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METHOD AND APPARATUS FOR STOPPING THE ROTATION OF A FULLY WOUND ROLL OF WEB MATERIAL

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FIG-1

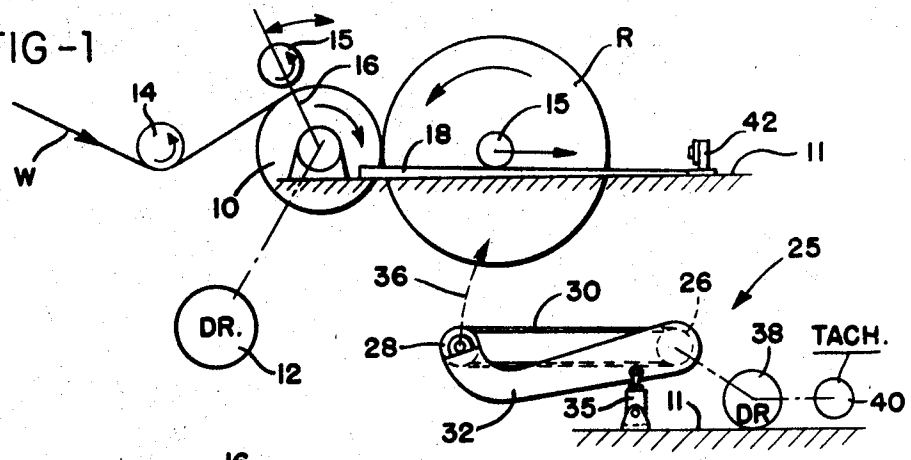



FIG-2

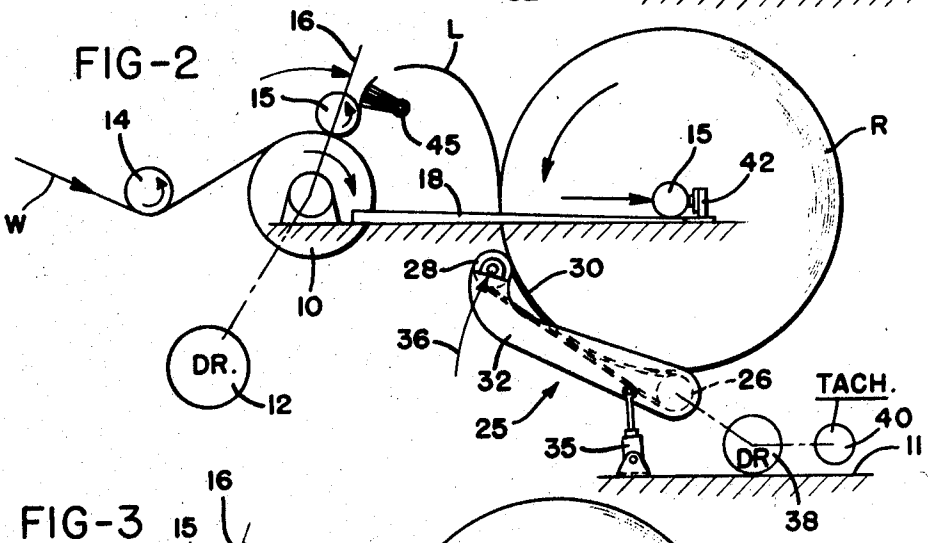
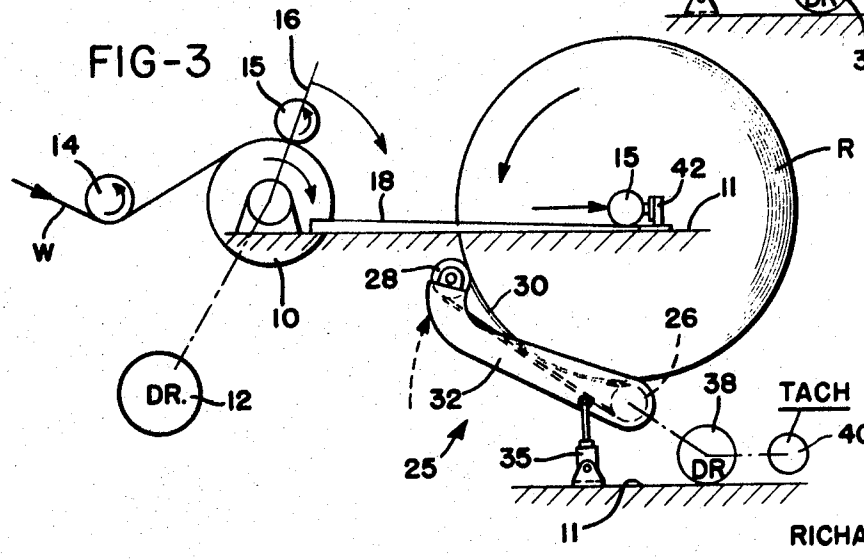



FIG-3




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# METHOD AND APPARATUS FOR STOPPING THE ROTATION OF A FULLY WOUND ROLL OF WEB MATERIAL

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U.S. Cl. 242—56 7 Claims

## ABSTRACT OF THE DISCLOSURE

Endless belts directed around parallel spaced rollers are driven at the peripheral speed of a winding roll of web material and are moved into pressure engagement with the roll. The web is then severed, and the belt drive is decelerated at a controlled rate to produce controlled deceleration of the roll with minimum relative rotation between the spool and the outer wraps of the roll.

