United States Patent

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[54] **WEB ROLL CRADLE FOR LOOSELY WOUND MATERIAL**
19 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **242/55,** 242/66, 242/68.7, 242/75.4, 242/156.2
[51] **Int. Cl.** **B65h 75/02**
[50] **Field of Search** 242/55, 56, 55.2, 57, 65, 66, 67.2, 68.7, 75, 75.3, 75.4, 75.41, 75.42, 75.43, 76, 156.2

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ABSTRACT: A cradle for supporting a web roll of material during an unwinding operation is provided wherein the outer turn of the web is maintained in a tight condition on the roll by rotation of the rear support roller at a differential speed slower than the forward roller. A control system is provided wherein flexible brake bands are adapted to engage the periphery of the rear roller and move in the direction opposite to the rotation of said roller in response to a dancer arm to brake the roll upon decrease in demand; said brake bands being driven in the direction of rotation of the roll upon restart of the unwinding operation or increase in demand to overcome the inertia of the roll. An improved roll centering system is provided wherein individual adjustment of the side guides as well as adjustment in unison for positioning the roll along the centerline of the cradle can be effected.

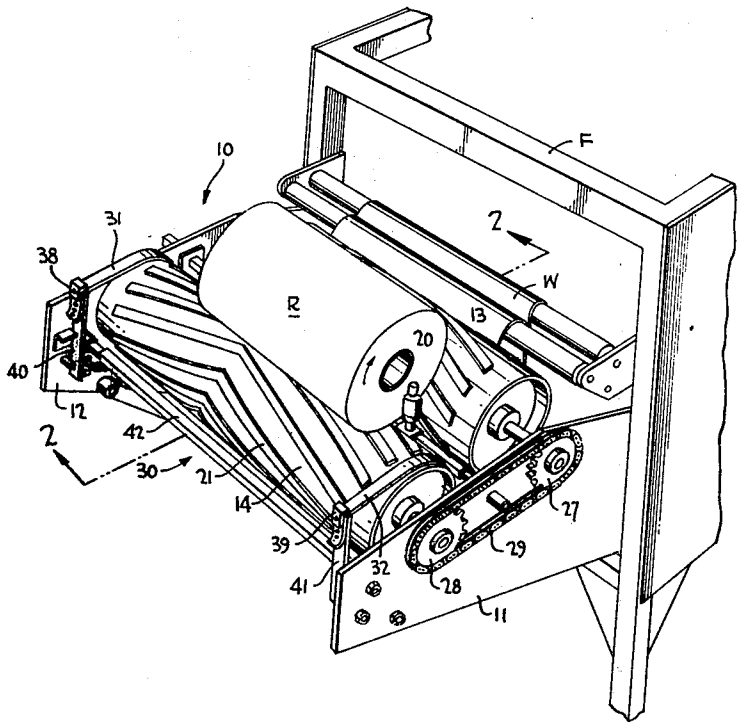

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FIG. 1

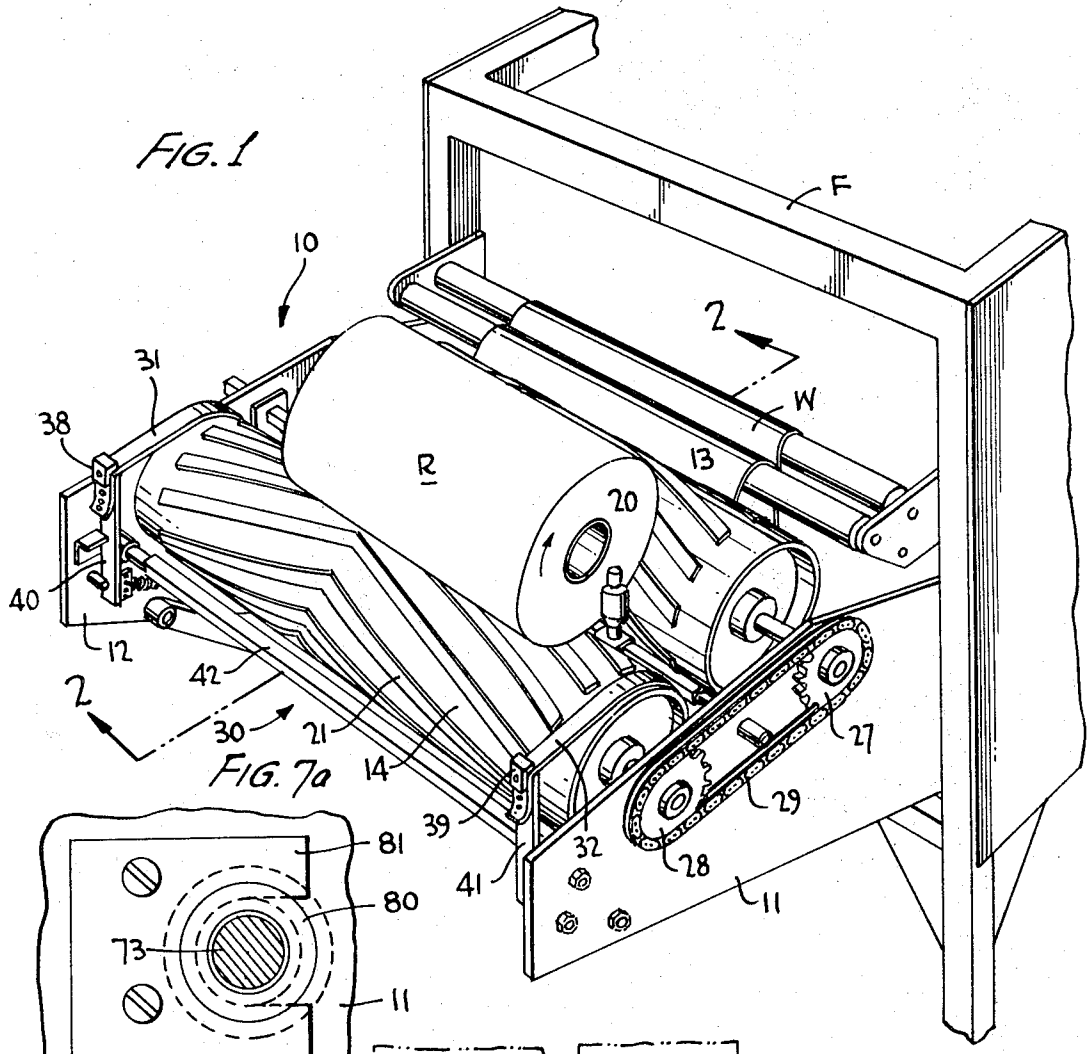
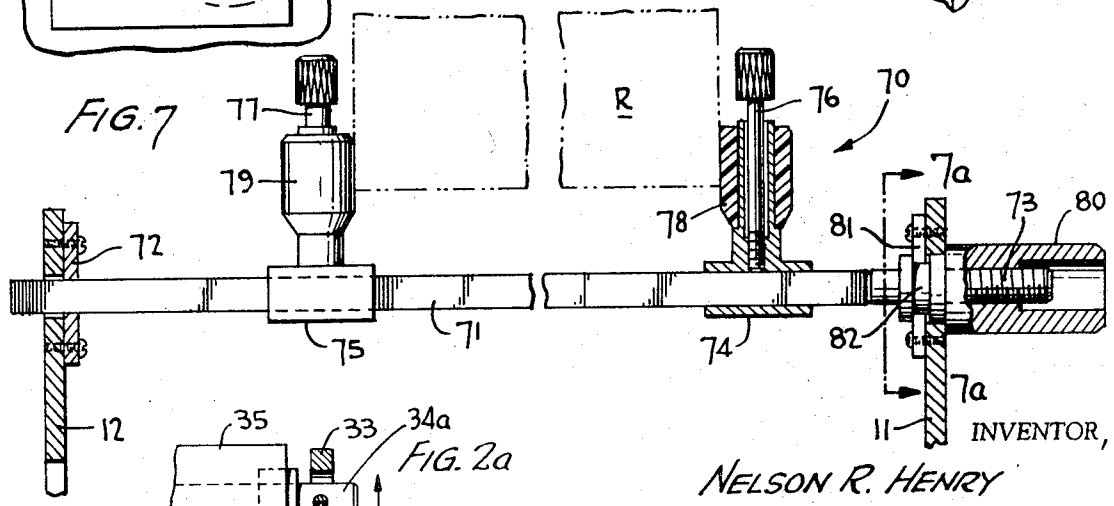


