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[21]	Appl. No.	736,322
[22]	Filed	June 12, 1968
[45]	Patented	Jan. 5, 1971
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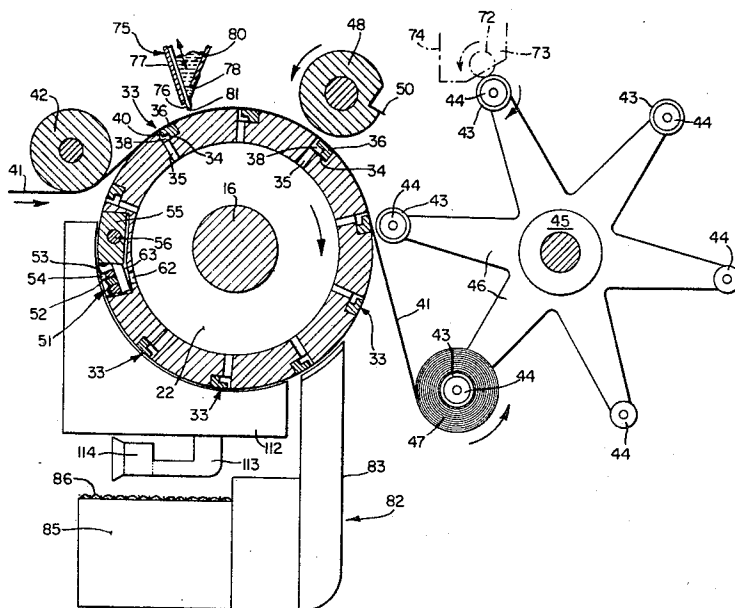
[54] WEB WINDING APPARATUS
30 Claims, 8 Drawing Figs.

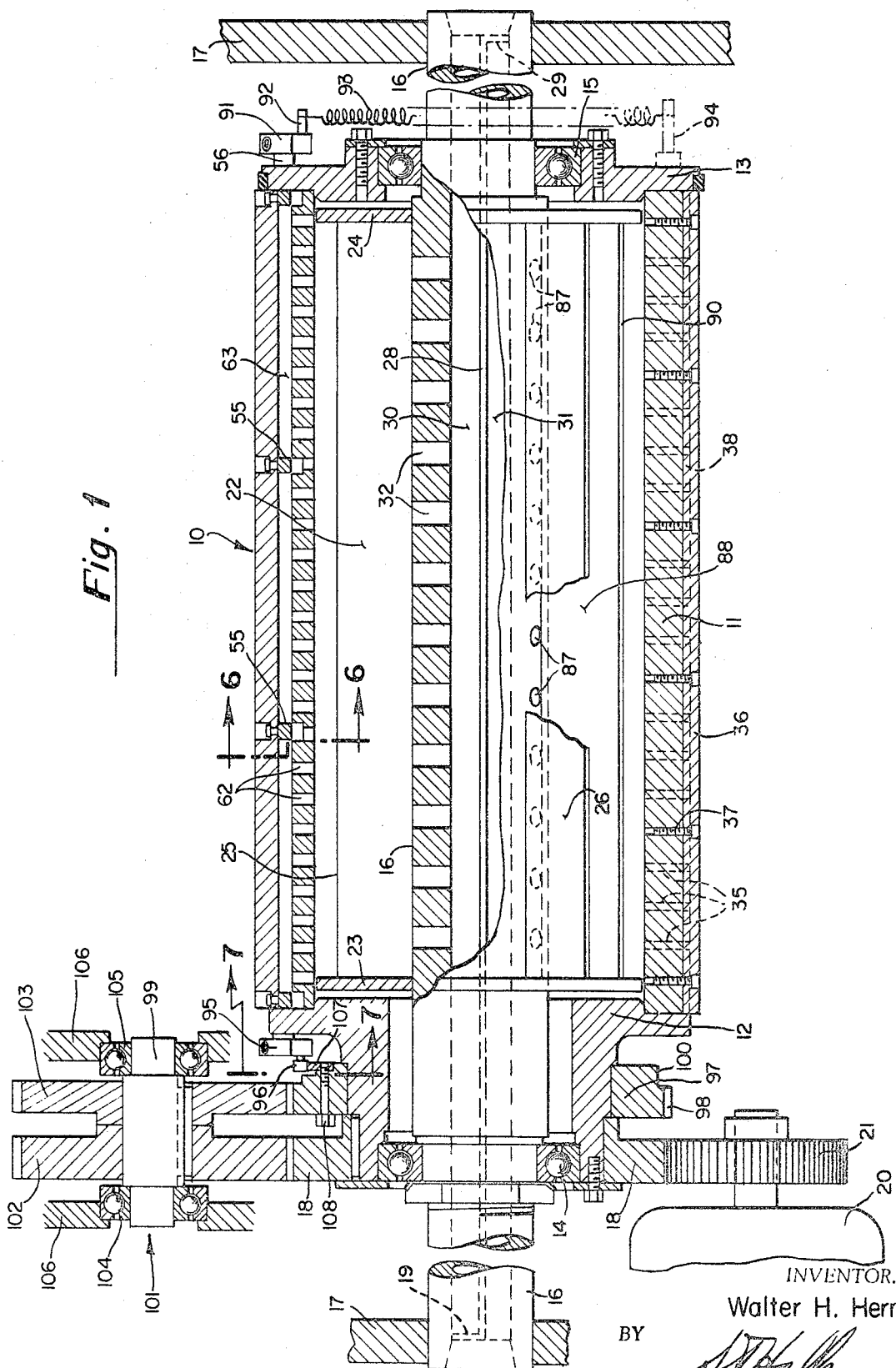
[52] U.S. Cl..... 242/56,
242/64

[51] Int. Cl. ^{242/84} B65h 19/20

[50] **Field of Search**..... 242/54, 55,
56, 56.1, 56.2, 56.3, 56.6, 56.9, 60, 64, 65, 66, 74;
242/74

ABSTRACT: A bedroll is disclosed having openings in its surface communicating with a partial vacuum for positively holding a web to the bedroll so as to control it in the event of a breakout. The arrangement and use of such a bedroll with a turret winder and a brokechute, and the advantages of this apparatus in connection with web winding in preventing and handling breakouts and in accomplishing reliable transfer of the lead end of the web to a new core, are disclosed.





