Oct. 15, 1968 D. A. DALY ETAL 3,405,855

PAPER GUIDE AND DRIVE ROLL ASSEMBLIES

Filed Jan. 24, 1967 2 Sheets-Sheet 1

Fig. 1

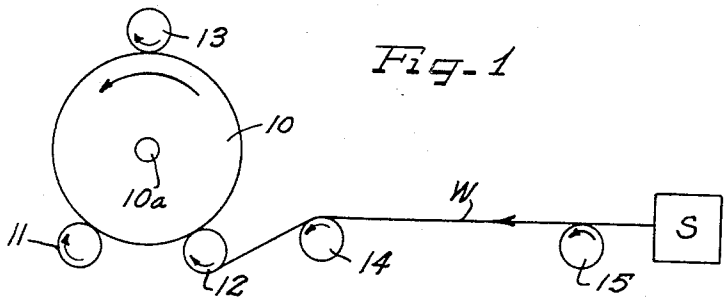


Fig. 2
PRIOR ART

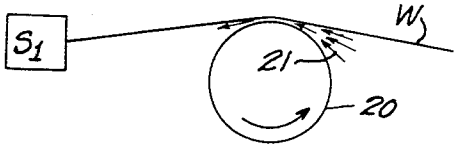


Fig. 3

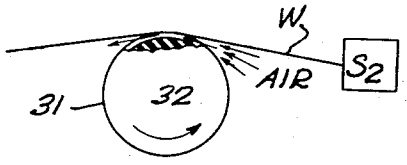


Fig. 4

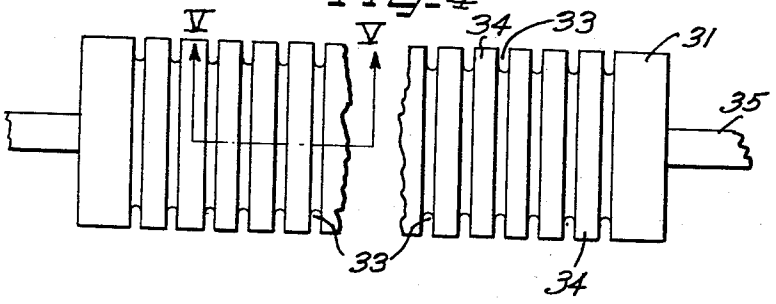


Fig. 5

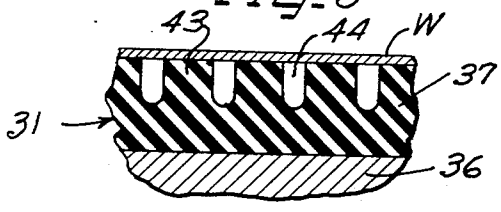


Fig. 6

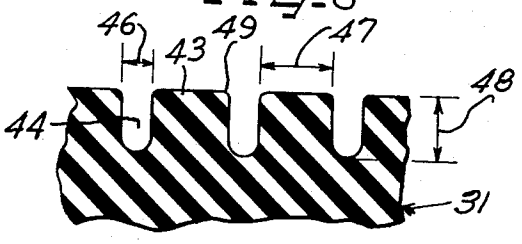
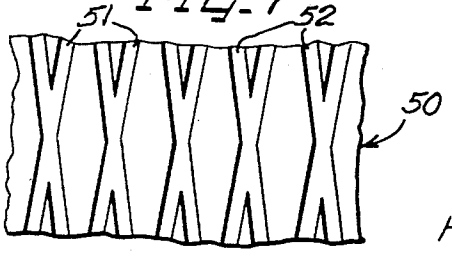


Fig. 7



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PAPER GUIDE AND DRIVE ROLL ASSEMBLIES