FIG. 7a

FIG. 7



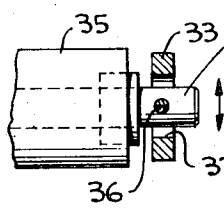


FIG. 2a

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FIG. 2

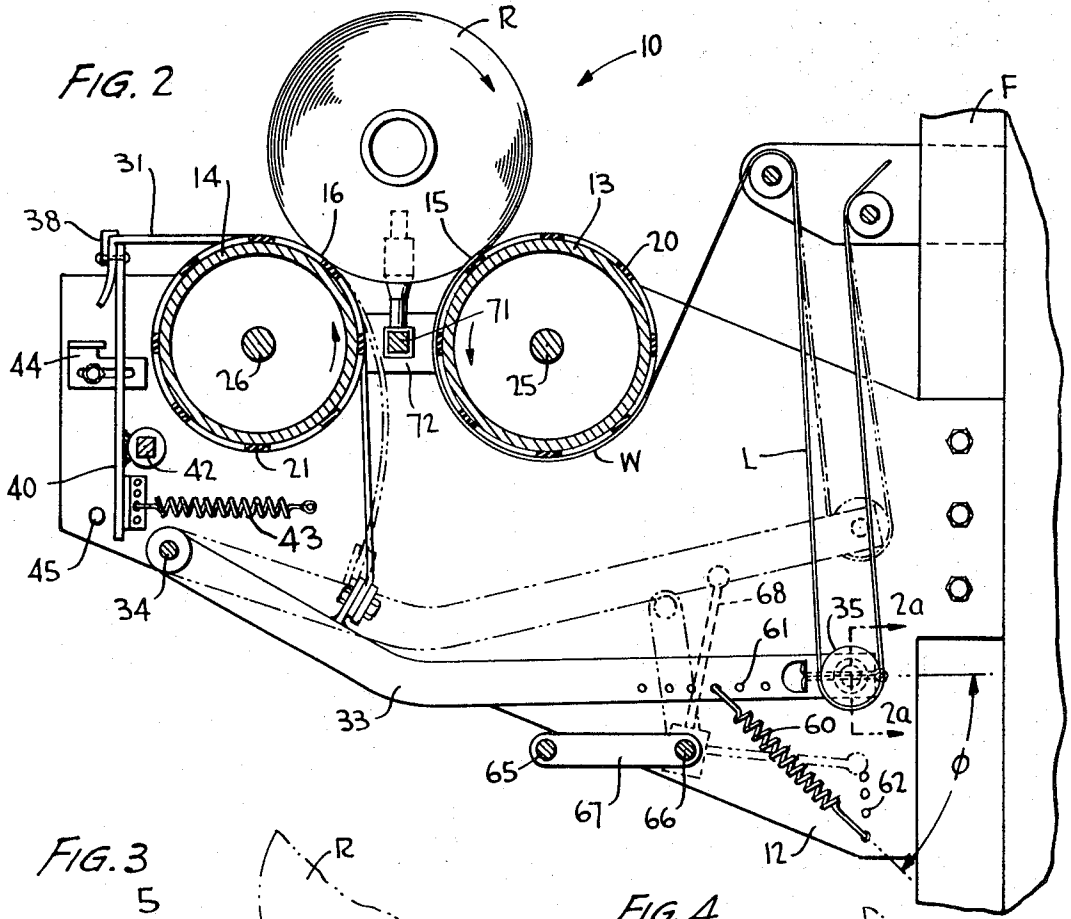

FIG. 3

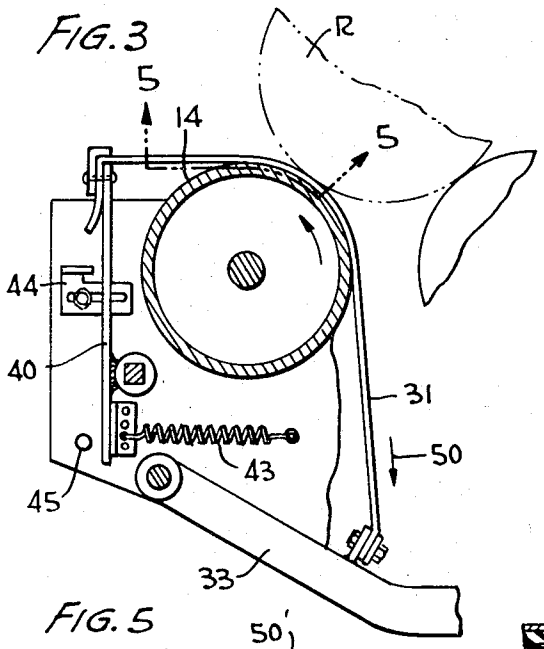

FIG. 4

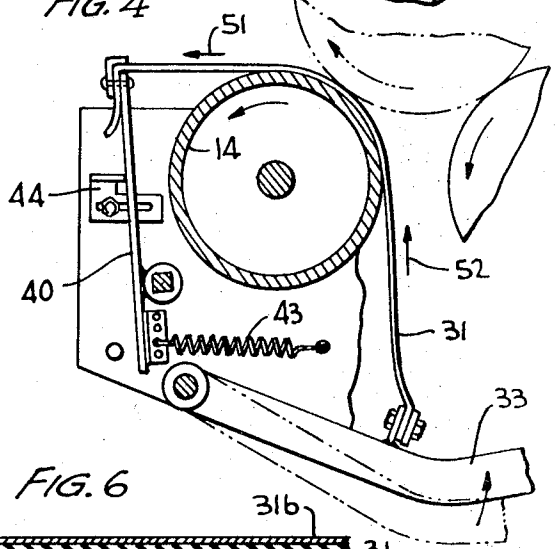

FIG. 5

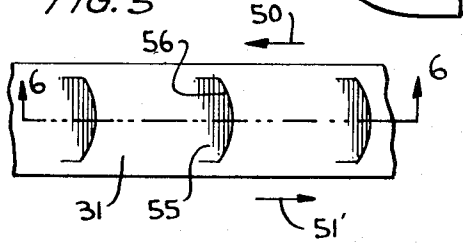

FIG. 6

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WEB ROLL CRADLE FOR LOOSELY WOUND MATERIAL

The present invention relates to apparatus for unwinding a web roll of flexible sheet material and, more particularly, to a web roll cradle wherein the roll is supported for unwinding under controlled tensions without the use of an arbor.

The supporting of a web roll on its periphery between a pair of support rollers has certain advantages over supporting the roll on an arbor extending through its core. One advantage in eliminating the arbor stems from the fact that the rolls without an arbor are lighter and easier to load into position by a single operator thereby saving valuable manpower as well as down time of a packaging machine or the like in which the web is being utilized. For a more complete description of the advantages of a web roll cradle, reference can be made to copending application Ser. No. 661,971 entitled "Web Roll Cradle," filed Aug. 21, 1967, U.S. Pat. No. 3,465,979 and assigned to the same assignee as the present invention.

While the cradle described in the above mentioned application is highly satisfactory for allowing unwinding of web rolls of packaging material without excess slackness and overcomes the many disadvantages of utilizing an arbor, there has been defined a need in the art for supporting and successfully allowing unwinding of a web roll which has been previously wound with excessive looseness. In such a case it is difficult to control slackness in the web on the final turn of the roll as it is unwound during the packaging operation by merely braking the roll and allowing small loops that build up to pass through pockets, as disclosed in said copending application. Furthermore, a need has existed for a web roll cradle in which larger or oversize rolls with corresponding increased inertia can be accommodated without allowing excessive slackness to develop during the periodic decreases in demand and to prevent breaking of the web during increased demand periods.