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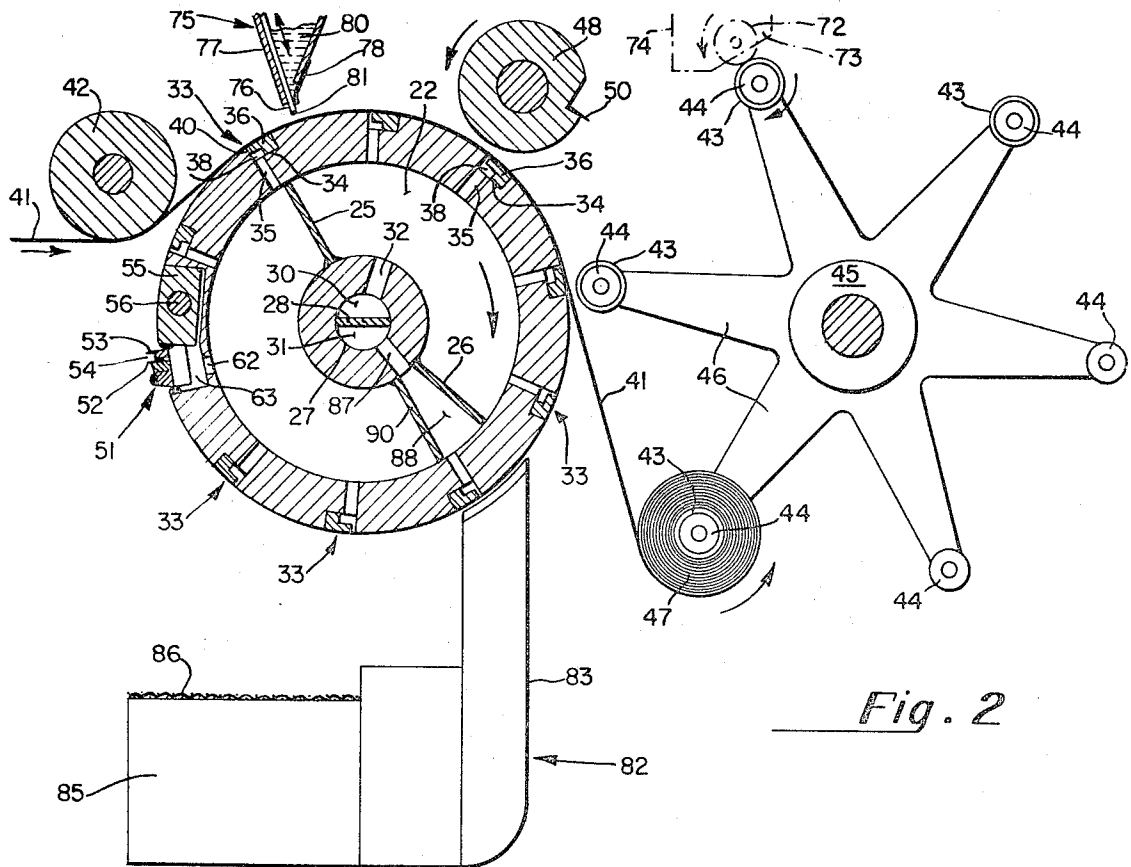


Fig. 2

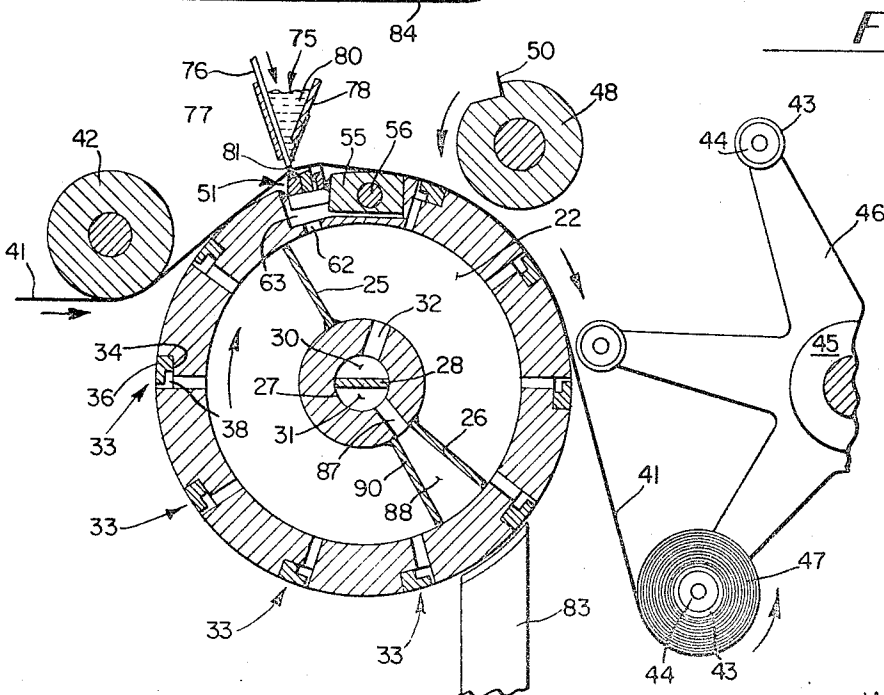


Fig. 3

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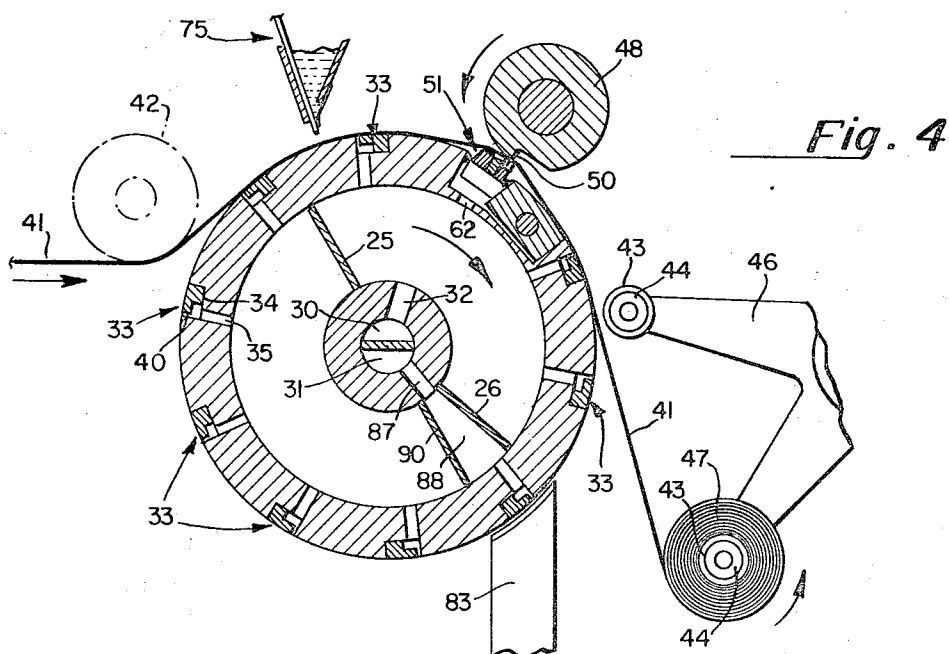


