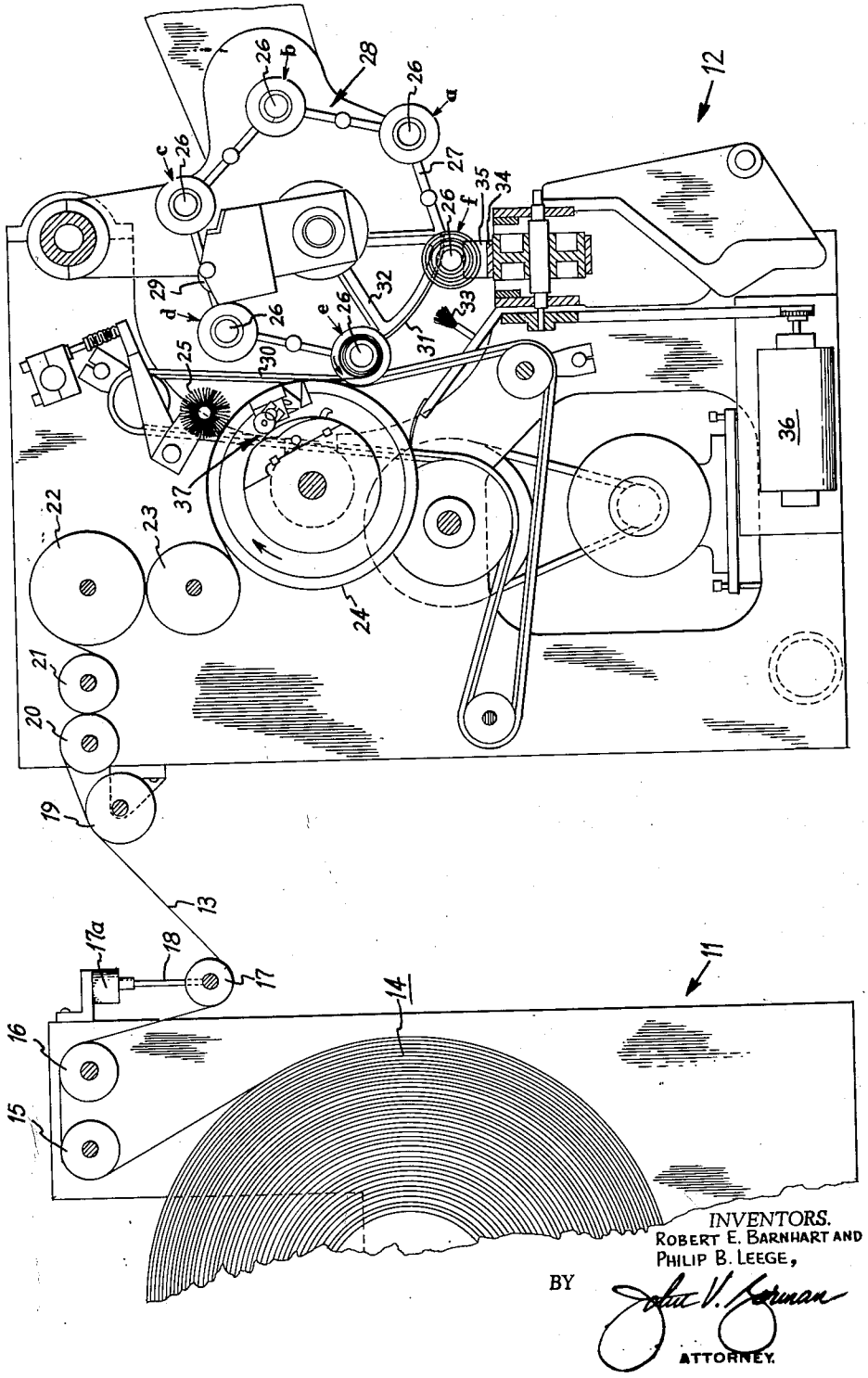
April 7, 1964 R. E. BARNHART ETAL 3,128,057