Filed Jan. 24, 1967 2 Sheets-Sheet 2

Fig. 8

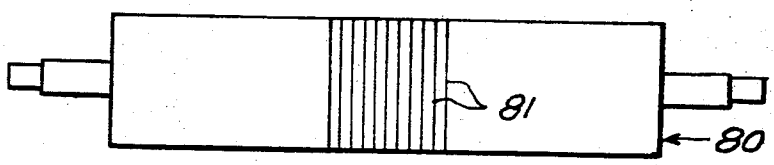


Fig. 9

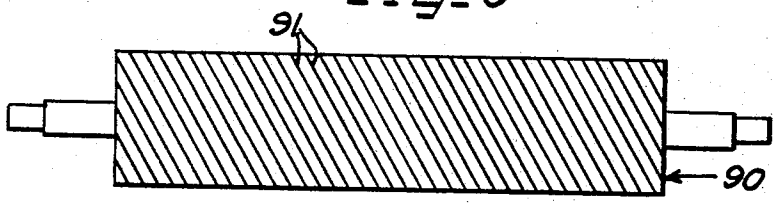


Fig. 10

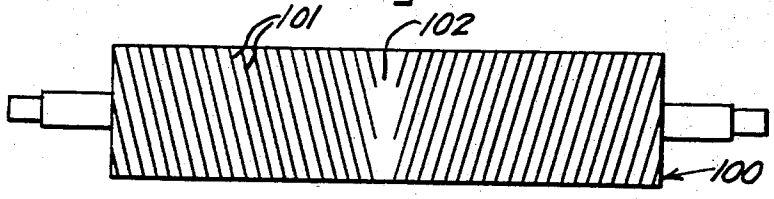
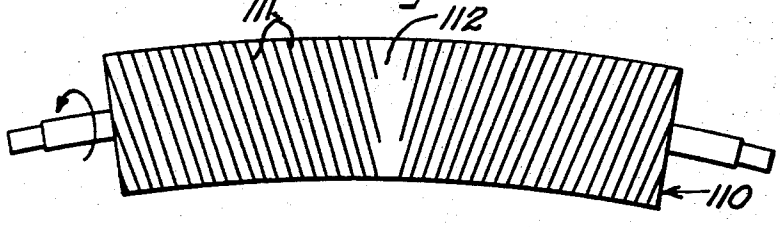


Fig. 11



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PAPER GUIDE AND DRIVE ROLL ASSEMBLIES

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Continuation-in-part of application Ser. No. 533,658, Mar. 11, 1966. This application Jan. 24, 1967, Ser. No. 611,426

27 Claims. (Cl. 226—1)

ABSTRACT OF THE DISCLOSURE

A high speed traveling web traction and guide apparatus having peripheral venting grooves and supporting land areas to vent air carried by the underside of the traveling web and prevent marking of the web. Various groove configurations are provided for specific purposes and this apparatus is usable as a guide roll, winder drum and similar apparatus. The sole purpose of the abstract is to enable the general public to quickly determine from a cursory inspection, the nature and gist of the disclosure, and the abstract shall not be used to limit or interpret the scope of the claims.

This is a continuation-in-part application of our co-pending application Ser. No. 533,658, filed Mar. 11, 1966.

In a high speed paper handling winder or rewinder mechanism wherein traveling webs of paper are passed over undriven or driven guide rolls at high surface speeds with only a light tension in the traveling paper web, air tends to be carried onto the guide roll surface by the traveling web forming an air cushion. The amount of air cushion is a function of speed of the mechanism and other various complex factors. The formation of a cushion is undesirable as it tends to lift the traveling web from contact with the guide roll surface. Having been lifted from the surface of the roll, the air cushion tends to make the paper skid or otherwise be deflected, causing paper surface markings, variations in tension and deviations in the path of movement of the paper web. The cushion of air also tends to permit an undriven guide roll to slow down in its speed of rotation and when the air cushion decreases with a subsequent paper speed decrease, the traveling web surface will again contact the roll surface and the relative movement between the two surfaces will cause undesirable marking of the paper surface, skidding, tension deviations and deviations in the path of movement of the paper web, all of which is undesirable in a winding or rewinding operation.

Further, in high speed handling mechanisms wherein the paper is being wound or rewound into a roll by the use of a nip between the rewind roll and a winding drum, it has been attempted to provide channels in the drum surface so that air being carried on the paper web and the drum surface will be able to be somewhat relieved, thus allowing the paper web to maintain some physical contact with the drum during the area of contact proceeding the nip. However, previous efforts to operate winding drums and the like have generally left something to be desired; either in inadequate contact between the web and the drum or in other instances, some forms of indentation on the drum surface have resulted in insufficient support or backing of the web to permit the web to resist any tendency to draw air in between the windup roll and the traveling web so as to push the web into such indentation, thereby entrapping air in the windup roll.