Fig. 4

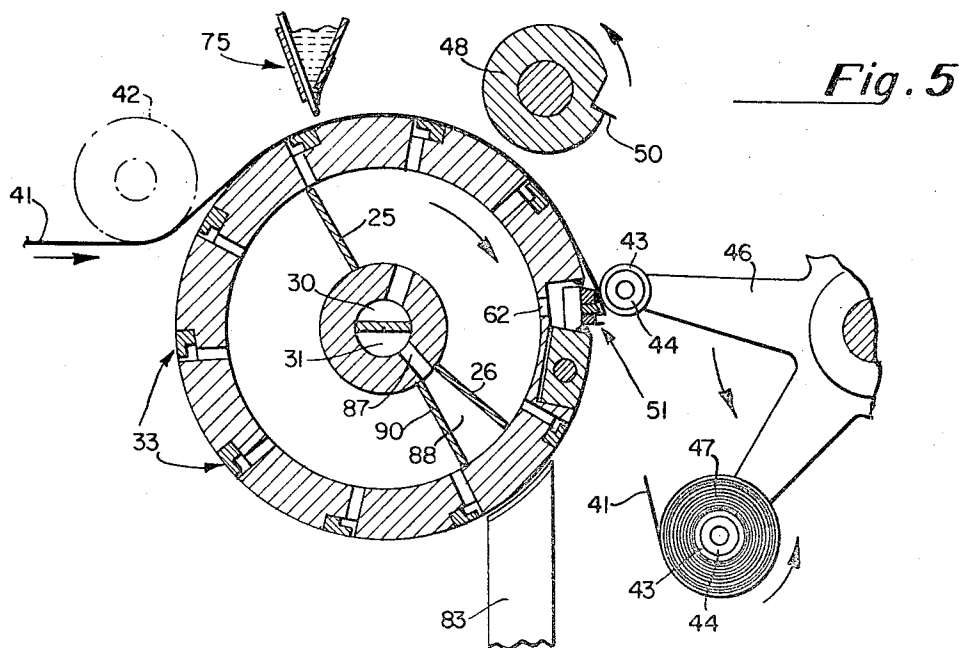


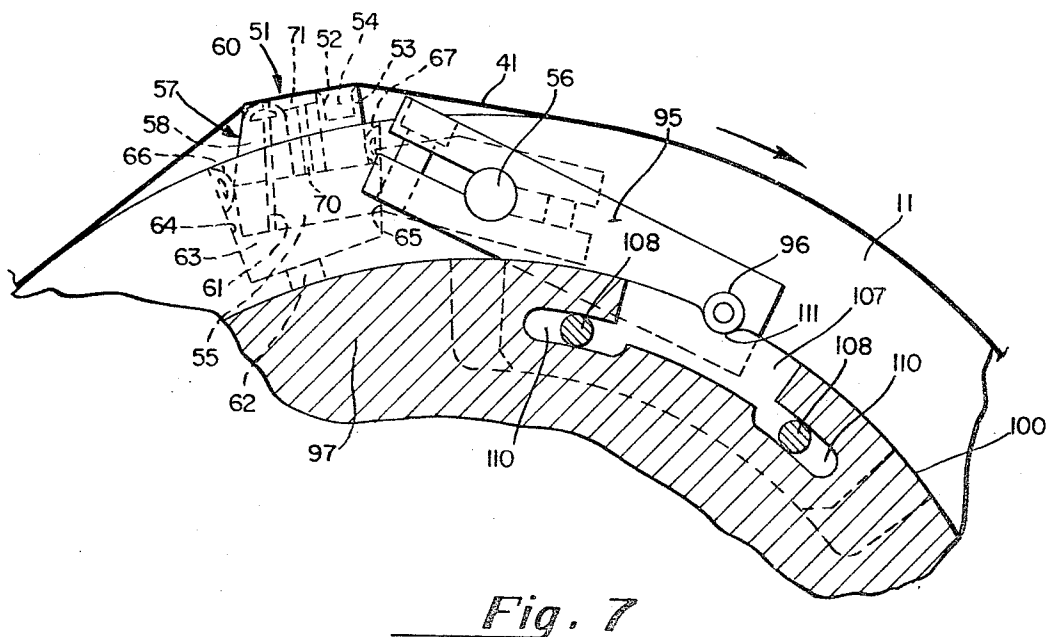
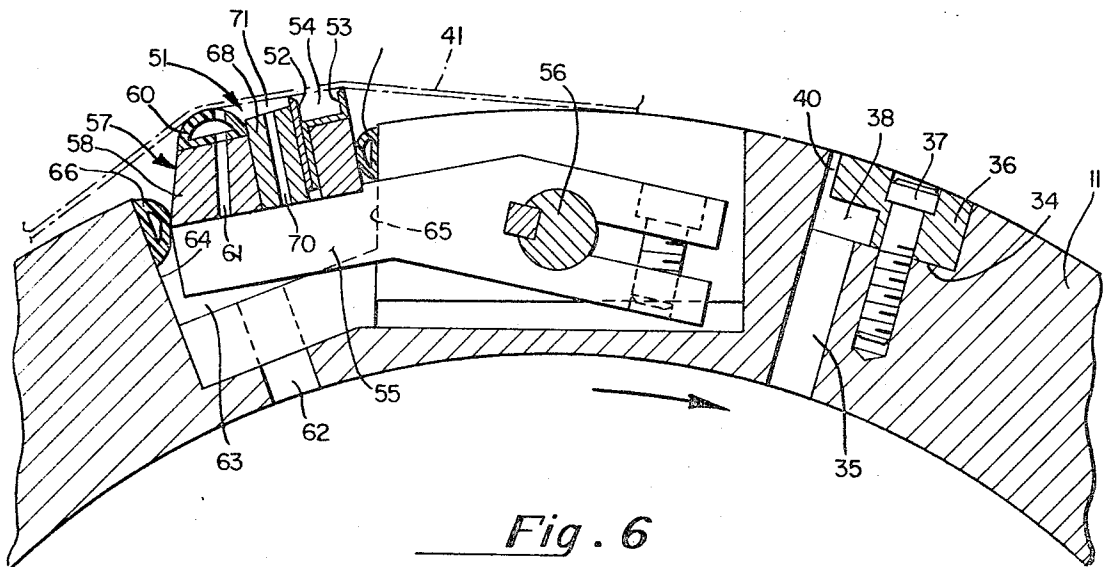
Fig. 5

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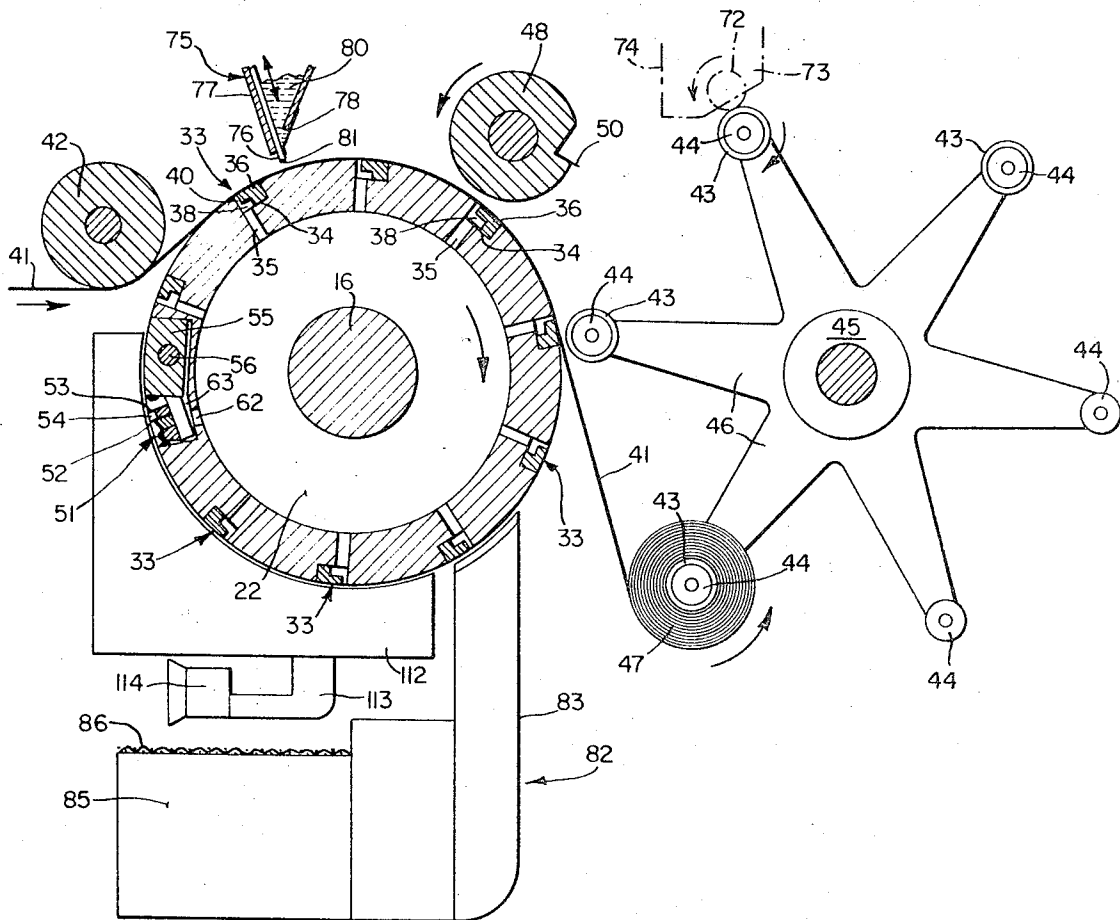


Fig. 8

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WEB WINDING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to improved web-winding apparatus and, more particularly, to web-winding apparatus including a bedroll which functions both alone and cooperatively with other elements on a winder to prevent and handle web breakouts.

