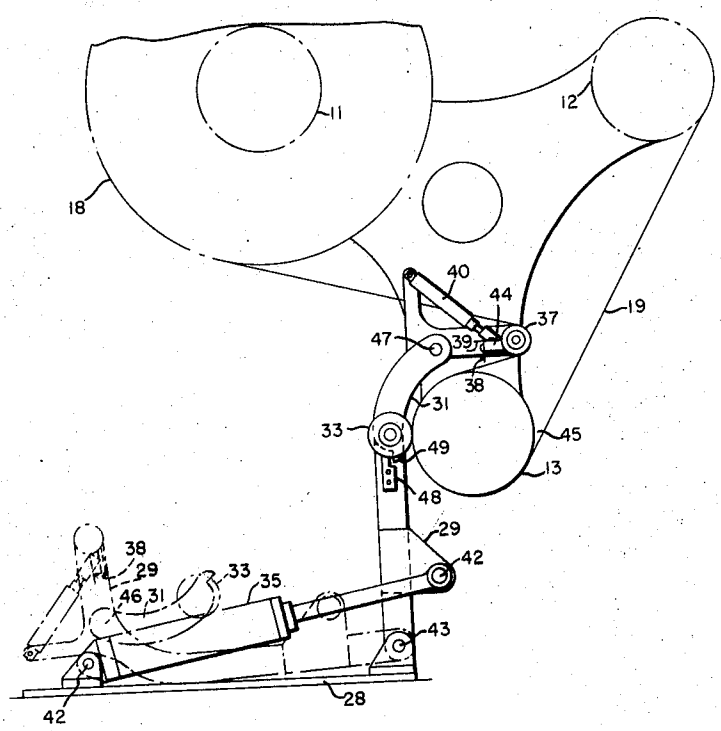


FIG. 1

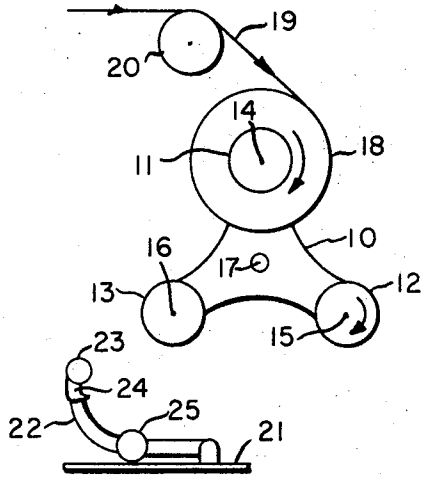


FIG. 2

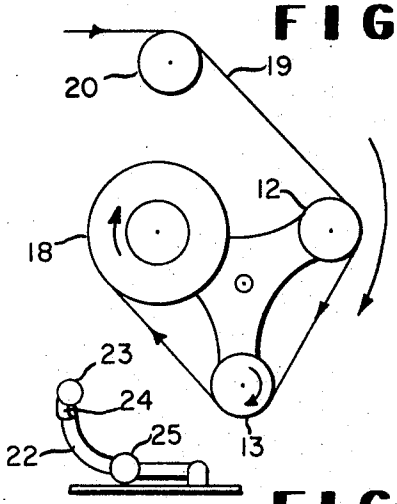


FIG. 3

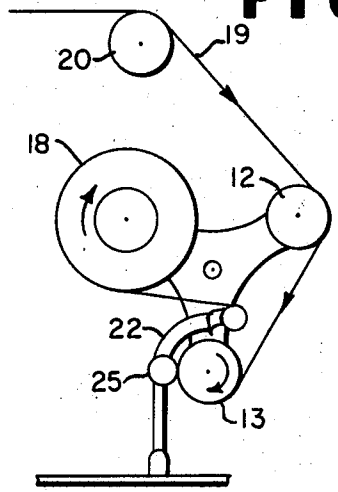


FIG. 4

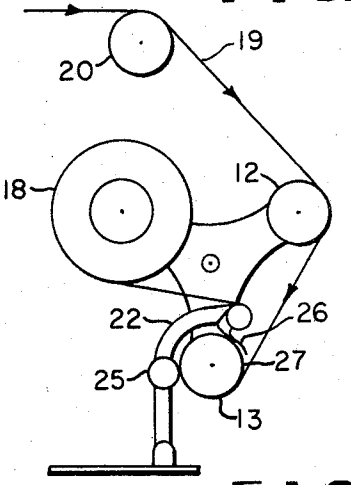


FIG. 5

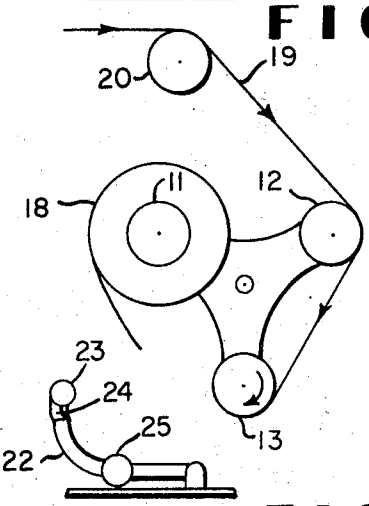
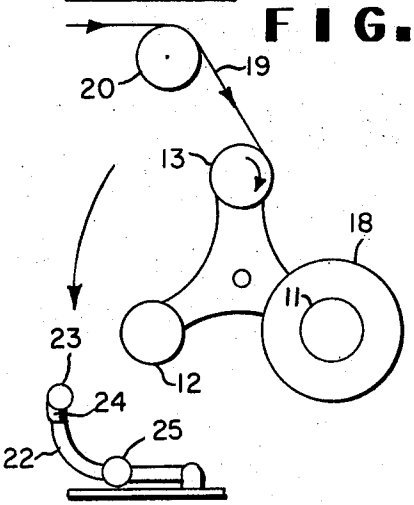