It is, accordingly, an object of the present invention to provide an improved guide roll and drive assembly for handling traveling paper webs with light web tension wherein undesirable surface markings of the paper is eliminated.

Another object of the invention is to provide an improved guide roll drive by contact with the paper web wherein the tendency to build up a cushion of air between the traveling web and the roll surface is eliminated thereby providing improved traction between the web and roll surface. The guide roll will thus continue to maintain good contact with the traveling paper web and will continue to hold the web accurately in its path of movement and will continue rotating with a surface speed substantially equal to the exact speed of movement of the traveling paper web.

A still further object of the invention is to provide an improved winding drum assembly for surface winding traveling paper webs wherein the tendency to trap air between the layers of paper being wound is eliminated and the paper forms usable rolls without bursting or the like.

Yet another object of the invention is to provide an improved winder drum having venting grooves on its peripheral surface which substantially eliminate an air cushion between the traveling web and the drum surface and provides adequate support and backing for the paper web so that the paper forms uniform rolls having more intimate paper to paper contact without any air entrapment between the layers of the paper in the rolls.

The invention contemplates providing a guide roll assembly for a paper web, including means for delivering a traveling paper web, such as used in a paper roll winder or rewinder and a freely rotatable guide roll and/or an independently driven guide roll engaging the web with the surface partially wrapped thereby and being driven thereby, in the case of the freely rotatable roll, and a plurality of alternating grooves and ridges generally uniformly aligned in certain configurations on the peripheral surface of the roll, purging the air carried over the roll surface by the oncoming traveling web.

The invention further contemplates providing winding drums on a surface winder with a plurality of alternating grooves and ridges generally uniformly aligned in certain configurations on the surface of the winder, said grooves having relatively narrow, deep configurations to eliminate the tendency to pump air into the rewind roll while providing adequate support for the web.

Other objects, features and advantages of the invention will become apparent with the teaching of the principles of the present invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims and drawings, in which:

FIGURE 1 is a schematic view showing rolls as arranged in a winder mechanism for handling a traveling paper web embodying a guide roll structure and operating in accordance with the principles of the present invention;

FIGURE 2 is an enlarged schematic elevational view showing the effect of an air cushion on the structure heretofore used;

FIGURE 3 is a schematic elevational view, with parts broken away, showing a roll structure operating in accordance with the teachings of the present invention;

FIGURE 4 is a generally perspective view showing one embodiment of the guide roll of the present invention;

FIGURE 5 is a fragmentary schematic sectional view taken substantially along the line V—V of FIGURE 4, showing a cross-sectional view of the preferred embodiment of the guide roll;

FIGURE 6 is a view somewhat similar to FIGURE 5 showing additional detailed features of the preferred embodiment of the guide roll;

FIGURE 7 is a fragmentary enlarged plan view of another form of the guide roll;

FIGURE 8 is a generally schematic view showing a different embodiment of the guide roll of the present invention;

FIGURE 9 is also a generally schematic view showing another embodiment of the guide roll of the present invention;

FIGURE 10 is a further generally schematic view showing a yet further embodiment of the guide roll of the present invention; and

FIGURE 11 is a generally schematic view showing a somewhat different embodiment of the guide roll of the present invention.

As shown on the drawings

FIGURE 1 shows a winder mechanism, schematically, with a paper roll **10** having an inner core **10***a* being wound, supported on and driven by winder drum **11** and winder drum **12** with a rider roll **13** (which may or may not be independently driven) at the top of paper roll **10**. Drums **11** and **12** normally drive paper roll **10** by frictional engagement, however, in certain instances, it may be desirable to provide other suitable drive means. A traveling paper web W is directed to the paper roll **10** at relatively high speeds from a suitable web supply means, indicated diagrammatically at S. The traveling paper web W passes over guide rolls **14** and **15** and drives them by frictional contact with their respective peripheral surfaces, or in certain instances, guide rolls **14** and **15** may be independently driven. As will be appreciated, the web supply means S may be a slitter mechanism which receives a relatively wide paper web from a calender stack or the like and cuts or shears the wide web into somewhat narrower sheets or ribbons and then by menas of an appropriate spreading mechanism, directs the individual ribbons to separate winder or rewinder mechanisms.