DOUBLE PLY WEB TRANSFER DEVICE

Filed June 12, 1962 2 Sheets-Sheet 1

Fig.1



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DOUBLE PLY WEB TRANSFER DEVICE

Filed June 12, 1962 2 Sheets-Sheet 2

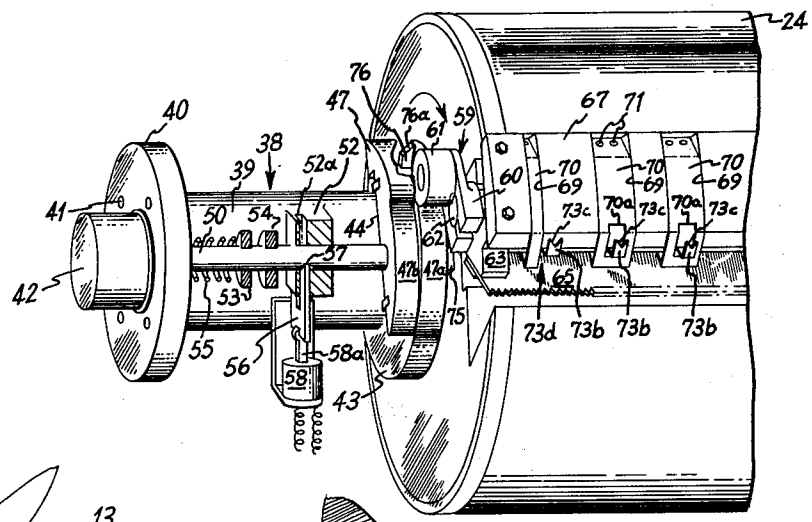


Fig. 2

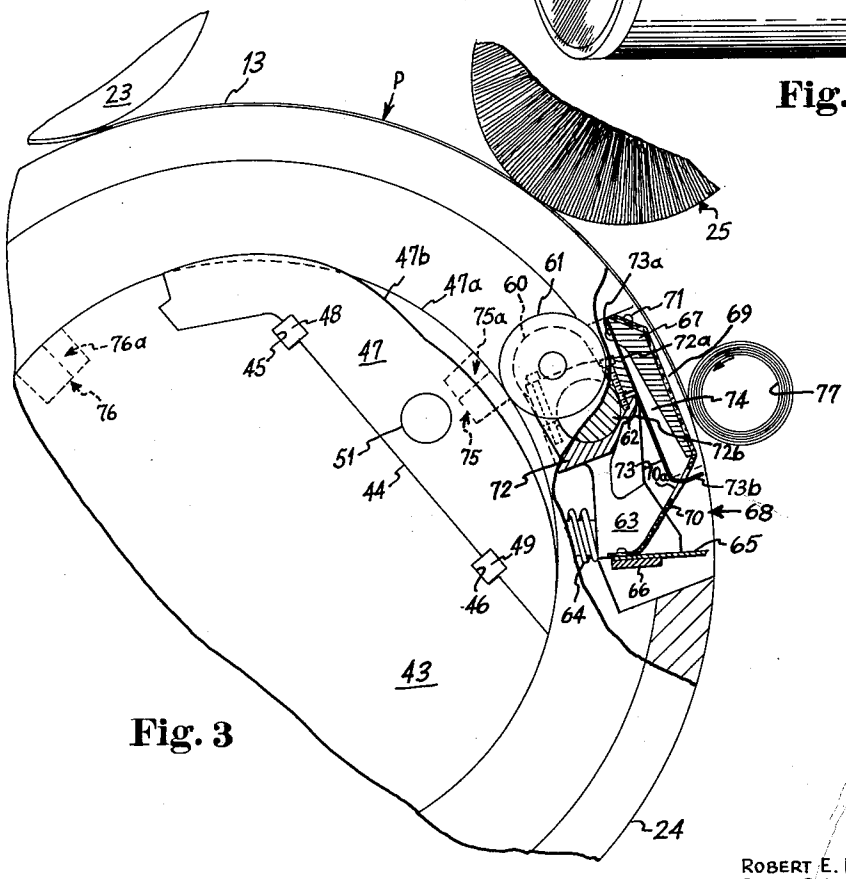


Fig. 3

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3,128,057

DOUBLE PLY WEB TRANSFER DEVICE

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Filed June 12, 1962, Ser. No. 201,905
5 Claims. (Cl. 242—56)