### Background of the invention

A fully wound rotating paper roll is commonly stopped after the paper web is transferred to a new core or spool by applying friction brake shoes against the ends of the spool supporting roll. In view of the trend towards producing, processing and winding paper at higher web speeds and in larger diameter rolls, however, the stopping of a fully wound rotating roll by breaking the spool has presented increasingly serious problems. For example, if a braking force is applied to the spol of a large diameter fully wound rotating roll, the inertia of outer wraps of the roll causes the outer wraps to rotate in advance or run ahead of the spool thereby disturbing the web tension within the roll. Frequently, the running ahead of the outer wraps is sufficient to cause the web to break within the roll. Then when the roll is subsequently unwound for printing or further processing, the break in the web results in additional problems such as downtime of the printing or processing machine.

### Summary of the invention

The present invention is directed to a simplified and dependable apparatus and method for stopping a fully wound rotating roll of web material and is especially suited for stopping large diameter heavy rolls having a high peripherial speed. In general, the invention is directed to the stopping of a fully wound roll by driving endless belts at the peripheral speed of the roll, moving the belts into pressure engagement with the outer surface of the roll, severing the web, and then gradually decelerating the speed of the belts while maintaining the pressure engagement between the belts and the peripheral surface of the roll. The rate of deceleration and the applied pressure of the belts against the winding roll are selected according to several factors including the roll weight, the caliper of paper and the roll speed.

As a result of stopping a rotating roll in accordance with the present invention, the relative rotation between the outer wraps and the spool is minimized and the chance of breaking the web within the roll is substantially eliminated. While the roll braking apparatus of the present invention is ideally suited for use in conjunction with a heavy duty single drum surface winder for winding large diameter heavy rolls, such as disclosed in Patent No. 2,703,683 issued to the assignee of the present invention, it is to be understood that the apparatus may be adapted for use with other types of winders such as a turret winder having multiple driven cores.



### Brief description of the drawing

FIGS. 1–3 show schematic views of a drum winder incorporating a roll stopping mechanism constructed in accordance with the invention and illustrate the successive steps for transferring the web to a new spool and for stopping a fully wound rotating roll.

### Description of the preferred embodiment

The detailed construction and operation of the continuous winding apparatus shown schematically in FIGS. 1–3 are disclosed in the above Patent No. 2,703,683. In general, this apparatus includes a drum **10** rotatably supported by a frame **11** and driven by a variable speed drive motor **12**. A guide roll **14**, such as a Mt. Hope roll, is positioned ahead of the drum **10** for directing a web W of paper or other material into engagement with the outer surface of the drum **10**.

An empty spool **15** is received by parallel spaced arms **16** rotatable on the axis of the drum **10** and is moved into nip relation with the drum **10** with the web W extending through the nip. The winding operation is initiated by wrapping the leading end of the web W around an empty spool **15** supported by the arms **16** so that rotation of the drum **10** causes a roll R to wind on the spool.

After the roll R has built up to a predetermined diameter, the arms **16** are rotated clockwise, thereby lowering the winding roll R until the bearings mounted on the ends of the spool **15** engage a pair of parallel spaced rails **18** supported by the frame **11** and extending horizontally from the drum **10**. As the roll R increases in diameter, its spool **15** moves horizontally along the rails **18** against the bias of pressure cylinders (not shown) which are employed to maintain a predetermined nip pressure between the winding roll R and drum **10**.

In accordance with the invention, a roll stopping mechanism **25** is positioned below and between the rails **18** and includes a pair of parallel spaced rollers **26** and **28** around which are directed a plurality of laterally spaced endless flat belts **30**. The roller **26** is rotatably supported by the frame **11**, whereas roller **28** is supported by parallel spaced arms which are pivotable on the axis of the roller **26** and extend generally horizontally in their retracted position as shown in FIG. 1. A pair of fluid cylinders **35** are pivotally supported by the frame **11** and have piston rods connected to the arms **32** for moving the roller **28** along an arcuate path **36** and thereby moving the belts **30** between retracted positions (FIG. 1) and extended postions (FIGS. 2 and 3). The roller **26** is driven by a variable speed electrical motor **38**, and the r.p.m. of the motor **38** is indicated by a tachometer **40**.