The guide roll **14** supports and directs a portion of the web between the web supply means S and the web receiving means in the form of the winder drum **12**. For satisfactory operation at high speeds, the web portion between the web supply means S and the web receiving means **12** must be accurately tracked to prevent weaving and shifting from side to side of the web, as such movement by the web will tend to produce an unsatisfactory paper roll. Guide roll **14** is generally a freely rotating roll having a relatively small angle i.e., generally less than 45°, wrapped by the paper web and driven by surface engagement with the web. Of course, guide roll **14** may also be provided with independent drive for certain applications. While the guide roll **14** is shown schematically in a location leading directly to the winder, it will be appreciated that it may be employed at various other locations. Winder drum **12** and guide roll **14** are generally of the same structure, and if desired, guide roll **15** may also have a similar structure.

As shown in FIGURE 2, during high speed winding or rewinding operations a boundary layer of air, generally indicated at **21**, is pulled into and squeezed between the driven or undriven plain surface cylindrical guide roll **20** and the moving paper web W. This cushion of air **21** results in a lifting of the paper web W, causing it to lose traction between the surface of the roll **20** and the web W and a speed differential occurs when the web contact is lost. The speed difference will be small in the case of a driven roll and large in the case of an undriven roll. During deceleration of the roll and/or web, the air cushion is lost or sufficiently decreased so that the roll surface and web will again come into surface contact, causing relative slippage or skidding between the web and roll surface. This results in undesired sheet marking, as the finished web is extremely susceptible to any surface marking. In addition, this slippage also results in tension variations in the paper web, which is also highly undesirable in respect to the operation of, for example, a slitter mechanism indicated diagrammatically at S_1. Further, such variations in web tensions are also undesirable in winding or rewinding operations as well, as the paper roll then tends to become uneven and otherwise objectionable instead of forming a uniform roll.

The building up of the air cushion **21** also causes lateral skidding, weaving and shifting from side to side of the web sheet, all of which deviations cause the web to deviate from its normal path of travel, which is highly undesirable in the operation of a winding or rewinding mechanism, as it tends to produce uneven paper rolls.

In accordance with the principles of the present invention, instead of providing a plain surface roll **20**, a guide roll **31** is provided, (FIGURES 3 through 6), which has venting means in the surface thereof, preferably in the form of alternating generally circumferentially aligned grooves **33** and ridges **34**. As shown in FIGURE 3, a traveling paper web coming from, for example, a slitter S_2 and passing over a guide roll **31**, tends to carry air with it over the surface of the roller, however, in accordance with the principles of the present invention, the air is purged or vented from the surface of the roller **31** by means of the alternating grooves and ridges and cannot form an air cushion between the web and roll surface, thus allowing continuous contact and traction between the web and roll surface for improved tracking and tension abilities. The plurality of alternating grooves and ridges generally uniformly aligned in a particular configuration, as the generally circumferential configuration shown in FIGURE 4, may be directly cut onto a roll surface with appropriate cutting tools, or the roll surface may be so-formed in its manufacturing process. Further, in certain instances it has been found that suitable roll sleeves or covers can be formed from a relatively soft material and the grooves and ridges cut thereon and the sleeve then slipped over a suitable plain surfaced roll. The roll surface may be formed of any suitable material such as aluminum, steel, or a solid elastomer, such as polyurethane, rubber, etc. The roll surface, as illustrated in FIGURES 5 and 6, is an elastomer. It has been found that various elastomers or blends thereof, yield surface properties, especially in regard to the coefficient of friction, which are highly useful when different grades of paper are being processed or, when materials other than paper are being wound, rewound, etc.