FIG. 6



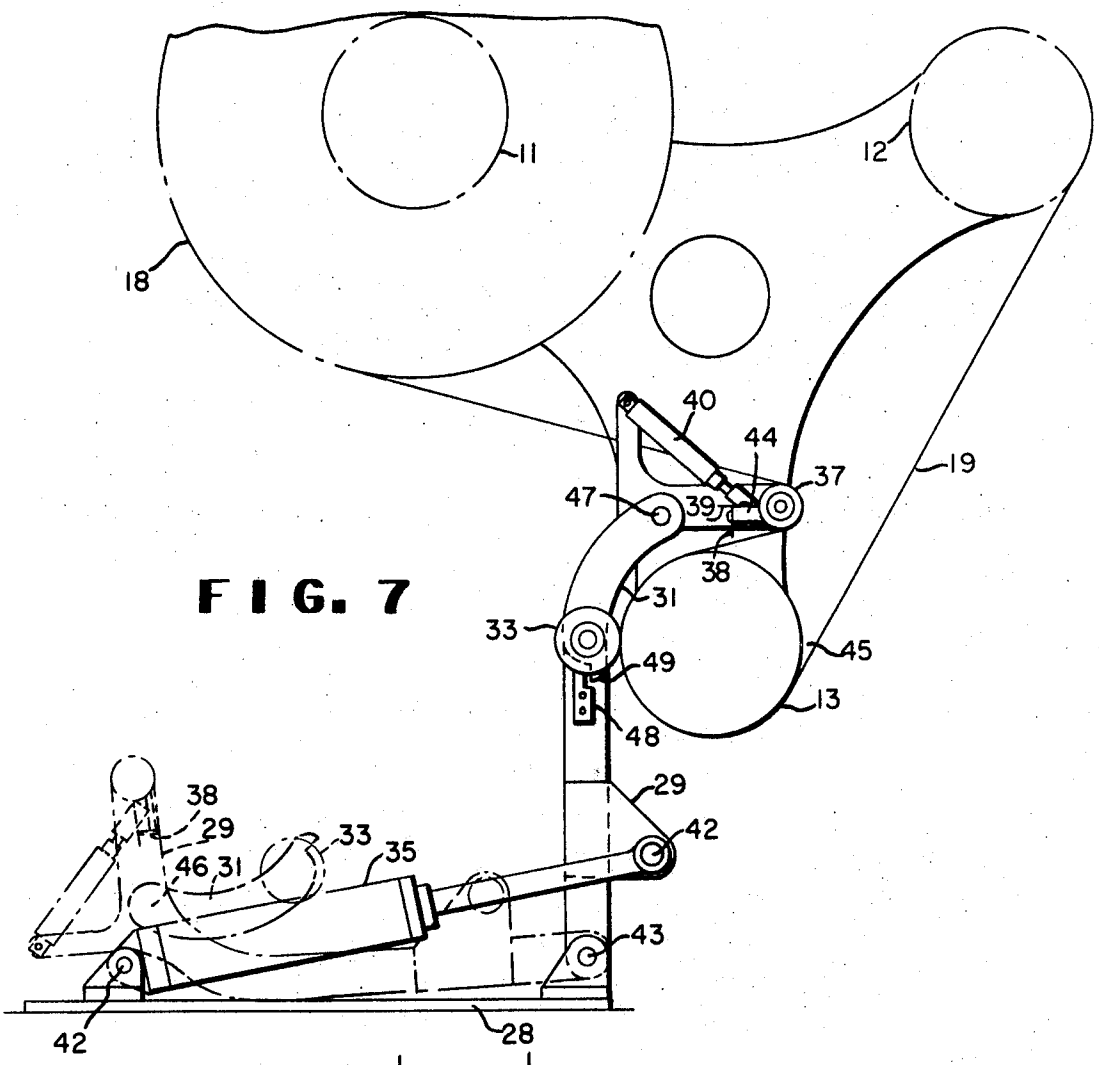

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FIG. 7

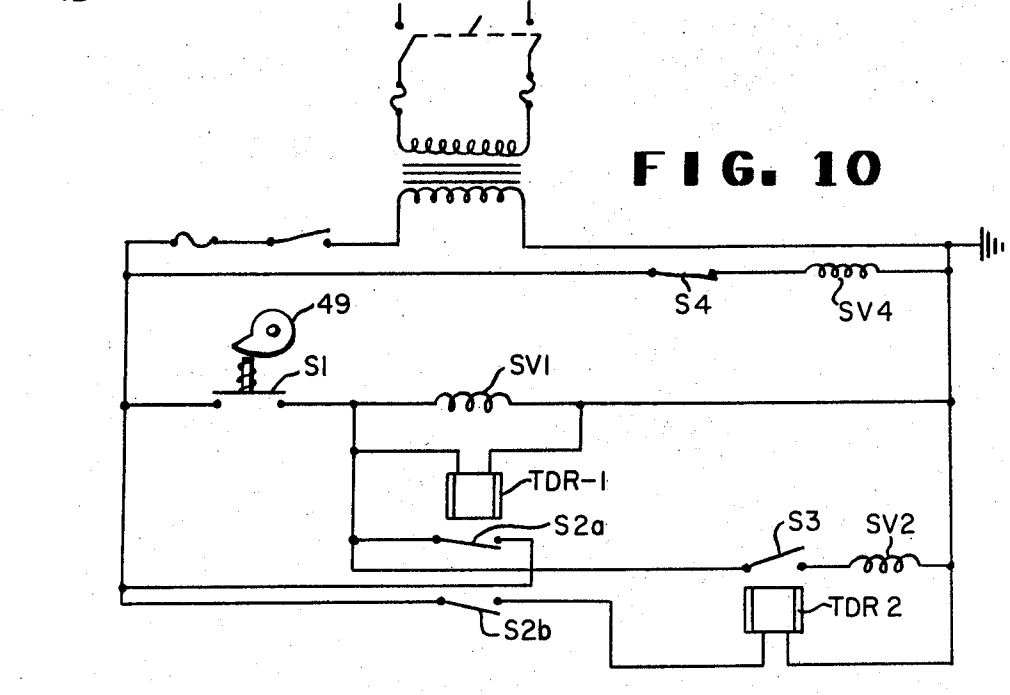

49
S4
SV4
S1
SV1
TDR-1
S2a
S3
SV2
TDR 2
S2b

FIG. 10

FIG. 8

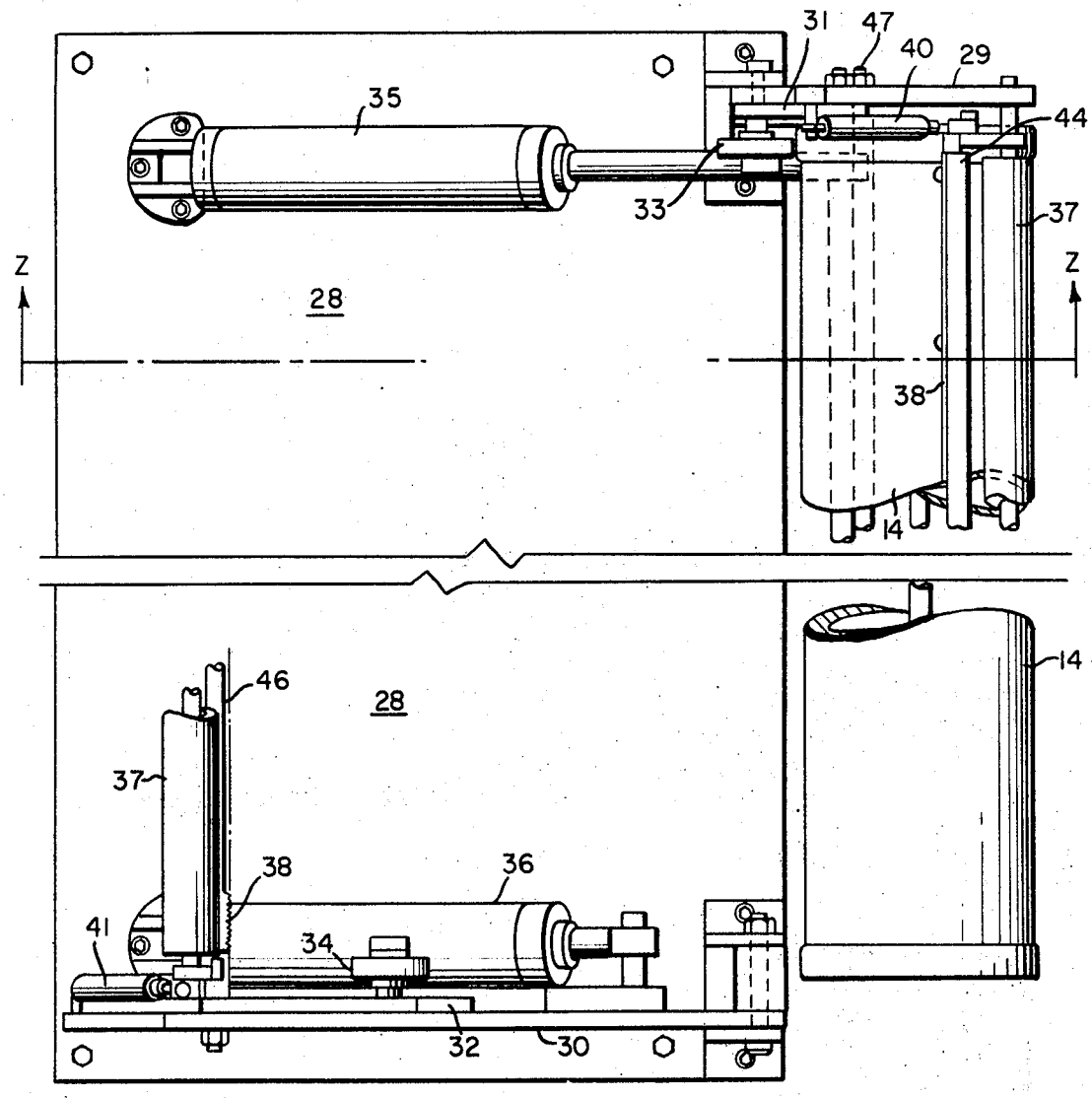
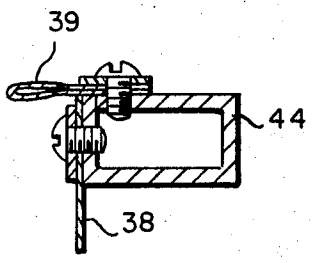

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47
40
29
35
44
33
37
Z
Z
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FIG. 9


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44
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PROCESS OF TRANSFERRING A TRAVELING WEB FROM A PULL ROLL TO AN EMPTY CORE

BACKGROUND OF THE INVENTION

At the end of the production or treatment of webs of paper, cellulose or thermoplastic film, the product is conventionally wound into rolls by a mechanism comprising a turret adapted to support a plurality of roll cores, each of which can be individually rotated, the turret being independently rotatable to bring an empty core into position for winding and the finished roll into an unloading position.