2. Description of the Prior Art

The web-winding apparatus of the invention is generally of the type referred to in U.S. Pat. No. 2,769,600 issued to Kwitek and Nystrand. Apparatus of this type is generally employed when a moving web of substantially continuous length must be wound in the form of a plurality of distinct rolls having a generally predetermined length. Thus, the apparatus may be employed directly at the end of a papermaking machine or the apparatus may be employed in a rewinding operation where paper is unwound from a relatively large parent roll and rewound into a plurality of smaller consumer rolls. Typical examples of such consumer rolls are the commercially available rolls of toilet tissue and paper toweling. The apparatus of the invention serves to provide a means to wind a web traveling generally continuously at relatively high speed onto cores for individual use. The speed of the substantially continuously advancing web may be on the order of 2,000 feet per minute and higher. Since individual consumer-type rolls such as those mentioned above generally contain from about 75 to about 500 lineal feet of web, it can be seen that the length of time required to form such rolls amounts to only a few seconds.

In the past, winding operations, whether of the intermittent type or the so-called continuous type, have had a number of problems. Initially, all winders were of an intermittent type where, upon the completion of the winding of one smaller roll, the winding operation was stopped for a period of time during which the completed roll was removed from a core-carrying frame and a new mandrel containing cores mounted thereon. After securement of the free leading edge of the web to the new core on the mandrel, the winding operation was started again to perform the winding of that particular roll.

With the advent of the so-called automatic or continuous winders, some of the problems were eliminated by automatically moving a new "core-carrying" mandrel into the path of the web being unwound while the web was still being wound on a preceding core-carrying mandrel to complete the winding of that roll. A variety of methods are utilized for accomplishing severance or cutoff of the web, typical methods involving the projection of a cutoff knife through the web from within the bedroll, or the use of a rotating chopper roll to sever the web by projecting through a portion of the web momentarily held above the surface of the bedroll when severance is desired. In addition, other operations are conducted on the web as it moves over the bedroll. For example, sometimes adhesive is applied to the web to accomplish securement of the tail end of a wound web to the roll upon the completion of the winding of that roll, or to accomplish attachment of the web to a fresh core to commence the winding of a new roll. Also the lead end of the severed web must be carried from the point of severance to the mandrel to which it will be transferred and attached to commence the winding of a new web roll. In some instances, where a relatively wide web is to be slit into a plurality of webs of lesser width, such slitting is often accomplished on a roll preceding the bedroll, but might be done on the bedroll itself, with one or more slitter knives penetrating the web and running in circumferential grooves in the surface of the roll. Generally, such paper webs designed for consumer use are divided into separate sheets by transverse lines of weakness generally formed by a perforator arranged to treat the web prior to its movement over the bedroll.

All of the above-described factors, alone and in combination with one another, give rise to potential breakouts of the web during winding. Thus, the web may break during the winding of a single web "roll," leaving the unexpected free

leading end without any guiding force to withdraw it from the winder. The result is that substantial quantities of paper are fed into the area of the winder and the turret before the apparatus can be turned off, sometimes wrapping the winder bedroll and other times damaging the entire turret assembly. This problem is only compounded where the web is previously slit and one or more of the separate webs break out while others are still being wound. The same result can appear from a failure to transfer a free leading end of the web to a new core following its severance from the web wound on the preceding roll.

The web-winding apparatus of the invention provides a means for preventing the occurrence of breakouts due to loss of control of the web. This is done through the use of a bedroll which is capable of maintaining positive control of the web during the time the web is being treated as in any of the ways described above, that is, receiving adhesive, being severed or being transferred after severing. In addition, the apparatus of the invention provides a means for positively controlling the free leading end of the web following severance thereof from the preceding wound web roll. The control can be maintained until the free leading end is pressed into adhering engagement with a fresh core to commence the winding of a new web roll. In the event of a breakout due to unexpected failure of the web, as along one of its lines of weakness, perhaps caused by excessive stresses applied to the web during one of the above-described treatments, or due to some other cause such as an increase in web tensioning resulting from a change in speed of one portion of the equipment, a web disposal means is provided, preferably in conjunction with means for positively transferring or urging a web or a portion of the web which breaks out into the web disposal means for rapid handling in a manner enabling its removal as scrap for later repulping. Thus, in all of its aspects, the apparatus of the invention provides a very efficient and positive means for accurately and reliably handling a web during the winding thereof in a manner facilitating web severance and transfer and preventing and handling web breakouts.

SUMMARY OF THE INVENTION

The invention comprises improvements in web-winding apparatus wherein a web is fed in partial wrapping engagement over a bedroll to a core on one of a plurality of rotatably mounted winding mandrels carried in revolution by a rotatable turret past a pickup position where the free leading edge of a web formed by a transverse severance of the web is transferred to a core disposed on a successive winding mandrel. The improvements include a plurality of apertures in the surface of the bedroll and stationary suction means communicating with the apertures internally of the bedroll and effective for holding portions of the web overlying the apertures to the bedroll during a predetermined length of web travel, preferably substantially from about the point where the apertures are first covered by the web on the bedroll to a point beyond the pickup position.

Some embodiments include web disposal means which are disposed adjacent the surface of the bedroll beyond the pickup position and beyond the effective extent of the suction means along the path of the web. The web disposal means are adapted to receive portions of the web which fail to transfer at the pickup position to the core on the mandrel.

Some embodiments of the invention include a web support member sealingly disposed within an axially aligned groove in the surface of the bedroll. The web support member is adapted for cyclical radial movement from a first position to a second position outwardly spaced from the first position and at least radially outward of the outer surface of the bedroll so that it supports a transverse segment of the web fed in partial wrapping engagement over the bedroll. Web-severing means are employed in conjunction therewith and adapted to transversely sever the web along the line preceding the support transverse segment. Means are also employed in conjunction

therewith for applying adhesive to at least portions of the transverse segment while it is disposed upon the web support member radially outward of the outer surface of the bedroll. Alternatively, adhesive is applied to the core on which the web is to be wound.

Some embodiments of the invention include means for blowing air outwardly through apertures in the bedroll and through apertures in the support member during rotation of the bedroll and movement of the support member through a position beyond the pickup position and adjacent the web disposal means so that the leading end of the web is urged from the bedroll and into the web disposal means upon failure to transfer to a core on one of the mandrels at the pickup position.