The grooves and ridges on the surface of a roller must be so-formed as to present generally cylindrical smooth exterior or peripheral outer operating surfaces or land areas for supporting the paper web and preventing it from entering the grooves, as this would cause surface marking, while the grooves must be so-formed as to have sufficient volume (expressed as cross-sectional area) to allow venting or purging of the air trapped by the paper web to ambient atmosphere at the oncoming and off-running sides of the area of web wrap. FIGURE 5 illustrates a paper web W being supported on a plurality of alternating smooth generally cylindrically, closely axially spaced land areas **43** which permit the paper web W to bridge the grooves **44** and thereby protect the paper web against any marking by the roll surface while allowing the grooves **44** to vent the entrapped air to ambient atmosphere. The portion of the roll **31** shown at FIGURE 5 has an outer covering or sleeve **37** composed of a suitable material as mentioned earlier and which is supported on a metal surface **36**. This manner of construction permits economical replacement of the outer surface **37**, if and when such becomes necessary or desirable, due to wear and/or damage.

The preferred groove roll **31** is shown in fragmentary detail in FIGURE 6, and the grooves **44** are here shown as having a substantially uniform axial dimension **46** that is substantially in the range of 0.02 to 0.095 inch between generally cylindrical (smooth) land areas or ridges **43** alternating with the grooves **44**, with such land areas **43** having an axial dimension **47** that is substantially in the range of 0.200 to 0.900 inch. Preferably, the range of the axial groove dimension **46** is within the range of 0.02 to

0.08 inch and the preferred land axial dimension **47** is substantially in the range of 0.200 to 0.600 inch which is approximately 2 to 30 times the groove mouth axial dimension **46**, thereby giving a preferred open area on the surface of the grooved roll **31** of substantially in the range of 10% to 40%, however, generally the open area is preferably not more than substantially 33⅓ % and most preferably the open area is substantially in the range of 25% to 12%. The grooves **44** extend radially inwardly to a depth **48** substantially within the range of 0.03 to 0.30 inch. The grooves **44** are defined between generally radially extending parallel walls which are axially spaced a distance **46** of the axial groove mouth dimension. It has been found that it is generally desirable to have a ratio of land axial dimension to groove axial dimension substantially in the range of 5:2 to 30:1. It has also been found that the ratio of groove width to groove depth is preferably in the ratio of approximately 2:3 to 1:10. To express this in another way, it has been found that it is generally necessary to have sufficient land area to fully support and present a generally solid surface for contacting the traveling web, while at the same time present grooves having sufficient volume (as a function of cross-sectional area) to receive and vent all of the air entrapped by the oncoming web which is carried over the roll surface. In one embodiment, the grooves have an axial dimension at the roll periphery of 0.02 to 0.04 inch when used as a winder drum, and 0.04 to 0.095 when used on guide rolls and the like. In either case the grooves generally extend inwardly at least about 0.03 inch between side walls that are axially spaced at least as much as said groove axial dimension at the roll periphery. The ridges of a guide roll have an axial dimension at the roll periphery of approximately 0.20 to 0.60 inch and in the case of the winder roll, have an axial dimension in the range of 0.60 to 0.90 inch. It has been found that substantial amounts of marking of the traveling web can be avoided by providing the ridges **43** with blunt shoulders **49**, as best seen at FIGURE 6, to prevent any undesired marking or cutting by these ridge shoulders of the web as it passes thereover under light tension.

FIGURE 7 shows a fragmentary portion of the surface of a guide roll **50** having a different configuration of grooves and ridges from that shown in FIGURE 4. Guide roll **50** is provided with two sets of alternating generally circumferentially aligned spiraling grooves and ridges **51** and **52** which intersect from time-to-time to define generally diamond shaped land areas so as to have a total open area substantially in the range of 10% to 40%. This particular groove configuration is useful on winder rolls and the like where a maximum amount of web support is necessary with a relatively large open area to obtain a uniformly wound roll having intimate paper to paper contact.