This invention relates to an improvement in web rewinding machines and more particularly, to an improved mechanism to facilitate positive transfer of a multi-ply web of paper to a core upon which said multi-ply web is to be wound.

In connection with many web winding machines, and particularly with respect to machines utilized in rewinding double ply toilet tissue in converting tissue from a parent roll to a "log" of the diameter of the ultimate product desired, it has been found that during certain periods substantial transfer difficulties may arise by virtue of the fact that the web being transferred is not under positive control. Such operating problems are extremely difficult to diagnose and correct and, generally speaking, tend to develop when the humidity conditions in the converting room are not favorable and/or owing, possibly, to subtle changes in the condition of the double ply web being rewound. Conceivably, of course, such difficulties could also be due to imperceptible misalignment and maladjustment of the equipment. Whatever the cause, however, it is clear that a positive means of accomplishing web transfer would greatly improve operational efficacy during these periods.

An example of the difficulties which arise is that of "break out" which occurs due to the tendency of the plies of toilet tissue to separate upon commencement of the rewinding operation on a new core. The usual mechanism of "break out" is that the outer ply of the paper being fed onto the new core falls away or separates from the inner ply until an area with a length of several sheets (defined by transverse lines of perforations as is common in this form of product) of the paper and generally having a width smaller than that of the entire ply flutters near the new core. Eventually, the separated portion of the outer ply doubles back upon itself and is wound upon the core along with the double ply tissue then being fed. Consequently, during the early phase of rewinding, a portion of the long roll will have a several-ply thickness being fed thereonto, causing a bunching and wrinkling of the paper. In the area of bunching and wrinkling the diameter of the roll being wound becomes greater than that of the balance of the roll, and since the speed of the roll being wound is regulated by the normal diameter of the log roll as it progresses through its winding cycle, it is driven at too high an angular velocity in the bunched area. Thus, the web being wound over the bunched area will be under considerably greater tension than that originally contemplated. As a result, the web is severed along the lines of perforations in the paper being fed to the log, creating further problems in separation, bunching and fold-back, making the roll unacceptable due to the imperfection of rewind quality and frequently necessitating machine shut-down.

If a machine, for example, is designed to operate at a web speed of approximately 1100 feet per minute, during the periods in which inefficient or ineffective transfer is experienced it is not unusual to have to reduce the speed of rewinding to a value of approximately 700 feet per minute in order to maintain quality and to continue production. A reduction in line speed, of course, results in increased operating and production costs as well as inconvenience in meeting scheduled production requirements. Also, due to the erratic and unpredictable nature of such transfer problems, this is one of the factors to be contended with in an effort to maintain a stable working force.

It is an object of this invention to obviate the above difficulties.

Another object of the present invention is to provide an improved means to facilitate the transfer of multiple ply webs on a rewind machine so as to achieve sufficient positive control over the web end being transferred so as to override the effect of humidity and web conditions and thereby insure uniformly good action at machine speeds at or in excess of the design speed of the rewinder.

It is a further object of the invention to provide means on a rewinding machine for double ply webs whereby each of the webs or portions thereof may be made to directly contact and be adhered to an adhesive applied to the core of the roll being wound.