The transfer of the continuous, moving sheet from one roll to another is often one of the most wasteful operations in its production. In a manual operation, the sheet is severed transversely to the direction of film travel, which results in a tear in the sheet oblique to its line of travel. The interruption of the film speed and the lack of control of tension during the roll changing results in many feet of material at the beginning of the roll ending up as nonsaleable waste. This is sometimes referred to as "stub-roll" waste. Attempts have continually been made to provide automatic roll changers that minimize wrinkles and other irregularities in the newly started rolls, and minimize the variables present in a manual operation.

Several roll starters are commercially available which employ an adhesive or a cluster of rolls to assist the transfer of the film. Other such apparatus require a foldback of the material which adds to the initial irregularity of the newly-started roll. Continuing attempts to provide smooth, efficient roll starters have resulted in increasingly complex apparatus, which require great expense in initial outlay for the equipment, adaptation of the existing winding machinery, and maintenance.

SUMMARY OF THE INVENTION

The instant invention provides a continuous winding process which permits the transfer of a web from a fully wound roll to an empty core substantially without changing the speed of the moving web or causing ripples or irregularities in the initial portion of the newly started roll. Further, the instant process can be incorporated into existing commonly used winding machinery without extensive modification.

Specifically, the invention provides the following:

In a process for continuously winding a web, the steps of transferring the advancing web from a fully wound core to an empty core wherein the cores are mounted on a turret with each core rotatable about its own axis and also rotatable about the common turret axis, said transferring steps consisting essentially of:

a. driving a first core about its axis winding the web onto the core;
b. driving an empty second core about its axis;
c. rotating the turret to advance the second core into the path of the web so that the traveling web partially wraps the rotating second core while spanning the distance between and traveling to the roll forming on the first core;
d. deflecting a portion of the web between the first and second cores substantially increasing the web wrap around the second core;
e. removing the driving torque from the second core permitting the second core to idle while the web continues to travel to the first core;

f. severing the web between the first core and the second core, in the deflected portion wrapped around and near the surface of the second core, terminating the web traveling to the first core and establishing a leading edge on the traveling web that follows the surface of the second core as the second core idly rotates; and thereafter
g. applying torque to positively drive the newly started second core initiating the formation of a new roll of web on the second core.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1–6 are schematic side elevations of an apparatus showing, in sequence, the steps for transferring a traveling web from a full roll to an empty core.

FIG. 7 is a side elevation of one particular embodiment of the instant invention in its operative position, in a cross section taken at line Z—Z in FIG. 8.

FIG. 8 is a plan view of the apparatus, divided to show the upper and lower portions in operative and inoperative positions, respectively.

FIG. 9 is an enlarged side view of a portion of the severing means of the apparatus shown in FIGS. 7 and 8.

FIG. 10 is a diagram for an electrical circuit which can be used to automatically control the instant invention.

DESCRIPTION OF THE INVENTION

This invention will be described in conjunction with the drawings.

FIG. 1 shows a part of a typical web-winding machine having a three-position windup turret **10**. Each position on the turret is occupied with a core **11, 12** and **13**. The cores are positively driven to rotate about their own axes **14, 15** and **16,** respectively, and the turret **10** made to rotate about its axis **17** thereby rotating the cores about the turret axis **17.**

Core **11** contains a roll **18** of web **19** that is fed from a source not shown over guide roll **20.** The roll **18** has reached its desired size and it is necessary to transfer the traveling web to an empty core. Empty core **13** will be selected as the transfer core and will receive the traveling web.

FIG. 1 also shows apparatus for deflecting, severing and urging the web **19** into contact with the empty core **13** at the proper time. The apparatus includes a frame **21,** movable arm **22,** idler roll **23,** movable knife **24** and guide roller **25.**

While in the position as shown in FIG. **1,** empty core **13** is positively driven by applying torque to the core mandrel. The turret **10** is then rotated clockwise about 300 degrees to the position as shown in FIG. 2. The turret is advanced so that the empty core **13** intercepts the path of the web **19** partially wrapping empty core **13** and spanning the distance between the full roll **18** and the empty core **13** with the web **19.**

Thereafter, as shown in FIG. **3,** the web spanning the distance between the full roll **18** and the empty core **13** is deflected substantially increasing the web wrap around the empty core **13.** The empty core **13** is still being positively driven.