When the grooved guide roll of the present invention is used at the winder drum position, it serves to purge or vent the air from between the oncoming web and the winder drum, while at the same time prevents air from becoming entrapped between the oncoming web and the windup roll. This is primarily due to the capacity of the groove to carry a large volume of air while at the same time presenting sufficient land areas to fully support the web and give it backing as it is being wound around the windup roll. Expressed in another manner, the narrow width of the grooves allows the web to substantially bridge the grooves and not be deflected thereinto, so that an essentially flat surface is presented to the windup roll on the opposing side of the web. Being flat and substantially solid, this winder roll surface excludes air from being carried by the oncoming web into the winding roll, thus preventing any air from being entrapped between the layers in the winding roll. As will be appreciated, air wound into a paper roll will cause machine direction bursting or shearing in the winding roll.

FIGURE 8 shows a generally schematic view of another configuration of grooves and ridges usable on a guide roll of the invention. Guide roll **80** is provided with grooves **81** which extend over a relatively narrow portion of the outer periphery of the roll surface, generally in the center of the roll **80** as shown. In one embodiment of this configuration, between 10% to 30% of the roll periphery is grooved to obtain proper air venting while excessive traction which is undesirable when working with certain types of 'baggy" webs is avoided. This type of configuration is highly useful in guide rolls where the web must be allowed a certain degree of lateral or cross-machine freedom while being guided to a winder drum or the like.

As will be appreciated, the grooves provided on the peripheral surface of guide rolls, winder drums and similar apparatus not only vent the air cushion from between the traveling web and the peripheral roller surface but also increase the velocity of the air being vented through the grooves. The increase of air velocity tends to cause a pressure differential to develop between ambient air and the air within the grooves. A partial vacuum develops so as to pull the web onto the peripheral roller surface to achieve more intimate contact between the web and the roller surface allowing greater traction than otherwise possible. Referring back to FIGURE 8, another embodiment that can be used to achieve controlled traction may be defined as differential grooving. In this embodiment, the grooves are spaced across the entire roller surface, but from the center of the roll outwardly, they become progressively more narrow and more shallow to effect progressively less efficient venting toward the edges of the roller. Progressively less efficient venting of air permits relative cross-machine freedom of the traveling web toward the edges of the roller and yet allows sufficient traction at the center of the roller to adequately guide the web as desired. Certain "baggy" webs must have cross-machine freedom as they are being guided over a roller so that the baggy spots in the web do not bunch up or pucker but are allowed to smooth out while traveling over the roller. The groove configurations discussed in conjunction with FIGURE 8 allow sufficient traction to hold a traveling web from any side to side shifting by a relatively narrow fully efficient section of grooving near the center of the roll, and leave the remainder of the roll smooth, or at least only differentially grooved so that some air film will be developed to allow web imperfections to smooth out while traveling over the roll.

FIGURE 9 illustrates a still further groove configuration usable on a guide roll. The guide roll **90** is provided with spiral grooves **91** extending substantially over the entire roll periphery. The spiral of the groove is preferably at a pitch of 2 to 5 inches. A pitch may be defined as the ratio between the height to the span, i.e., the ratio between a point along the radial direction and a point along the axial direction. As will be appreciated, groove configurations with the greatest pitch, i.e., 3 to 5 inches, are preferred for winder drum application, while groove configurations having the least pitch, i.e., 2 to 4 inches, are preferred for guide roll application. The spiral of the grooves may be either a right-hand spiral or a left-handed spiral. FIGURE 9 shows a right-handed spiral, but as will be readily apparent, a left-handed spiral may be provided if desired. This type of groove configuration is especially useful for guide rolls after a slitter mechanism to guide a portion of the slit web toward a winder roll, but this configuration may also be used on winder drums as it provides excellent support and sufficient venting.

FIGURE 10 shows yet a further groove configuration usable on a guide roll of the present invention. The guide roll **100** is provided with a relatively sharply converging groove **101** which converges toward the center of roll **100** at an angle to the roll axis substantially in the range of 10° to 65°. The center land **102** of roll **100** is provided as a means of indicating and may be omitted if desired. This type of configuration has been found to be especially

effective on guide rolls and winder drums wherein a traveling web must be provided with sufficient land support areas and efficient venting to achieve good traction.