Briefly stated, in accordance with one aspect of this invention, in connection with a paper winding machine having a bedroll about which a multi-ply web of paper passes, a plurality of mandrels adapted to successively and continuously receive and wind predetermined lengths of paper upon cores, and an adhesive applying means for applying adhesive to a multiplicity of ring-shaped areas of each core prior to winding, there is provided a piercing means for producing apertures in the multi-ply web at a multipilicity of points spaced transversely of the web, the means comprising a multiplicity of punches each aligned with one of the ring-shaped adhesive areas of the cores. The apertures are produced from the side of the web which is to be outermost when wound upon the core, causing fibers from the outermost ply of the web to be exposed on the innermost side of the web. There is also provided severing means for cutting the web slightly in advance of the apertures, and transfer means for causing the apertured and severed end of the web to be pressed against the core. The transfer is accomplished by orienting the web on the core with the exposed fibers of the outermost ply aligned with the ring-shaped adhesive areas on the core and directly contacting the adhesive thereon.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the present invention, it is believed that the invention will be better understood from the following description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a diagrammatic view of a machine with which the present invention is adapted to be used;

FIGURE 2 is a fragmentary perspective view, partly in section, of the web perforating and severing mechanism comprising the present invention along with the actuating mechanism therefor; and

FIGURE 3 is an enlarged fragmentary elevational view, partly broken away, showing the detailed cross section of the perforating and web severing devices and the actuating mechanism therefor.

As shown in FIGURE 1 an unwind stand indicated generally at **11** is associated with a web rewinding machine denoted by reference number **12**. The function of this equipment is to unwind a web **13**, for example, a double ply web, from a parent roll **14**, to perforate the web transversely and to rewind the web **13** so as to form a multiplicity of toilet roll logs from which the individual toilet rolls are later separated.

The parent roll **14** is rotatably supported on the unwind stand and is cause to be revolved in the feeding direction by either a delivery roller or a belt drive, neither of which is shown in the drawing. Upon being unwound from the parent roll **14**, the web **13** passes over idlers **15** and **16** and under a dancer roll **17** which is adapted to maintain uniform tension in the web **13**.

Such dancer rolls are well known in the prior art and consequently, no detailed description herein is necessary. In the present case, however, the dancer roll is shown as supported and controlled by an air cylinder 17*a* and its associated plunger 18. The web then passes over a Mount Hope (spreader) roller 19 which is crowned slightly at its central portion, thereby causing the web to expand laterally to its full width, thus eliminating wrinkling, and functioning as an aid in "tracking" the web to maintain it in its proper position. The web 13 then passes through the nip of the feed rolls 20 and 21 which frictionally engage the web, pulling it into the rewinding machine at a substantially constant rate. After passing under feed roll 21 the web 13 progresses through a perforator mechanism indicated generally at 22. The details of the mechanism 22 are not shown in the drawings and play no part in the present invention, the perforator being referred to merely to illustrate the general nature of the machine with which the subject invention may be operatively combined. However, one suitable such mechanism is described clearly in U.S. Patent 2,870,840, issued on January 27, 1959, to E. M. Kwitek. During the time of its passage through the perforator 22 the web is perforated transversely across its full width at uniformly spaced intervals, as is the common practice in producing rolls of toilet tissue. Then the web passes around a dummy slitter roll 23 to a bedroll 24.

The bedroll 24, which is rotating in a clockwise direction as viewed in FIGURE 1 carries the paper under a rotating guide roll 25 in the form of a cylindrical brush. The roll 25 performs the dual function of guiding the web 13 about the periphery of the bedroll 24 and aiding in the treatment of the web for transfer, as will be described hereinafter in more detail. From the bedroll 24 the web is wound upon cores mounted upon mandrels or core shafts 26 which are carried by an indexing turret or spiders 27.

As shown, a mandrel assembly identified generally as 28 comprises a six-station unit intermittently rotated by means of a Geneva mechanism adapted to move the assembly ⅙ of a revolution at a time. The sequence of operation of the turret or mandrel assembly 28 is as follows: a core is placed on the core shaft or mandrel 26, by manual or automatic means, at the station indicated by the letter *a*. After being actuated once by the Geneva drive, the core progresses or rotates to the station *b*, wherein suitable mechanisms may be employed to cut the core into a multiplicity of predetermined lengths. Such means have not been shown in FIGURE 1 nor have the web slitting means normally associated with such core cutting means been illustrated on the machine. In a machine such as shown in the drawing, the full length toilet roll log would be subsequently cut into a multiplicity of smaller rolls by means of a log cutting device, examples of which are well known by those skilled in the art. If web slitting and core cutting devices were incorporated on the rewinder, it will be understood that the individual shorter length toilet rolls would be prepared by the device.