Accordingly, it is one object of the present invention to provide an improved web roll cradle which is capable of unwinding the web from rolls which have been loosely wound and/or rolls which are oversized.

It is another object of the present invention to provide a web roll cradle which maintains the outer turn of the web on the periphery of the roll tight under all conditions to positively prevent slackness from developing.

It is still another object of the present invention to provide a braking system for a web roll cradle which combines improved braking action with start assist for the support rollers of the cradle to overcome inertia of the web roll to thereby prevent slackness during braking or breakage of the web during starting.

To briefly describe the construction of the apparatus of the present invention, a pair of support rollers are positioned to support a web roll at spaced contact points on its periphery. The rollers are suitably driven during the unwinding operation by the force of the web being pulled by the packaging machine or the like with which the web roll cradle is associated. In accordance with one feature of the present invention, the forward of the two rollers about which the web is trained for delivery to the packaging machine, is slightly larger in diameter and thus in peripheral length than the rear roller, and the rollers are interconnected for driving at the same rotational speed. This means that the surface of the rear roller rotates at a differential speed slower than the forward roller during unwinding so that the final turn of the web normally tends to slip forwardly on the periphery of the roll between the supporting pressure nips or contact points whereby tension in the final turn of the web is assured of being maintained and slackness is prevented.

The difference in diameter of the rollers is generally selected to approximate the amount of differential pull needed to tighten the outer turn of the web on the web roll and is thus proportional to the degree of looseness with which the web is wound. For example, packaging material or film is sometimes wound with more than normal looseness, as contemplated by the present invention, where the film is being printed with advertising matter just prior to being rewound into the roll so that more than normal air space between adjacent turns of the web is required to prevent sticking and transfer of the ink image between the adjacent turns of the web. It has been found by experience that such preprinted packaging film is wound so that an approximately one-sixteenth inch larger diameter forward roller, i.e. approximately three-sixteenths inch larger on the periphery of the roll, causes the desired degree of tightening of the final turn of the web to prevent the deleterious slackness from appearing.

The web is withdrawn from the cradle in accordance with the invention by passing around and under the forward roller through substantially 180° so that the frictional area of contact with the web is greater than at the point of contact of the rear roller. Since the friction coefficients of the surfaces are the same any slippage of the roll with respect to the rollers that may be required when the final turn of the web is tight is maintained solely at the rear roller. This means that the web at all times unwinds at the greater speed prevailing at the forward roller for maximum unwinding efficiency.

According to an important feature of the web roll cradle which further prevents slackness in the web during unwinding is the provision of an improved brake. This feature is embodied in a pair of flexible bands extending substantially 90° around the opposite peripheral end portions of the rear roller; the frictional engagement of said bands being controlled by a dancer arm operating in response to the slackness in a control loop formed in the web previously unwound. Advantageously, the brake band is caused to move in the direction opposite to rotation of said rollers to improve the braking efficiency. The dancer arm is preferably U-shaped with a roller forming the crossmember, which roller is mounted for skewing movement on the side supports whereby any difference in tension from one side of the web to the other is compensated.

An associate advantage gained from driving the brake band to retard the rotation of the roll is the loading of the brake band into a position to move in the direction of rotation of the roller as the demand for the web decreases the size of the loop to assist rotation of the roll during restart or acceleration. Accordingly, the inertia of the roll is overcome as required and possible breakage of the web due to increased tension upon demand for more web is minimized.

Preferably, the return driving of the brake band to provide the assist rotation is accomplished by a simple spring means which is attached to the end of the brake band opposite to that attached to the controlling dancer arm. Means are provided to limit the movement of the band in both the brake and assist directions so as respectively to increase the frictional contact with the roller to progressively increase the braking force as slackness in the web develops and to cause a release of the brake band in the opposite direction to allow substantially free rotation of the roll as the reverse condition develops.

Additional features of the combined web roll cradle and the novel braking system of the present invention include the provision of an eccentric release for the dancer arm to provide easy threading of the web during startup of the machine. Also, the dancer arm is provided with a spring which progressively increases in tension coefficient as the controlled loop decreases to prevent deleterious overtravel of the arm and consequent breakage of the web. Further, especially for excessively heavy rolls with high inertias, the brake band may be provided with novel wedge-shaped slits transverse to the direction of relative movement, to provide increased static friction at an exposed edge of the slit. This gives improved rotational assist to the roll during the startup or accelerating rotation of said roll; said slits in said band being crescent shaped to insure smooth relative movement in the opposite direction during the retarding or braking operation.

An additional feature of the web roll cradle of the present invention is concerned with the provision of adjustable alignment means to maintain the edges of the roll in sidewise alignment of said rollers. In accordance with the invention, each of the upstanding guide rods is adapted for individual adjustment

along a common support rod; said support bar being bodily adjustable for relocating said guide rods in unison for repositioning of said roll on said support rollers. The guide rods themselves advantageously serve the purpose of locking the mounting collars in position of the support bar and the means for adjusting the guide rods in unison includes a captive sleeve threadedly engaging one end of said bar for infinite adjustment.