FIGURE 11 shows yet another embodiment of the invention wherein the grooves of the present invention may be provided on a Mount Hope type roll. Mount Hope rolls are well known to the art and need be described here only sufficiently to point out the novel concepts of the invention. Roll **110** is provided with an inner flexible shaft in accordance with the general structure of the Mount Hope roll and has a relatively flexible outer covering in order to allow it to flex or bow at its center, away from the plane of the roll axis. Mount Hope roll **110** is provided with grooves **111** somewhat similar to those previously described in FIGURES 8 through 10, depending primarily on the contemplated use. The Mount Hope type of roll, having a groove configuration on its periphery is especially useful to obtain spreading or shifting of two parallel running webs, such as would be encountered immediately after a slitter mechanism.

It will be understood that the guide roll of the present invention and the grooves thereof may be used at any position in the paper machine wherein it is necessary or desirable to maintain direct surface contact and traction between a traveling web and the roll surface, however, it has been found that the grooved roll has a preferred use as a guide roll, a winder drum, a lead-in roll to the slitter, a spreader roll immediately after the slitter directing the web to the rewind rolls, etc.

Thus, it will be seen that we have provided an improved guide roll and drive assembly for use with a windr or rewinder mechanism, or other similar mechanisms which meet the objectives, advantages and features above set forth. The mechanism provides a solution to the problem which has arisen with high speed web winding and which occurs with low web tensions as used in winder-type mechanisms.

The drawings and specification present a detailed disclosure of the preferred embodiments of the invention, but it is to be understood that the invention is not limited to the specific form disclosed, and covers all modifications, changes and atlernative construction and methods falling within the scope and spirit of the principles taught by the invention.

We claim as our invention:

1. In a device for guiding a traveling web material, a rotatable cylindrical roll adapted to engage the traveling web surface having the roll surface partially wrapped thereby, and an oncoming and off-running guide means for the traveling web tending to hold the web onto the roll surface, said roll surface having a plurality of alternating generally uniformly aligned grooves and ridges directing the web in a direction, said ridges presenting a smooth generally cylindrical closely axially spaced land area for supporting the web and permitting the web to bridge the grooves and thereby protect the web against substantial marking, said grooves being vented to ambient atmosphere at the oncoming and off-running sides of the area of the web wrap of the roll.

2. In a device for guiding a traveling web material according to claim **1** wherein the grooves have an axial dimension at the roll periphery substantially in the range of 0.020 to 0.095 inch and extend generally radially inwardly at least about 0.03 inch between side walls that are axially spaced at least as much as said groove axial dimension at the roll periphery and the ridges each presenting a generally cylindrical outer peripheral land area having an axial dimension substantially in the range of 0.200 to 0.600 inch at the roll periphery.

3. In a device for guiding a traveling web material according to claim **2** wherein the ratio of land width to groove width is substantially in the range of 5:2 to 30:1.

4. In a device for guiding a traveling web material according to claim **2** wherein the ratio of groove width to groove depth is substantially in the range of 2:3 to 1:10.

5. In a device for guiding a traveling web material according to claim **2** wherein the total open area is substantially in the range 10% to 40%.

6. In a device for guiding a traveling web material according to claim **5** wherein the total open area is substantially about 12% to 33⅓%.

7. In a device for guiding a traveling web material according to claim **2** wherein the grooves have an axial dimension at the roll periphery in the range of 0.02 to 0.04 inch and extend inwardly about 0.10 inch between side walls that are axially spaced at least as much as said groove axial dimension at the roll periphery and the ridges have an axial dimension in the range of 0.60 to 0.90 inch at the roll periphery.

8. A device for guiding paper onto a winder mechanism of a paper machine according to claim **5** wherein the total open area is substantially not more than 33⅓%.

9. A device for guiding paper onto a winder mechanism of a paper machine according to claim **8** wherein the total open area is substantially about 25%.

10. In a device for guiding paper onto a winder mechanism of a paper machine according to claim **2** wherein the grooves have an axial dimension at the roll periphery in the range of 0.04 to 0.06 inch and extend generally inwardly about 0.10 inch between side walls that are axially spaced at least as much as said groove axial dimension at the roll periphery.

11. A device for guiding paper onto a winder mechanism of a paper machine according to claim **2** wherein the cross-sectional area of the groove is substantially at least one and one half the square of the groove axial dimension at the roll periphery.