Brief Description of the Drawings

FIG. 1 is a plan view of apparatus of the invention, showing part in section;

FIGS. 2-5 are schematic sectional elevation views of apparatus of the invention progressively illustrating the manner of operation of the apparatus;

FIG. 6 is a sectional view taken along line 6-6 of FIG. 1 illustrating the construction of a web support member; and

FIG. 7 is a sectional view taken along line 7-7 of FIG. 1 illustrating one type of actuating means for moving the web support member; and

FIG. 8 is a schematic sectional elevation view of an alternative embodiment of the apparatus of the invention.

Description of the Preferred Embodiment

FIG. 1 shows a portion of the apparatus of the invention and illustrates the construction of a bedroll in accordance with the invention. The bedroll, indicated generally by reference numeral 10, comprises a shell 11 mounted on spaced trunnions 12 and 13 which are rotatably carried by spaced bearings 14 and 15, respectively, mounted on a stationary shaft 16. The shaft 16 is supported at its ends by a frame 17. A drive gear 18 is coaxially mounted on the trunnion 12 and is keyed thereto so as to rotate with the trunnion 12 about the shaft 16. A drive motor 20 is connected to the drive gear 18 by means of a pinion gear 21 so that the bedroll 10 is turned in a direction and at a speed controlled by the drive motor 20 and the drive and pinion gears, 18 and 21. A stationary vacuum chamber, indicated generally by reference numeral 22, is formed within the interior of the bedroll 10. The details of one embodiment of this chamber 22 are shown in FIG. 1, and are more clearly illustrated in FIGS. 2 through 5 of the drawings.

The width of the vacuum chamber 22, which determines generally the width of the web which will be handled by the bedroll 10 in the manner contemplated in the invention is defined by spaced end plates 23 and 24 extending from the stationary shaft 16 to a point closely spaced from, that is, just out of contact with the inner surface of the rotating shell 11 of the bedroll 10, as shown in FIG. 1. The leading and trailing edges of the vacuum chamber 22 are defined by a leading plate 25 and a trailing plate 26, respectively, as shown in FIG. 2.

A partial vacuum is created in vacuum chamber 22 by means of a source of partial vacuum, such as a vacuum pump or suction fan (neither being shown), communicating through one end of stationary shaft 16 and through a cylindrical passageway 27 extending along its length. The passageway is divided into two segments, 30 and 31, by means of a partition plate 28 extending along its length, the segment 30 being closed at one end by a semicircular plate 19, while the other segment 31 is closed at the opposite end of shaft 16 by a semicircular plate 29. These segments 30 and 31 connect with the interior of the shell 11 by means of radial openings through the wall of the shaft 16. Thus, as shown in FIGS. 1 and 2, the segment 30 or passageway 27, which connects to a source of partial vacuum, communicates with vacuum chamber 22 through a plurality of holes 32 axially spaced along shaft 16.

The shell 11 has a plurality of through-extending openings, indicated generally by reference numeral 33, connecting its inner cylindrical surface with its outer cylindrical surface. The size, number, and distribution of these openings will be course vary depending upon the type and nature of the material being handled as well as the nature and conditions of such handling. For example, it is contemplated that the shell 11 may have uniformly spaced, drilled holes over its entire surface, and the use of shells constructed of perforated sheet, honeycomb material or other porous cellular material is also contemplated. These are believed to be particularly suitable where relatively impervious web materials are being handled and where relatively low, partial vacuums are required to enable suitable control of the web. Where light, relatively pervious web materials are involved, such as sanitary tissues having a basis weight of from about 6 to about 20 pounds per 3,000 square feet, it has been found that suitable controlling force may be exerted on the web by utilizing a shell having relatively few openings through which the partial vacuum acts on the web. It is more practical to create a high vacuum force on pervious webs through fewer openings, since the pressure drop through the web is generally greater and the resulting force is sufficient to control the web.

Where the web contains transverse lines of weakness, such as lines of perforations designating tear lines to separate single sheets of the web, such openings 33 are preferably arranged to be in contact with the web adjacent the lines of perforations in the web and on the trailing side thereof. Since breakage of such a perforated web invariably occurs at a line of perforations, the leading end of the next succeeding sheet of the web will be held against the surface of the shell 11 and thereby controlled.

The drawings illustrate a shell of this latter type and construction. The openings 33 extend along axially extending lines spaced about the circumference of the bedroll 10. The preferred form of opening 33 is shown in FIGS. 2-5 and in greater detail in FIG. 6.

The surface of the shell 11 has a plurality of axial grooves 34 extending along its length. The grooves 34 are substantially equidistantly spaced from one another circumferentially about the shell 11. A plurality of axially spaced holes 35 connect the bottom of the grooves 34 to the inside surface of the shell 11, the holes 35 terminating adjacent one edge of the bottom of the groove 34. An elongate insert plate 36 of lesser width than that of the groove 34 is inserted into the grooves 34 and secured therein by bolts 37. The insert plate 36 is preferably of sufficient thickness to substantially coextend the outside cylindrical surface of the bedroll 10 over a portion of the groove 34. A portion of the bottom of insert plate 36 is relieved along its length to define in the groove 34 an enlarged space 38 connected to the surface of the bedroll 10 by a slot 40 of relatively narrow width. In practice a shell 11 having an outside diameter of about 15 inches is employed with its inside surface connected to the slot 40 by means of holes 35 having a diameter of about three-eighths inch, spaced 1 to 2 inches apart, while the slot 40 might have a width of about 0.040 inch.

This construction enables uniform application of partial vacuum to a web passing over the surface of the bedroll 10 and covering the slot 40 so that the speed of force response or application of vacuum force to the web will be substantially instantaneous even when the bedroll 10 is rapidly rotating. Thus, during rapid rotation of the bedroll 10 in a winding operation, as the slot 40 moves from a point preceding the leading plate 25 to a point beyond the leading plate 25 where it is radially outward from the vacuum chamber 22, very little response time is involved in applying vacuum to the surface of the web in contact with the bedroll 10, largely due to the short radial distance through which the vacuum must act, that is, the depth of the slot 40. The above-described system provides a means for positively controlling a web arranged in partial wrapping engagement with a bedroll in that, should a break occur in the web while it is wrapping the bedroll 10 and carried over the vacuum chamber 22, the loose ends of the web

will be held to the surface of the bedroll 10 until subsequently removed as will be described subsequently.

It is also contemplated that the entire interior of the shell 11 be subjected to partial vacuum created by a stationary suction box disposed adjacent the exterior of the bedroll 10 at a portion of its periphery not wrapped by the web 41, as shown in FIG. 8. Thus FIG. 8 illustrates a stationary suction box 112 disposed adjacent to and closely spaced from the exterior cylindrical surface of the bedroll 10. The suction box is located adjacent a portion of the external surface of the bedroll 10 which is not wrapped by the web 41. The suction box 112 is connected by the duct 113 to a source of partial vacuum such as the vacuum pump 114. The vacuum is impressed on the interior of the shell 11 through the openings 33 therein. Alternatively, the vacuum could be introduced through one or both end plates of the shell 11 instead of through the stationary shaft 16 on which it is mounted.

FIG. 2 shows a number of functional elements arranged to cooperate with the bedroll 10 described above and forming a preferred form of continuous web winding apparatus. Thus, a web 41 is introduced by a guide roll 42 on to the surface of a rotating bedroll 10 of the type described above. The web 41 is carried about a portion of the periphery of the bedroll 10 in partial wrapping engagement therewith and is moved into contact with a core 43 carried on a rotatably mounted mandrel 44. The web 41 is then wound into a web roll 47 on core 43. The mandrel 44 is one of a plurality of mandrels 44 carried in rotation through an orbital path by means of a rotatable turret assembly 45. The turret assembly 45 is adapted for indexed operation as by the use of a geneva cam mechanism (not shown) operably connected to the drive motor 20. The turret assembly 45 has a plurality of arms 46 carrying rotatably mounted mandrels 44 thereon.