Still other objects and advantages of the present invention will become readily apparent to those skilled in this art from the following detailed description, wherein I have shown and described only the preferred embodiment of the invention, simply by way of illustration of the best mode contemplated by me of carrying out my invention. As will be realized, the invention is capable of other and different embodiments, and its several details are capable of modification in various obvious respects, all without departing from the invention. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

In the drawings:

FIG. **1** is an overall perspective view of a web roll cradle constructed in accordance with the principles of the present invention;

FIG. **2** is a cross-sectional view taken along line **2–2** of FIG. **1** illustrating the positioning of the support rollers and the combined braking and rotation assist system;

FIG. **2***a* is a cross-sectional view taken along line **2***a*–**2***a* of FIG. **2**;

FIG. **3** is a detailed illustration of the rear roller showing the position of the brake band of the system of FIG. **2** during the braking operation;

FIG. **4** is a detailed illustration of the position of the brake band of the system in the rotational assist or driving mode;

FIG. **5** is a view taken along line **5–5** of FIG. **3** showing the construction of one form of brake band having a one-way clutch which can be utilized with the apparatus of the present invention;

FIG. **6** is a cross-sectional view taken along line **6–6** of FIG. **5** showing in detail the construction of the one-way clutch in the brake band;

FIG. **7** is a detailed cross-sectional view taken along the center line of the web roll cradle with parts removed for clarity, illustrating the apparatus for adjustable centering the roll in said cradle; and

FIG. **7***a* is a cross-sectional view taken along line **7***a*–**7***a* of FIG. **7** showing the end of the support bar and its mounting for overall adjustment of the centering device.

Referring now specifically to FIG. **1** of the drawings, a more detailed description of the apparatus of the present invention will be given to more clearly point out the inventive concepts embodied therein. Thus, a roll cradle **10** is illustrated which can be mounted on any suitable processing machine of which only frame F is shown in FIG. **1**. This machine could, for example, be a form and fill packaging machine wherein a web W of packaging material, such as polyethylene, cellophane, glassine laminates or the like, is unwound from a roll R and subsequently formed into a continuous tube by a longitudinal heat seal, and thence formed into individual packages by applying transverse heat seals and severing along the same. It will be realized, however, that the web roll cradle **10** could equally well be utilized with other types of machines wherein a continuous web of flexible material is required to be supplied under varying demand conditions.

The roll cradle **10** is defined by a pair of side members **11**, **12** which are suitably attached in a cantilever fashion to the frame F of the machine to which the web W is to be supplied. The side frames **11**, **12** rotatably support a front roller **13** and a rear roller **14**, which, as shown, are parallel and extend horizontally so that the roll R of web material may be placed within the space between the rollers for support at spaced contact points or pressure nips **15**, **16** (see FIG. **2**).

The required path of travel of the web W from the roll R is best shown in FIG. **2**, wherein it is shown passing around and under the forward roller **13** for approximately **180** degrees peripheral contact. In the embodiment of the invention shown for describing the same, it will be understood that the web W is pulled by the machine in which the web W is being utilized so that the rollers **13**, **14** rotate in the direction of the arrows in FIG. **2**.

The operative surfaces of the rollers **13**, **14** are provided with a plurality of longitudinally extending strips of resilient material that serve to form a plurality of respective ridges **20**, **21** (see FIGS. **1** and **2**). The ridges **20**, **21** may be herringbone patterned and serve to engage the roll R across the full width thereof. While these strips **20**, **21** form an important function in insuring that the web W is free of creases as it passes from the roll R, this construction forms no part of the present invention and is instead described in detail and claimed in the copending application mentioned above.

The rollers **13**, **14** are supported and journaled in the side frames **11**, **12** on suitable shafts **25**, **26** to which are respectively secured sprockets **27**, **28** of equal diameter, see FIG. **1**. A chain **29** interconnects the sprockets **27**, **28** so that during withdrawal of the web W from the Roll R the rollers **13**, **14** are rotated at the same rotational speed. The forward roller **13** is, in accordance with the principles of the present invention, made larger in diameter than the rear roller **14** so that the latter rotates at a differential speed slower than the former. Because of this construction, the final turn of the web W around the periphery of the roll R is maintained tight from the contact point **16** moving clockwise to the contact point **15**. This tightening of the final turn is effected by slipping with respect to the periphery of the roll R the required amount to progressively take up the slack as said roll R unwinds.

The usual case when operating on preprinted packaging film, which has been intentionally loosely wound to allow final drying and setting of the ink on the film, requires that the forward roller **13** be approximately one-sixteenth inch larger on diameter and approximately three-sixteenth inch larger on circumference to properly take up the slack. However, since it is impossible to obtain the winding of each turn of the web W with exactly the same tension, provision is made for the roll R to slip with respect to the rear roller **14**. This is assured since the rollers are made with the same frictional surface and the web W is in contact with more of the periphery of the forward roller **13** whereby the frictional holding force on the rear roller **14** is less. Thus, unwinding of the roll R continues at the greater speed of the forward roller **13** in all situations for maximum efficiency.

Instead of employing different sized rollers **13**, **14** to cause the rear roller **14** to rotate slower, it is contemplated within the scope of the present invention to utilize other means of causing the requisite differential rotation. For example, by utilizing rollers **13**, **14** of equal diameter and selecting the sprocket **28** to be larger than the sprocket **27**, the rear roller **14** rotates slower in the same manner as in the preferred embodiment. In this case, by merely replacing the sprockets **27**, **28** with the appropriate size, any amount of tension takeup in the roll R may be effected.