12. A device for guiding paper onto a winder mechanism of a paper machine according to claim **2** wherein the guide roll surface has at least two sets of generally circumferentially aligned grooves and ridges, said sets of grooves and ridges intersecting one another from time-to-time to define a generally diamond-shaped land area, with the total open area being in the range of 20% to 40%.

13. In a device for guiding a traveling web material according to claim **1** wherein the ridges are provided with blunt shoulder portions.

14. In a device for guiding a traveling web material according to claim **1** wherein the rotatable cylindrical roll is a winder drum.

15. In a device for guiding a traveling web material according to claim **1** wherein the roll surface has at least two sets of generally circumferentially aligned grooves and ridges, said sets of grooves and ridges intersecting from time-to-time to define generally diamond shaped land areas, with the total open area being substantially not more than 33⅓%.

16. In a device for guiding a traveling web material according to claim **1** wherein the alternating generally uniformly aligned grooves and ridges are at an angle to the roll axis.

17. In a device for guiding a traveling web material according to claim **16** wherein the angle is substantially in the range of 10° to 60°.

18. In a device for guiding a traveling web material according to claim **16** wherein the grooves and ridges are substantially normal to the roll axis.

19. In a device for guiding a traveling web material according to claim **16** wherein the grooves and ridges are in a chevron-like pattern converging toward the center of the peripheral surface of the roll.

20. In a device for guiding a traveling web material according to claim **16** wherein the grooves and ridges are in a spiral-like pattern extending from one end of the roll surface to the other end thereof.

21. In a device for guiding a traveling web material according to claim **1** wherein the grooves and ridges are at a pitch of about 2 to 5 inches.

22. In a device for guiding a treveling web material

according to claim 1 wherein differential grooving is provided to achieve controlled traction of the web.

23. In a device for guiding a traveling web material according to claim 1 wherein the rotatable cylindrical roll is bendable to urge the roll toward and away from the web.

24. In a device for guiding a traveling web material according to claim 1 wherein the rotatable cylindrical roll is provided with an outer covering composed of an elastomer.

25. In a paper web winder machine, the combination comprising, means receiving a traveling web of paper, rotating means engaging the traveling web at a distance from said receiving means, an imperforate freely rotatable idler guide roll engaging the traveling web within said distance with the roll surface partially wrapped thereby and being driven thereby and a plurality of generally uniformly spaced grooves and ridges aligned at an angle to the rotational axis of said roll, said grooves being open at the surface of said roll to receive air carried over the roll surface by the oncoming web, said ridges presenting smooth substantially continuous closely spaced land areas supporting and backing said traveling web enabling it to bridge said grooves, said grooves being vented to atmosphere at the oncoming and off-running sides of the area of web contact.

26. A method of controlling deviations in the path of travel of a moving web material comprising, winding the moving web onto a receiving roll, delivering the web from a supply means to the receiving roll, contacting the web surface between said supply means and receiving roll with a freely rotatable guide roll having its peripheral surface partially wrapped by said web, such contacting being carried out at a multiplicity of closely spaced narrow regions, with spaces therebetween open to ambient atmosphere purging air carried over the guide roll surface by the oncoming web, the ratio of the average width of said spaces to the average width of said regions being substantially in the range of 5:2 to 1:30, whereby the purging of air increases traction between the moving web and said region thereby accurately maintaining the web in its path of travel.

27. In a device for guiding paper, a guide roll adapted to engage a traveling paper web surface with the roll surface partially wrapped thereby, oncoming and off-running guide means for the traveling paper web tending to hold the paper onto the guide roll surface, said guide roll surface having a plurality of alternating generally circumferentially aligned groove means and ridges, said ridges presenting a smooth generally cylindrical closely axially spaced land area for supporting the paper web and permitting the paper web to bridge the groove means and thereby protect the paper web against substantial marking, said groove means having relatively narrow axial dimensions and being vented to ambient atmosphere at the oncoming and off-running sides of the area of paper web wrap of the guide roll to form air ducts directing air carried over said guide roll surface to said ambient atmosphere thereby increasing contact between said paper web and the surface of said guide roll.

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