After the web **19** is substantially wrapped around the empty core **13,** the driving torque is removed from the empty core **13.** Immediately thereafter, the knife **24** is made to strike and sever the full width of the web **19** as shown in FIG. **4.** The empty core **13** now idles and the leading edge of the traveling web **26** follows the sur-

face of the empty core 13 entering the narrow space 27 between the web and the core surface unhindered and wrinkle free. Immediately thereafter, torque is reapplied to core 13 tightening the several loose film wraps that occurred while the core was idly rotating. The winding process then continues on core 13.

FIG. 5 shows the position of the web after the start of the new roll on core 13. Rotation of core 11 is stopped and the web deflection and severing means is retracted.

FIG. 6 shows the turret positioned so that the full roll 18 can be removed and replaced with an empty core with continuous winding taking place on core 13.

The process of this invention can be used during the continuous windup of webs made from many different kinds of materials including cellophane, plastics, paper, etc. To appreciate the significance of the usefulness of this invention, it was found that in the production of cellophane where production rolls were being wound having a width of 50 inches, an outside diameter of about 24 inches and an inside (core) diameter of about 8.75 inches the stub-roll waste was only about 3 pounds of web material per production roll when the roll transfer process of the present invention was used. Operating without removing the driving torque from the empty core prior to severing the web and reapplying the torque after severing the web but instead permitting the empty core to be positively driven throughout the roll transfer results in a stub-roll waste of about 17 pounds of web material per production roll.

The following apparatus can be used to carry out the process of this invention.

The windup machine can be any of the types conventionally used having a turret that will accommodate at least two cores. Each of these core positions is individually rotatable about its own axis to provide the means to develop a wound roll. The core positions can be rotated as a unit about their common turret axis. Thus, as the core positions are rotated their angular displacements with respect to one another remain constant. In conventional windup apparatus such as this, means which are not shown are provided to control the tension pattern of the convolutely wound web as the windup diameter increases. Such mechanism and controls do not constitute a part of this invention but are employed in association with the method and apparatus of this invention.

The only modification necessary to employ such conventional windup machines in the process of the present invention is to modify the sequential timing of activating and deactivating core rotation and turret rotation. Once the sequence is known, as disclosed by this invention, modifying the timing sequence of the winding machine can be accomplished by one skilled in the art.

Apparatus such as that disclosed in U. S. Pat. No. 2,787,427, issued to Marczincsin, can be used to deflect and sever the web.

Another piece of apparatus particularly designed for deflecting and severing the web in the process of the present invention is shown in the drawings and will be disclosed below. Referring to FIG. 7 and FIG. 8, the apparatus comprises a fixed frame 28, movable frames 29 and 30, frame guide links 31 and 32, guide rollers 33 and 34, double-acting pneumatic cylinders 35 and 36, idler roll 37, web-severing blade 38, web-urging means 39, double-acting pneumatic cylinders 40 and 41 and means, not shown, to coordinate the individual mechanism motions for forming suitably wound rolls of web material.

As shown in FIGS. 7, 8 and 9, the mechanism for depressing the running web 19 between the surface of the production roll 18 and the empty core 13, severing the depressed web and urging the severed web against the surface of the empty core 13 rotates about pivotal centers 42 and 43 when movable frames 29 and 30 are actuated by the double-acting pneumatic cylinders 35 and 36. This mechanism is only in the operating position for short periods of time and is in the retracted position when not operating. Idler roll 37 depresses the running web 19 in the web span between the windup turret position so that the wrap of running web 19 around the core 13 is increased by at least 90° of circumferential surface. As previously mentioned, the core 13 is being driven by the drive mechanism, not shown, of the windup turret 10.

The means for severing the running web in this preferred embodiment is the web-severing blade 38 which is shown in FIG. 9. This blade is fabricated from 0.032 in. steel saw-blade material, has a tooth angle α of 60°, a tooth pitch of one-fourth inch and has no set in the teeth. This blade is mounted on the frame 44 shown in FIG. 7 and FIG. 9 while frame 44 is mounted to pivot about the axis of idler roll 37 when actuated by the two double-acting pneumatic cylinders 40 and 41. A web-urging means 39 also shown in FIG. 9 is mounted off of frame 44 at substantially 90 degrees to the location of the web-severing blade 38. It is thus seen that the actuation of frame 44 by pneumatic cylinders 40 and 41 will cause the web-severing blade 38 to engage the running web 19 first. Immediately upon engaging the web, the teeth of the web-severing blade 38 sever the running web 19 and the web-urging means 39, such as a piece of folded canvas, is then brought to bear against the severed end of the running web 19 so that the severed end is urged against the surface of the core 13 and captured in the nip area 45, shown in FIG. 7, formed by the moving surface of the core 13 and the running web 19.