Upon the completion of the winding of a web roll 47 on one of the mandrels 44, the web 41 is severed and the leading end of the web 41 formed by the transverse severance of the web 41 is moved into engagement with a new core 43 on a succeeding mandrel 44 which has been advanced into a pickup position, as shown in FIG. 2, through the indexing operation of the turret assembly 45.

Web severance may be accomplished by means of a knife (not shown) mounted within the bedroll 10, but is preferably accomplished by means of a rotating chopper roll 48 carrying a knife 50 and arranged to cooperate with a web support member, indicated generally by reference numeral 51, carried by the bedroll 10 which, at a predetermined time as shown in FIGS. 6 and 7, raises a transverse segment of the web 41 above the surface of the bedroll 10 so that the web 41 is severed in the transverse segment by the knife. One embodiment of the support member 51 of the invention comprises two edge elements 52 and 53, defining a slot 54, the edge elements, 52 and 53, being secured to and carried on a plurality of pivotably mounted arms 55 carried on and keyed to a shaft 56 rotatably mounted beneath the outside surface of the bedroll 10 and extending axially therealong and through the trunnions 12 and 13, as shown in FIG. 1. The actuation of support member 51 will be described subsequently.

An elongate support element 57 preceding the edge elements, 52 and 53, is also attached to and moved by the arms 55. The details of this construction is more clearly shown in FIG. 6 of the drawings. Support element 57 is preferably of resilient construction to permit interfering contact with other elements of the apparatus without damage to the apparatus. Thus, it has a base strip 58 and a cap strip 60 of resilient construction, such as the hollow rubber strip shown. This support element 57 has a plurality of passageways 61 extending therethrough from its radially outermost surface to its radially inward surface, that is, through cap strip 60 and base strip 58. These passageways 61 communicate with the interior of the shell 11 through a plurality of openings 62 in and through the shell 11 disposed along the bottom of the groove 63 in which the web support member 51 is disposed. The web support member 51 is adapted for movement radially inward and out-

ward of the bedroll 10 in sealing contact with the sides 64 and 65 of the groove 63 maintained by resilient seals 66 and 67 shown in FIG. 6. Thus, when the support member 51 is carried over the vacuum chamber 22 and exposed to the partial vacuum therein, vacuum force is applied to the underside of the web 41 carried by the support element 57 and holds the leading end formed by severance of the web 41 to the support element 57. Thus, in accordance with FIG. 2, it can be seen that the leading end of the web 41 will be held to the support element 57 until it is transferred to a fresh core 43 on a rotating mandrel 44 to commence the winding of a new roll 47. It is removed from the bedroll 10 and attached to the core 43 by a superior attractive force, normally involving adhesive, between the web 41 and the core 43.

In FIG. 6, the support member 51 also includes a spacer strip 68 between the support element 57 and edge element 52. The spacer strip 68 also has passageways 70 spaced along its length, communicating with the interior of shell 11 so that vacuum may be applied therethrough to the elongate space 71 defined by the web 41, the edge element 52, the cap strip 60, and the upper surface of the spacer strip 68. The upper surface of spacer strip 68 is disposed generally radially inward from the outer surface of the cap strip 60 and the edge element 52 so that, upon severance, the leading end of the web 41 is drawn into the elongate space 71 and held against the upper surface of spacer strip 68. This tends to reduce or eliminate the extent of the leading end of the web 41 which is exposed to windage forces upon rotation of the bedroll 10. If such forces are too great, as when the bedroll 10 rotates very rapidly, the leading end of the web 41 may be pulled loose from the support element 57 unless a spacer strip 68 is employed as described above.

Adhesive may be applied to the surface of a core 43 on a mandrel 44 prior to moving the core 43 into the pickup position to receive the leading end of a web 41. As shown in FIG. 2, this might be done by means of a plurality of spaced applicator wheels 72 rotating through a body of adhesive 73 carried within a reservoir 74 after which they sealingly emerge and contact the surface of a core 43 with a predetermined amount of adhesive. However, adhesive is preferably applied directly to the lead end of the web 41 and, specifically, to the portion of the lead end backed by cap strip 60 of the support element 57 of the web support member 51. Thus, the web support member 51 is moved outwardly so as to move a transverse segment of a web 41 into wiping engagement with a metered amount of adhesive carried on a tongue member 76 of a device, indicated generally by reference numeral 75, for dispensing a metered amount of adhesive. The device 75 includes a fixed wall 77 and a flexible wall 78 forming part of a chamber or reservoir 80 containing adhesive. The tongue member 76 is reciprocated in and out of the reservoir 80 as needed and, when it emerges from the reservoir 80 from between the fixed wall 77 and the flexible wall 78, it carries on its bottom edge 81 a metered amount of adhesive. A device suitable for this purpose is described in U.S. Pat. No. 3,289,898 issued Dec. 6, 1966 to W. H. Herman and entitled "Metering and Dispensing Device for Viscous Liquids," which patent and the disclosure therein is hereby incorporated by reference.

In either arrangement, the leading end of the web 41 is ultimately pressed into adhering engagement with the core 43 as the web support member 51 moves past the pickup position, and the superior attractive force created by the adhesive between the core 43 and the leading end of the web 41 pulls the web 41 from the bedroll 10 and commences the winding of a new web roll 47.

Operation of the apparatus of the invention is illustrated by FIGS. 2-5, wherein FIG. 2 discloses the arrangement of the above-described apparatus during the winding of one web roll just prior to its completion and while the succeeding mandrel 44 is moving through the pickup position. FIG. 3 illustrates the preferred manner in which adhesive is applied to a transverse segment of the web 41 which will become the leading end of

the web 41 following transverse severance thereof. FIG. 4 illustrates the preferred manner in which transverse severance of the web 41 is performed. A portion of the web 41 is raised above the surface of the bedroll 10 by the web support member 51 and is severed in the area extending between the two edge elements, 52 and 53, by means of the knife 50 carried on the chopper roll 48. FIG. 5 shows the action of the cap strip 60 of the support element 57 in pressing the adhesive coated leading end of the web 41 into engagement with a core 43 on a rotating mandrel 44 to commence the winding of a new wound web roll 47.

It should be noted in connection with FIGS. 3-5 that during all of the time that the web 41 is contacted by any of the means described above, that is, the adhesive applying means 75, the severing means, 50, 52 and 53 or the web support member 51, the portions of the web 41 so contacted are held firmly to the surface of the bedroll 10 by means of partial vacuum in vacuum chamber 22 so that the web 41 is positively controlled in event of a breakout. It should be clearly understood that other operations are envisioned and might be performed on the web 41 during its contact with the bedroll 10; for example, slitting of the web 41 as by knives riding in circumferential grooves in the bedroll 10 and members projecting therefrom to form a plurality of adjacent webs being simultaneously wound.