In accordance with the teachings of the invention, provision is also made to assure that the roll R is unwound without slackness due to a totally different cause, i.e. overrunning of the roll R due to inertia after a demand for the web W has caused rotation of the roll R. Accordingly, the rear roller **14** is braked by an improved control assembly or system, generally designated by the reference numeral **30** (see FIGS. **1** and **2**), which utilizes a pair of flexible brake bands **31**, **32** at each end of said roller **14**. The bands **31**, **32** may be of any suitable construction, such as a construction including an operative underlayer **31***a* (see FIG. **6**) to give the required frictional properties and a backing layer **31***b* to resist stretching. With composite reference still to FIGS. **1** and **2** of the drawings, the lower ends of the brake bands **31**, **32** are attached by suitable brackets to opposite sides of U-shaped dancer arm **33** pivotally mounted about stub shafts **34**. Journaled for rotation on a stationary shaft **34***a* (see FIG. **2***a*) at the free end of the

dancer arm **33** is a roller **35** which makes a loop L in the web W through cooperation with idler rollers above (see FIG. **2**). The ends of the shaft **34***a* are mounted for pivotal movement transverse to the axis of said roller **35** on cotter pins **36** within the enlarged apertures **37** (note arrow in FIG. **2***a* showing one end). As a result, the side supports of the U-shaped dancer arm **33** are capable of independent movement, whereby variation in tension across the web W is accommodated; this being accomplished through differential upward and downward movement of the side supports or, in effect, skewing of the complete dancer arm **33**.

The opposite ends of the brake bands **31**, **32** are attached by angle brackets **38**, **39** to respective identical control levers **40**, **41** journaled on a support rod **42** (see FIG. **1**). Referring only to the control lever **40** as best seen in FIGS. **2**—**4**, it being understood that the construction of the lever **41** is identical and thus need not be discussed further, a spring **43** is connected to the lower end so as to constantly bias said lever **40** in the counterclockwise direction. This, in turn, tends to apply constant tension to the brake band **31** to cause frictional braking contact with the roller **14** as a result of the substantially 90° turn about the same, as shown in these figures. An adjustable stop **44** is provided to limit the movement of the lever **40** in the counterclockwise direction or in the direction which it is driven by the spring **43**; whereas, a fixed stop **45** controls the action of the lever **40** in the direction in opposed relationship to the spring **43**.

The full operation of the braking mode of the control assembly **30** can now be explained. As demand from the machine being supplied with the web W lessens, the loop L increases (note solid line position of FIG. **2**) so that the dancer arm **33** is lowered whereby the brake bands **31**, **32** are moved in the direction of the arrow **50**, as shown in FIG. **3**. As is clear from this figure, this is opposite to the then prevailing rotation of the roller **14** caused by the unwinding of the roll R so that a retarding effect will be gained and the roll R slowed. Since the brake band **31** is in fact moving counter to the roller **14** the braking efficiency is maximized and, as the loop L approaches its maximum size, the brake bands **31**, **32** are pulled by the dancer arm **33** with greater and greater force against the periphery of the roller **14** in opposition to the spring **43**. When the lower end of the lever **40** has abutted against the stop **45**, the downward limit of the dancer arm **33** is reached and the full action of the dancer arm **33** is operative to cause maximum frictional braking engagement of the brake bands **31**, **32** against the roller **14** so as to stop said roller **14** and prevent further rotation.

As the demand of the machine now cyclically increases, the feed of the web W is initiated by tensioning of the same thereby causing a lessening of the size of the loop L, as denoted, for example, by the dash-dot outline of FIG. **2**. The accompanying raising of the dancer arm **33** allows the brake bands **31**, **32** to move in the opposite direction as denoted by the upper arrow **51** in FIG. **4**; which movement is as a result of the spring **43**, which thus in effect acts as a driving means. Since the roller **14** has stopped rotating, the static friction between the brake bands **31**, **32** is more than sufficient to set up the required driving relationship and, remembering that the brake bands **31**, **32** are in firm frictional engagement with the periphery of the roller **14**, the action of the spring **43** thus serves to initiate rotation of the roller **14** in the desired direction. The lower portion of the bands **31**, **32** assume a relaxed attitude as shown adjacent arrow **52** in FIG. **4** during the driving mode since said portion is isolated from the upper tensioned portion by the frictional contact with the roller **14**.

The initiation of the rotation at startup of the cradle **10** is particularly important when the roll R is oversized and thus of substantial weight. By overcoming the inertia of the roll R, the web W is submitted to substantially less tension than has heretofore been required thereby reducing the possibility of breakage of the web. Furthermore, since rotation is initiated sooner the speed of rotation of the roll R is slower since there is less catching up to do whereby the tendency for overrunning of the roll R due to inertia as the demand again decreases is reduced.

As the arm **33** is continued to be raised by reduction in the loop, the lever **40** is finally brought into abutment with the stop **44** so that the brake band **31** can assume a full relaxed position as shown by the dash-dot line position of FIG. **2**. This allows the roller **14** to assume substantially free rotation so that during the periods of greater demand substantially no resistance to rotation is afforded.

Although the static friction between the brake bands **31**, **32** and the periphery of the roller **14** is in most cases sufficient to provide the required starting force to overcome the inertia of the roll R, it may be desirable in some cases to make provision for a one-way clutch means, as will be described with reference to the brake band **31**. For this purpose, there may be provided in the operative surface of the band **31**, for example, a plurality of wedge-shaped cutouts **55** (see FIGS. **5** and **6**) which provide exposed edges **56** for increased bite against the periphery of the roller **14** in the driving direction (note arrow **50'**). In addition to the increased force with which the roller **14** is thus driven, the point at which the band **31** is released from static to sliding engagement is prolonged thereby increasing the range of maximum driving action. These edges **56** are preferably crescent shaped as shown in FIG. **7** so that the relative movement of the band **31** in the opposite or braking direction is not adversely affected and is substantially smooth. This is so since as the band **31** moves in the braking direction (note arrow **51'**) the edges **56** are directed in reverse or in the same direction as the rotation of the roller **14**. Furthermore, said edges **56** are encountered progressively beginning at the apex of the crescent and then increasingly on each side so that no abrupt contact is made.