The entire operation performed by the described apparatus can be conveniently accomplished automatically and initiated on command of a counter that closes a set of contacts after production roll 18 has been wound with a predetermined number of convolute wraps. This action would operate a pneumatic solenoid valve which would admit compressed air into double-acting cylinders 35 and 36 causing the movable frames 29 and 30 to be rotated into a near vertical position. Frame guide links 31 and 32 partially rotate about their centers 46 and 47 when movable frames 29 and 30 are actuated. Guide rollers 33 and 34 which are mounted on frame guide links 31 and 32 eventually bear against the surface of the core 13 which limits the strokes of the pneumatic cylinders 35 and 36. After a predetermined time interval, the driving torque applied to empty core 13 is removed and a second pneumatic solenoid valve would actuate which would admit compressed air into the double-acting pneumatic cylinders 40 and 41 causing the frame 44 to be actuated and thus the severing of the running web 19 to be accomplished immediately followed by the initiation of a new wound roll on core 13 and the reapplication of driving torque to core 13. The return of the four pneumatic cylinders 36, 36, 40 and 41 to their nonoperating positions is

conveniently accomplished by timed reversal of the pneumatic solenoid valves to reverse the strokes of all four of the double-acting pneumatic cylinders after a pre-set time interval from the time that limit switch **48** is first actuated.

FIG. **10** is a simplified wiring diagram of an electrical circuit suitable for controlling the operation of the apparatus as previously described. The pneumatic solenoid valve **SV1** which admits compressed air into double-acting cylinders **35** and **36** is actuated by momentary-contact switch **S1** which is initiated by the cam **49** of a mechanical counter or by a total timing mechanism. Time delay relay **TDR1** is actuated simultaneously with solenoid valve **SV1**. The time delay relay **TDR1** closes switch **S2a** for a given period of time thus sealing the circuit around switch **S1**. Switch **S2b** energizes time delay relay **TDR2** for a given period of time and time delay relay **TDR2** closes switch **S3** and opens switch **S4** for a pre-set period of time. Switch **S3** energizes solenoid valve **SV2** which admits compressed air into double-acting pneumatic cylinders **40** and **41**. Switch **S4** opens the circuit to solenoid **SV4** which causes the power to be removed for a short interval of time, such as 0.2 second after the knife cut, from a clutch which drives core **13**. This removes all applied torque to core **13** during the period when the leading edge of traveling web **26** is transferred to core **13**. The four pneumatic cylinders **35, 36, 40** and **41** are returned to their nonoperating positions when solenoid valves **SV1** and **SV2** are de-energized by the timed opening of switch **S2*a***.

I claim:

1. In a process for continuously winding a web, the steps of transferring the advancing web from a fully wound roll to an empty core wherein the cores are mounted on a turret with each core rotatable about its own axis and also rotatable about the common turret axis, said transferring steps consisting essentially of:

a. driving a first core about its axis to wind the web onto the first core and form a roll;

b. driving an empty second core about its axis;

c. rotating the turret to advance the second core into the path of the web so that the traveling web partially wraps the rotating second core while spanning the distance between and traveling to the roll forming on the first core;

d. deflecting a portion of the web between the first and second cores substantially increasing the web wrap around the second core;

e. removing the driving torque from the second core permitting the second core to idle while the web continues to travel to the first core;

f. severing the web between the first core and the second core, in the deflected portion wrapped around and near the surface of the second core, so as to terminate the web traveling to the first core and to establish a leading edge on the traveling web;

g. urging the leading edge on the web to follow the surface of the second core as the second core idly rotates; and thereafter

h. applying torque to positively drive the newly started second core initiating the formation of a new roll of web on the second core.

2. The process of claim **1** wherein the web is cellophane.

3. The process of claim **1** wherein the web is a plastic.

4. The process of claim **1** wherein the web is paper.

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