In the event of web breakage, a system is provided for disposing of the web 41 immediately so that any web 41 not wound on the cores 43 will be carried by the bedroll 10 to a web disposal means indicated generally by reference numeral 82. The web disposal means 82 may preferably comprise a brokechute 83 disposed adjacent the surface of the bedroll 10 and leading to a means for storing the unwound portions of web 41 in a manner permitting them to be repulped. One means for doing this involves a chopper fan 84 arranged to receive such portions of the web 41 from the brokechute 83 and cut it into small pieces. The output of the chopper fan 84 is fed to a bin 85 with a wire face 86 permitting the removal of air while retaining the remitting web product within. Although the friction of air adjacent the rotating bedroll can usually be relied upon to deflect the unwound web 41 into the brokechute 83 and the use of a chopper fan 84 generally creates a partial vacuum in the brokechute 83 tending to draw the web 41 from the surface of the bedroll 10, it has sometimes been found advantageous to utilize a more positive means for removing the web 41 from the bedroll 10 and for reliably directing it into the brokechute 83. This is believed to be more important where heavier basis weight webs of greater stiffness and lesser porosity are involved. One means for doing this comprises a source of high-pressure air connecting through one end of the stationary shaft 16 to the segment 31 of the axial passageway 27 therein. The segment 31 of the axial passageway 27 is connected by means of a plurality of holes 87 along the length of the shaft 16 to a pressure chamber 88 formed by trailing plate 26 and side plate 90 extending from the stationary shaft 16 to a point closely spaced from the inner surface of the shell 11. In this manner, when openings 33 in the shell 11 move past the pressure chamber 88 disposed beyond the pickup position and inside the shell 11, high-pressure air is forced through the openings 33 in the shell 11, through the enlarged chamber or space 38 and the slot 40 so as to positively force the web 41 from the surface of the bedroll 10 and into the brokechute 83.

Looking now at FIGS. 1 and 7, the manner in which the shaft 56, carried by the shell 11, is turned, so as to control the radial position of the web support member 51, will be described. One end of the shaft 56 has an arm 91 with a pin 92 extending therefrom. The arm 91 is affixed to the shaft 56 and rotates therewith. A spring 93 attaches the pin 92 to a fixed pin 94 on the trunnion 13 so that as the bedroll 10 rotates, the arm 91 is continually drawn radially inward so that the shaft 56 tends to move the web support member 51 radially outwardly of its groove 63 and above the surface of the rotating bedroll 10. The opposite end of the shaft 56 has an arm 95 af-

fixed thereto so as to rotate therewith. The opposite end of the arm 95 carries a rotatably mounted cam follower 96. A camming member 97 having a gear portion 98 and a cam surface 100 is rotatably mounted upon and coaxially with the trunnion 12 and arranged for relative rotational movement therebetween. This results in the cam follower 96, carried by the shell 11, moving relative to the camming surface 100 upon rotation of the bedroll 10. The camming surface 100 has a depression 111 into which the cam follower 96 rolls when moving relatively along the camming surface 100. The position, size and shape of the depression 111 are predetermined to achieve the desired movement of the cam follower 96 at the desired time. In this manner, the radial movement and position of the web support member 51 is controlled. A transmission means, indicated generally by reference numeral 101, is arranged to operably connect the drive gear 18 with the gear portion 98 of the cam member 97 such that the cam member 97 rotates at a predetermined rate relative to the rotational rate of the bedroll 10. A preferred form of the transmission means 101 comprises two coaxially mounted gears, 102 and 103, keyed to one another and mounted for rotation on a shaft 99 carried on bearings, 104 and 105, respectively, carried by a frame 106. One of the gears 102 and 103 has more teeth than the other. In this manner, by employing a cam 97, such as that shown in FIG. 7, and by employing transmission means 101 such that the cam member 97 is rotated relative to the bedroll 10 once during many revolutions of the bedroll 10, for example, once in every 100 revolutions of the bedroll 10, radial movement of the web support member 51 may be accomplished in a smooth, accurate manner free from mechanical stresses and vibrations. The exact position where the camming action occurs, that is, the timing of the camming operation, may be adjusted by employing a movable camming plate as a portion of the camming surface 100. The movable camming plate may comprise a circumferential cam segment 107 bolted to the cam member 97 by bolts 108 carried in circumferential slots 110 permitting its adjustment circumferentially over a limited distance about the cam 97.

There has accordingly been shown and described herein a novel and unique improvement in web-winding apparatus and particularly a new type of bedroll having a plurality of apertures or openings in its surface communicating with stationary suction means internally of the bedroll which are effective for holding portions of the web overlying the apertures to the bedroll during a portion of the travel of the web in engagement with the bedroll. In addition, the manner in which this bedroll operates to control the web in the event of web breakage and the cooperation of this bedroll with other elements of a web winder to accomplish web severance and transfer of the lead end of the web to a new core has been described. Moreover, a means for positively controlling the web in the event of a breakout during winding in order to insure its removal from the winding apparatus and introduction into a web disposal means has been pointed out.

From the above description of the invention, it will be apparent that various modifications in the apparatus described in detail herein may be made within the scope of the invention. Thus different types of elements on the winder could be employed for accomplishing some of the functions described above. For example, different types of apparatus could be employed for applying glue to portions of the web or to the core, such as a glue gun. In addition, other means for accomplishing severance of the web could be employed. In addition, different forms of web support means could be utilized and the apparatus would be advantageous even when different means of actuating the web support member was employed. Therefore, the invention is not to be limited to the specific details of the apparatus described herein except as may be required by the following claims.

I claim:

1. In web winding apparatus, wherein a web is fed in partial wrapping engagement over a bedroll to a core disposed on one of a plurality of rotatably mounted winding mandrels carried

in revolution by a rotatable turret past a pickup position where the free leading edge of a web formed by transverse severance of the web is transferred to a core disposed on a successive winding mandrel, the improvement wherein;

said bedroll comprises a cylindrical shell defining an internal generally cylindrical hollow chamber, the surface of said shell having a plurality of apertures therein; and said apparatus includes:

stationary suction means communicating with said apertures internally of said bedroll and effective for holding portions of the web overlying said apertures to the bedroll during a predetermined length of web travel, said suction means comprising:

a stationary vacuum box disposed adjacent a portion of the periphery of the outside surface of said shell; and means for creating a partial vacuum within said vacuum box, whereby a partial vacuum is created in said internal generally cylindrical hollow chamber within said shell.

2. In web-winding apparatus, wherein a web is fed in partial wrapping engagement over a bedroll to a core disposed on one of a plurality of rotatably mounted winding mandrels carried in revolution by a rotatable turret past a pickup position where the free leading edge of a web formed by transverse severance of the web is transferred to a core disposed on a successive winding mandrel, the improvement wherein:

the surface of said bedroll has a plurality of apertures therein, said apertures being in the form of axially aligned and circumferentially spaced grooves in the surface of said bedroll; and

said apparatus includes stationary suction means communicating with said grooves internally of said bedroll and effective for holding portions of the web overlying said apertures to the bedroll during a predetermined length of web travel.

3. The improvement in web-winding apparatus according to claim 2, wherein:

said web has evenly spaced transverse lines of weakness along its length; and

said grooves are spaced apart by a distance equal to the distance between said lines of weakness.