With reference again to FIG. **2**, the dancer arm **33** may be provided with a specially oriented spring **60** to assist in efficiently regulating the action of the loop L. As illustrated, the spring **60** is adjustably attached to the dancer arm **33** to a reverse acute angle Φ by selectively positioning the opposite ends in adjustment holes **61** in the dancer arm **33** and holes **62** in the side frame **12**. As a result of this, the spring **60** is provided with an effective tension coefficient which progressively increases as the size of the loop L decreases. In other words, as the demand for feed of the web W increases the dancer arm **33** resists upward movement with greater force. This arrangement assures that there is no possibility of overtravel of the dancer arm **33** outside the normal arc (see FIG. **2**) during periods of increased demand where a fixed part of the framework might otherwise be encountered thus snapping the web W.

During startup of the machine with a new roll R, it is desirable that the control system **30** be released so that the web W may be threaded with ease. For this purpose, a rod **65** extending across the width of the cradle **10** and eccentrically mounted with respect to pivot shafts **66** by spaced arms **67** (FIG. **2**, only one of each being shown) is provided. One pivot shaft **66** is provided with an operating lever **68** for rotating the support rod **65** into position under the dancer arm **33** and upon further rotation to raise the same to the dash-dot position of FIG. **2**. In this latter position, it can be seen that the brake band **31** is slackened so as not to substantially hinder the rotation of the roller **14** thereby allowing the web W to be pulled from the roll R and fitted about the rollers **13**, **37**, **35** and **36** in the feed path.

Referring now to FIG. **7**, the roll R is positioned in the center of the cradle **10** by an improved centering mechanism, generally designated by the reference numeral **70**. To explain this construction, mounting bar **71** extends across the full width of said cradle **10** and through the side frames **11**, **12**. The right-hand end of the bar **71** is mated with a square aperture in retaining plate **72** to hold the bar **71** in nonrotative position whereas the left-hand end is round and provided with a threaded end portion **73**.

Adjustably positioned along the length of the bar **71** are a pair of collars **74**, **75** to which are attached upstanding

threaded rods 76, 77, respectively. The lower ends of the rods 76, 77 are adapted to engage the bar 71 so that upon tightening of said rods the collars 74, 75 are locked in the desired position. Rotatably carried by the rods 76, 77 are guide sleeves 78, 79, respectively, which may be made of any suitable material, such as plastic, with a bearing sleeve at the center thereof to reduce the effects of wear. The guide sleeves 78, 79 may thus be quickly and conveniently brought into juxtaposition with the ends of the roll R by the operator by simultaneously operating the knurled free end of the rods 76, 77 with his two hands, shifting the respective collars 74, 75 along the bar 71 to the desired position and relocking the collars 74, 75.

After the individual adjustment has thus been made an adjustment of the guide rollers 78, 79 together may be desirably or necessary to bring the roll R to a position along the centerline of the cradle 10. This may be effected in accordance with the present invention by use of a threaded sleeve 80 which is held captive to the side frame 11 by yoke plate 81, the edge of which is in engagement with a circular groove 82 in the sleeve 80 (see FIGS. 7 and 7*a*). Thus, upon rotative adjustment of the sleeve 80 the screw 73 acts as a jackscrew to shift the support rod 71 across the cradle 10 to thereby move the guide sleeves 78, 79 in unison to reposition the roll R as desired.

Upon review of the above description the several advantages of the apparatus of the present invention will be understood. First, the provision for rotation of the supporting rollers 13, 14 at a differential speed with the forward roller 13 over which the web W is unwound rotating faster, provides an arrangement wherein the final turn of the roll R between the contact points 15, 16 is maintained in a slack-free condition. With the provision of the highly effective control system 30, the braking of the roll R is automatically controlled in a highly efficient manner by combined reverse movement and tensioning of the brake bands 31, 32 in accordance with the slackness sensed in the web W by the dancer arm 33. The control system 30 further acts through the same brake bands 31, 32 to drive the rear roller 14 in its direction of rotation each time there is an increase in demand for the web W so as to effectively overcome the inertia of the roll R. The centering mechanism 70, because of its individual and unison adjusting features, allows more efficient positioning of the roll R in the cradle 10 with assurance of the precise centering required for proper feeding of the web W.

In this disclosure, there is shown and described only the preferred embodiment of the invention, but, as aforementioned, it is to be understood that the invention is capable of various changes or modifications within the scope of the inventive concept as expressed by the accompanying claims.

I claim:

1. An arborless roll cradle for supporting a web roll during intermittent unwinding operation by pull on the web free of said roll comprising a pair of elongated support rollers having parallel and horizontally disposed axis, said rollers being spaced to allow said roll to be supported at spaced contact points on the periphery of the same, said rollers including a forward roller to receive the web from the periphery of the roll and direct the same away from the roll during the unwinding operation and a rear roller, means for positively rotatively connecting said rollers together so that the surface of said rear roller rotates at a differential speed slower than said forward roller, whereby the final turn of said web normally slips on the periphery of said roll between said contact points to maintain tension therein, said forward roller contacting said web around at least substantially 90° and the operative surfaces of said rollers are provided with the same frictional properties whereby slippage is assured of being maintained solely at said rear roller when said final turn of said web is tight, and frictional brake means applied to the surface of at least one of said rollers to insure against overrunning of said rollers and slackness in said web.