Subsequent actuation rotates the core progressively to station *c* where no function is performed and then to station *d*. During the arcuate travel between stations *c* and *d* the core is swept over a plurality of glue applicator rollers 29 each of which apply a narrow width band or ring of glue or adhesive about the periphery of the core. Most desirably, the glue applicator rollers are placed so as to result in an application of two adhesive rings on each portion of the core which will later be separated. Thus, the preference is that the core of each finished roll of toilet tissue produced will have two glue rings thereon.

From station *d* subsequent rotation of the mandrel assembly 28 moves the core to which glue has now been applied into a web winding station *e*. During its arcuate travel between stations *d* and *e* the core shaft drive

mechanism engages driving belt 30, causing the mandrel or core shaft 26 and the core thereon to accelerate to a peripheral speed substantially identical to that of the bedroll 24. At the same time the core and core shaft 26 closely approach the bedroll 24 and the core is in position to pick up the leading end of the web 13 which has been severed and positioned against the core by means to be later described. The adhesive on the core causes the end of web 13 to adhere thereto and the winding of a predetermined length of web 13 onto the core is commenced. It will be understood that all of the hereinabove described action takes place during the continuous movement of the core from station *d* to station *e*.

Subsequent to the start of winding of the core, the core shaft 26 reaches the station *e* where the toilet roll log continues to be wound until a substantial portion of the proper length of web 13 is contained thereon. Then indexing of the turret again occurs and the partially wound toilet roll log commences movement toward the log stripping station *f*. During the course of the log's movement from station *e* to station *f* the balance of the predetermined length of web 13 is wound thereon and the log is finished when the next subsequent core shaft and its associated core approaches bedroll 24, the web is severed and the transfer of the newly formed leading end of the web 13 to the subsequent core accomplished.

Also, during the movement from station *e* to station *f*, the core shaft frictionally engages the lower edge 31 of bracket 32. The edge 31 is arcuate and corresponds with the arc through which the core is moved. The engagement of the bracket 32 with the periphery of the core shaft causes a substantial reduction in the angular velocity of the core shaft and the log mounted thereon and imparts a slow rotational motion thereto. As an aid in insuring the engagement of the tail of the web to the balance of the wound roll, a brush unit 33 is provided which extends longitudinally of the wound core and as the loose tail of the wound roll wipes over the bristles of the brush, the tail is charged electrostatically with a polarity such that the tail is attracted to the roll and lies securely thereagainst.

When the completed log reaches the station *f*, a continuous flat belt 34 having a lug 35 extending perpendicularly therefrom is utilized in stripping the core from the core shaft, propelling the roll by means of the lug 35. The core stripping belt 34 and lug 35 may amount to nothing more than an intermittently actuated conveyor belt. Such actuation could be provided by means of a limit switch energized once for each ⅙ revolution of the mandrel assembly 28 and stopped by any suitable means such as a limit switch adapted to break the electric circuit to the belt drive motor 36 when the lug 35 reaches a position on the lower or return leg of the conveyor.

The foregoing briefly describes the relationship of the various parts of the machine constituting the rewind apparatus. For details of the construction and operation of the various parts referred to, reference is made to U.S. Patent 2,769,600, issued on November 6, 1956, to E. M. Kwitek et al. From the specification of the Kwitek et al. patent it will be seen that the machine described therein is substantially identical with the equipment hereinabove described, differing principally by the inclusion of a web slitting and core cutting device, and in the construction and function of the guide roll overlying the bedroll. The construction of the machine will therefore be readily understood by those of ordinary skill in the art and for this reaosn further description of its general nature and design is unnecessary. The balance of this specification will therefore be devoted entirely to a description of the portion of the rewind apparatus to which changes have been made, in order to illustrate the adaptation of the subject invention to that device. That portion comprises the perforating and web severing device and the actuating

means therefore indicated generally at 37 and located respectively within and in close proximity to the bedroll 24.