4. In web-winding apparatus, wherein a web is fed in partial wrapping engagement over a bedroll to a core disposed on one of a plurality of rotatably mounted winding mandrels carried in revolution by a rotatable turret past a pickup position where the free leading edge of a web formed by transverse severance of the web is transferred to a core disposed on a successive winding mandrel, the improvement wherein:

the surface of said bedroll has a plurality of apertures therein, and said apparatus includes:

stationary suction means communicating with said apertures internally of said bedroll and effective for holding portions of the web overlying said apertures to the bedroll during a predetermined length of web travel; and

web disposal means disposed adjacent the surface of said bedroll beyond said pickup position and beyond the effective extent of said suction means along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

5. The improvement in web-winding apparatus according to claim 4, wherein said web disposal means comprises a broochute.

6. The improvement in web-winding apparatus according to claim 2, wherein:

said bedroll comprises a cylindrical shell defining an internal generally cylindrical hollow chamber;

said apertures comprise axially aligned and circumferentially spaced grooves in the surface of said shell; and including;

at least one passageway connecting said groove with said internal generally cylindrical hollow chamber; and a cover piece disposed along said groove in a manner limiting the circumferential width of said groove ex-

posed to the surface of said shell while leaving substantially open the radially inward portion of said groove.

7. In web winding apparatus, wherein a web is fed in partial wrapping engagement over a bedroll to a core disposed on one of a plurality of rotatably mounted winding mandrels carried in revolution by a rotatable turret past a pickup position where the free leading edge of a web formed by transverse severance of the web is transferred to a core disposed on a successive winding mandrel, the improvement wherein:

the surface of said bedroll has a plurality of apertures therein;

said bedroll has at least one axially aligned groove in its surface; and

said apparatus includes:

stationary suction means communicating with said apertures internally of said bedroll and effective for holding portions of the web overlying said apertures to the bedroll during a predetermined length of web travel;

a web support member sealingly disposed within said groove and adapted for cyclical movement from a first position to a second position outwardly spaced from said first position and at least radially outward of the outer surface of said bedroll so that it supports a transverse segment of the web fed in partial wrapping engagement over said bedroll, said web support member having a plurality of apertures along its length communicating with said suction means; and

actuating means for moving said web support member in a predetermined cyclical manner.

8. The improvement in web-winding apparatus according to claim 7, including web severing means operably connected to said web winding apparatus and adapted to transversely sever said web along a line preceding said supported transverse segment.

9. The improvement in web-winding apparatus according to claim 7, including means for applying adhesive to at least portions of said transverse segment while it is disposed upon said web support member radially outward of the outer surface of said bedroll.

10. The improvement in web-winding apparatus according to claim 7, including:

means for applying adhesive to at least portions of said supported transverse segment while it is disposed upon said web support member radially outward of the outer surface of said bedroll; and

web severing means operably connected to said web-winding apparatus and adapted to transversely sever said web along a line preceding said supported transverse segment, whereby the leading end of said web following said line of severance and containing adhesive is held in contact with said web support member by means of partial vacuum communicating through said plurality of apertures therein, and is pressed into contact with a core disposed on one of said winding mandrels at said pickup position to commence the winding of a new roll.

11. The improvement in web-winding apparatus according to claim 8, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position and beyond the effective extent of said suction means along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

12. The improvement in web-winding apparatus according to claim 9, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position and beyond the effective extent of said suction means along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

13. The improvement in web-winding apparatus according to claim 10, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position and beyond the effective extent of said suction means along the

path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

14. The improvement in web-winding apparatus according to claim 12, wherein said web disposal means comprises a brokechute and means to create a partial vacuum therein, whereby the leading end of said web is drawn from said bedroll and into said brokechute upon failure to transfer to a core on one of said mandrels at said pickup position.

15. The improvement in web-winding apparatus according to claim 12, including:

means for blowing air outwardly through apertures in successive transverse portions of said bedroll and through apertures in said support member during rotation of those portions and movement of said support member through a position beyond said pickup position and adjacent said web disposal means;

whereby the leading end of said web is urged from said bedroll and into said web disposal means upon failure to transfer to a core on one of said mandrels at said pickup position.

16. The improvement in web-winding apparatus according to claim 7, wherein said web support member comprises a resilient strip, and including:

two axially aligned and circumferentially spaced-apart support elements spaced from and preceding said resilient strip; and

severing means comprising a rotatably mounted chopper roll having a cutting element axially aligned relative to said bedroll and said chopper roll, said cutting element being arranged to penetrate the space between said support element on said support member sufficiently to sever a web running over said bedroll and supported on said support elements.

17. The improvement in web-winding apparatus according to claim 1, wherein said apertures are in the form of axially aligned and circumferentially spaced grooves in the surface of said bedroll.

18. The improvement in web-winding apparatus according to claim 1, wherein:

said web has evenly spaced transverse lines of weakness along its length; and

said grooves are spaced apart by a distance equal to the distance between said lines of weakness.

19. The improvement in web-winding apparatus according to claim 1, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

20. The improvement in web-winding apparatus according to claim 19, wherein said web disposal means comprises a brokechute.

21. The improvement in web-winding apparatus according to claim 1, wherein said bedroll comprises a cylindrical shell defining an internal generally cylindrical hollow chamber, said apertures comprise axially aligned and circumferentially spaced grooves in the surface of said shell, and including:

at least one passageway connecting said groove with said internal generally cylindrical hollow chamber; and

a cover piece disposed along said groove in a manner limiting the circumferential width of said groove exposed to the surface of said shell while leaving substantially open the radially inward portion of said groove.

22. The improvement in web-winding apparatus according to claim 1, wherein said bedroll has at least one axially aligned groove in its surface, and including:

a web support member sealingly disposed within said groove and adapted for cyclical movement from a first position to a second position outwardly spaced from said first position and at least radially outward of the outer surface of

said bedroll so that it supports a transverse segment of the web fed in partial wrapping engagement over said bedroll, said web support member having a plurality of apertures along its length communicating with said suction means; and

actuating means for moving said web support member in a predetermined cyclical manner.

23. The improvement in web-winding apparatus according to claim 22, including web-severing means operably connected to said web-winding apparatus and adapted to transversely sever said web along a line preceding said supported transverse segment.

24. The improvement in web-winding apparatus according to claim 22, including means for applying adhesive to at least portions of said transverse segment while it is disposed upon said web support member radially outward of the outer surface of said bedroll.

25. The improvement in web-winding apparatus according to claim 22, including:

means for applying adhesive to at least portions of said supported transverse segment while it is disposed upon said web support member radially outward of the outer surface of said bedroll; and

web severing means operably connected to said web-winding apparatus and adapted to transversely sever said web along a line preceding said supported transverse segment, whereby the leading end of said web following said line of severance and containing adhesive is held in contact with said web support member by means of partial vacuum communicating through said plurality of apertures therein, and is pressed into contact with a core disposed on one of said winding mandrels at said pickup position to commence the winding of a new roll.

26. The improvement in web-winding apparatus according to claim 23, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

27. The improvement in web winding apparatus according to claim 24, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

28. The improvement in web-winding apparatus according to claim 25, including web disposal means disposed adjacent the surface of said bedroll beyond said pickup position along the path of said web, said web disposal means being adapted to receive portions of said web which fail to transfer at said pickup position to the core on said mandrel.

29. The improvement in web-winding apparatus according to claim 27, wherein said web disposal means comprises a brokechute and means to create a partial vacuum therein, whereby the leading end of said web is drawn from said bedroll and into said brokechute upon failure to transfer to a core on one of said mandrels at said pickup position.

30. The improvement in web-winding apparatus according to claim 22, wherein said web support member comprises a resilient strip, and including:

two axially aligned and circumferentially spaced-apart support elements spaced from and preceding said resilient strip; and

severing means comprising a rotatably mounted chopper roll having a cutting element axially aligned relative to said bedroll and said chopper roll, said cutting element being arranged to penetrate the space between said support elements on said support member sufficiently to sever a web running over said bedroll and supported on said support elements.