2. The combination of claim 1 wherein said forward roller contacts said web around substantially 180° to increase the frictional contact at said forward roller.

3. The combination of claim 2 wherein said brake means comprises a flexible band extending around a portion of one of said rollers and control means for operating said brake means in response to slackness in said web, whereby excess slackness in said roll is prevented.

4. The combination of claim 3 wherein said control means includes a dancer arm making a loop in said web after passing from engagement with said forward roller, said brake band being attached to said dancer arm so as to move opposite to the rotation of said one roller upon sensing an increase in size of said loop, and means to move said brake band in the direction of rotation of said one roller to assist rotation of said rollers and thereby overcome inertia of said roller upon sensing a decrease in size of said loop.

5. The combination of claim 4 wherein is provided means to limit the movement of said brake band in the direction of rotation of said rollers whereby said brake band becomes slack upon reduction of said loop to a minimum to allow substantially free rotation of said rollers.

6. An arborless roll cradle for supporting a web roll during intermittent unwinding operation comprising a pair of elongated support rollers having parallel and horizontally disposed axes, said rollers being spaced to allow said roll to be supported at spaced contact points, the improvement comprising brake means for retarding said rollers, control means for operating said brake means in response to the slackness sensed in said web, said brake means being driven by said control means in the direction opposite to the direction of rotation of said rollers to retard said roll upon sensing an increase in slackness, and means for driving said brake means in the direction of rotation of said rollers to assist in overcoming inertia of said roll upon sensing a decrease in slackness.

7. The combination of claim 6 wherein said brake means includes a flexible band trained around and frictionally engaging a peripheral portion of one of said rollers, said control means includes a pivotal dancer arm connected to a first end of said brake band, means carried by the free end of said dancer arm to form a control loop in said web and said drive means being interconnected with a second end of said brake band.

8. The combination of claim 7 wherein said drive means includes a pivotally mounted lever connected to said second end of said brake band, and spring means for pivoting said lever to drive said brake band in the assist direction.

9. The combination of claim 8 wherein is further provided adjustable stop means for limiting the movement of said lever in the assist direction so as to allow release of said brake band from said one roller, and stop means to limit movement in the braking direction to cause said brake band to be tightened upon increase in slackness in said web as represented by an increase in size of said loop.

10. The combination of claim 7 wherein is provided eccentric release means for engaging said dancer arm to effect reduction of said loop and release of said brake means to allow free rotation of said rollers during threading of said web.

11. The combination of claim 7 wherein is further provided a spring attached to the free end of said dancer arm to tend to form said loop, said spring having a tension coefficient which progressively increases as the size of the loop in said web decreases whereby to prevent overtravel of said arm in response to a sudden demand in said web.

12. The combination of claim 6 wherein said brake band is provided with one-way clutch means for increasing the frictional engagement of said brake band against said roller in the assist direction to increase the force and range of the driving action overcoming inertia of said roll.

13. The combination of claim 12 wherein said clutch means include crescent-shaped slits in said band for providing reaction edges in the direction of rotation, the portion of band bounded within the area defined by said slits serving to provide smooth retarding during movement in the braking direction.

14. An arborless roll cradle for supporting a web roll during unwinding operation including a pair of elongated support rol-

lers having parallel and horizontally disposed axes, said rollers being spaced to allow said roll to be supported at spaced contact points on the periphery of the same, the improvement comprising upstanding alignment rods extending through the space between said rollers perpendicular to said plane, guide means on said rods for engaging the respective end faces of said roll to maintain centering on said support rollers, a support bar extending along the length of said rollers for said rods, means on said bar for allowing individual adjustment of said rods with respect to the end faces of said roll and means at one end of said bar to adjust said rollers in unison to cause repositioning of said roll on said support rollers.

15. The combination of claim **14** wherein said individual rod-adjusting means comprises a threaded portion at said one end of said rod, and a collar on said bar threadedly engaged by said threaded portion of said rod, said one end of said rod being adapted to engage said bar through said collar to bind the same in adjusted position.

16. The combination of claim **15** wherein said bar and said collar are polygonal to prevent relative rotation, means for holding said bar against rotation with respect to said rollers and wherein said unison adjusting means includes a captive sleeve threadedly engaging said one end of said bar.

17. An arborless roll cradle for supporting a web roll during intermittent unwinding operation comprising a pair of elongated support rollers having parallel and horizontally disposed axis, said rollers being spaced to allow said roll to be supported at spaced contact points, the improvement comprising brake means for retarding said rollers, control means for operating said brake means in response to the slackness sensed in said web, said control means including a U-shaped dancer arm having cross means forming a control loop in said web and spaced support means for said cross means, the ends of said cross means being mounted for relative movement with respect to said support means such as to allow skewing of said dancer arm to accommodate differential tension across said web.

18. The combination of claim **17** wherein is provided means for mounting said ends for pivotal movement transverse to said cross means.

19. The combination of claim **18** wherein said ends pass through an enlarged aperture of said support means, said mounting means including a cotter pin passing through said enlarged aperture.