In accordance with one method for operating the winder of the invention, when the winding roll R has built up to almost its desired diameter, the belts **30** are accelerated until their speed matches the peripheral speed of roll R as indicated by the tachometer **40**. As roll R is moved away from the winding drum **10** by moving its spool **15** along the rails **18** toward the stops **42** located at the end of the rails **18**, the cylinders **35** are energized to raise the arms **32** and move the belts **30** into pressure engagement with the lower portion of the rotating roll R. After the roll R leaves the drum **10**, the speed of roll R decreases slightly which produces slack within the web W. The slack is formed into a loop L with the aid of a suitable air pipe **45** (FIG. 2).

After the loop L is formed, the web is severed with the air jets from the pipe **45**, and the leading end of the cut web is immediately directed by the air jet around the empty spool **15** supported by the arms **16** and into the nip formed between the empty spool and the drum **10** to commence the winding of a new roll R. The motor

38 is then decelerated at a controlled uniform rate which is selected according to several factors including the type of web material, the weight of the fully wound roll R, the caliper of the web W, and the peripheral speed of the roll R. As the motor **38** and belts **30** decelerate, the belts **30** are held in pressure engagement with the peripheral surface of the roll R by maintaining a predetermined pressure within the cylinder **35**.

As mentioned above, an important advantage obtained by stopping the fully wound rotating roll R in accordance with the invention is that a predetermined pressure engagement is maintained between the belts **30** and the roll R and the belts **30** are decelerated at a controlled rate so that the roll R is stopped with minimum relative rotation between the outer wraps of the roll R and its supporting spool **15**. As a result, the web tension within the roll is not significantly disturbed, and the chances of the web breaking within the roll are substantially eliminated. While preferably the belts **30** are brought up to matched speed with the roll R before the belts are moved into pressure contact with the roll, it is to be understood that the belts **30** may be made free-wheeling with the use of a suitable clutch and brought up to speed by engagement with the roll R, after which a controlled braking torque would be applied to the roller **26** by deceleration of the motor **38** or some other braking device.

What is claimed is:

**1.** In apparatus for winding a web of material into a roll and including means for rotatably supporting a spool, and means for winding the web on the spool, an improved braking mechanism separate from said winding means for stopping the rotation of a fully wound roll, comprising a plurality of parallel spaced rollers, means for supporting said rollers, at least one endless belt directed around said rollers, means for producing pressure engagement between said belt and the peripheral surface of the rotating roll, and means for producing controlled deceleration of said belt and the corresponding peripheral speed of the roll to minimize relative rotation between the spool and the outer wraps of the roll.

**2.** Apparatus as defined in claim **1** wherein the position of a first said roller is fixed relative to said winding means, said means for supporting said rollers comprise parallel spaced arms pivotable on the axis of said first roller and supporting a second said roller, said means for producing pressure engagement comprise fluid cylinder means connected to said arms for moving said second roller between a retracted position and an extended position causing said belt to engage the peripheral surface of the rotating roll, and said means for producing controlled deceleration comprise a variable speed motor connected to said first roller.



**3.** Apparatus as defined in claim **1** wherein said winding means include a drum adapted to form a nip with the winding roll, parallel spaced rail means extending generally horizontally from said drum and adapted to support the spool of the winding roll as it builds up on the spool, said rollers and said endless belt being disposed generally below said rail means, and said means for producing pressure engagement comprise pressure cylinder actuated means for raising said belt upwardly against the rotating roll.

**4.** Apparatus as defined in claim **3** including stop means adjacent said rail means for positioning the spool of a fully wound roll, a first one of said rollers being spaced generally below said stop means, said means for supporting said rollers comprise generally horizontally extending parallel spaced arms pivotable on the axis of said first roller and supporting a second of said rollers, said pressure cylinder actuated means connected to said arms and operative to move said arms upwardly causing said belt to engage the lower portion of the rotating roll, and said means for producing controlled deceleration comprise a variable speed motor connected to said first roller.

**5.** A method for stopping the rotation of a fully wound roll of web material supported by a spool, comprising the steps of bringing the speed of at least one endless belt supported by rollers up to substantially the peripheral speed of the roll, moving said belt into pressure engagement with the peripheral surface of the rotating roll, and decelerating the speed of said belt at a controlled rate to produce controlled deceleration of the roll with minimum relative rotation between the spool and the outer wraps of the roll.

**6.** A method as defined in claim **5** including the step of severing the web after said endless belt is moved into pressure engagement with the peripheral surface of the rotating roll.

**7.** A method as defined in claim **5** wherein said belt is brought up to the speed of the roll before the belt is moved into pressure engagement with the rotating roll.


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U.S. Cl. X.R.

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