As shown on FIGURE 2, the actuating mechanism for the perforating and severing devices is mounted on a spool-shaped member 38 having a central cylindrical portion 39. The spool-shaped member 38 is equipped at one end with a flange 40 provided with bolt holes 41 to facilitate the mounting of the member 38 to one end support wall of the rewinder 12. The spool-shaped member 38 is in alignment with the bedroll 24 axis, and as will be noted in the drawing, the bedroll axle 42 extends through the hollow axial portion of the spool.

A cam 43 is mounted on the end of the spool 38 opposite that to which flange 40 is secured. As will be seen more clearly in connection with FIGURE 3, the cam 43 has a cylindrical periphery with the exception of a substantially segmentally shaped cut-out on one side along the line 44. Two slots 45 and 46 have been machined into the cut-out edge to permit the acceptance of guide strips in slideable engagement. The slots 45 and 46 are parallel to the axis of spool-shaped member 38 and extend across the entire thickness of the cam 43.

A sliding cam segment 47 comprising a member having a thickness which is approximately double that of the cam 43 and having guide strips 48 and 49 attached thereto is adapted to be received in the cut-out portion of the cam 43. The lower surface of the segment 47 conforms closely to the configuration of the cam 43 surface along line 44 and guide strips 48 and 49 are received within slots 45 and 46 respectively. Cam segment 47, when in position on cam 43, is free to slide back and forth in slots 45 and 46. The upper portion of the sliding segment 47 is divided into two distinct cam surfaces of equal width each extending full length on the periphery of the upper portion. Cam surface 47*a* of the sliding segment 47 is adapted to be placed most nearly contiguous to the bedroll of the machine and is in the form of a portion of a cylinder having the same radius of curvature as the peripheral surface of the cam 43. When the sliding segment 47 is in position with cam surface 47*a* superposed over cam 43, the cam surfaces match exactly to thereby complete the periphery of the cam 43 and make the composite surface a perfect cylinder.

Cam surface 47*b* has a slight rise immediately following the leading portion thereof (with respect to the relative movement of the bedroll), thereby elevating that portion of the surface 47*b* slightly above the corresponding part of cam surface 47*a*. Thereafter, cam surface 47*b* recedes gradually to a point below surface 47*a* to provide a depressed portion which reaches its maximum depth somewhere in the vicinity of the central region of the cam surface and subsequently rises at a substantially uniform rate until it reaches the trailing edge of the sliding segment 47. The respective leading and trailing edges of each of the surfaces 47*a* and 47*b* are in alignment, of course, to present a smooth composite cam surface with the sliding segment 47 in either of the two descriptions described below.

Sliding segment 47 is selectively placed in the proper position, with either cam surface 47*a* or surface 47*b* in alignment with the cam 43, sliding back and forth and being guided by the strips 48 and 49. One form of selective locating apparatus is shown mounted on the central cylindrical portion 39 of the spool. Sliding segment 47 is mounted upon a rod 50, which extends toward the flange 40 and is telescoped within the hole 51 drilled laterally through the sliding segment 47. Rod 50 is supported by and slideably mounted within a bore in the outwardly projecting support 52 formed integrally with the central cylindrical portion 39 of the spool-shaped member 38. The sliding segment 47 and the rod 50 are locked together by any suitable and well known means so that the segment moves with the rod.

Two spaced collars or washers 53 and 54 are rigidly fastened to the slideable rod 50 and provide locating and spring support means for the rod. Washer 53 is a spring support washer, abutting against one end of helical spring 55 while the opposite end of the spring is pushed against the inner surface of the flange 40. The force exerted by the spring 55 against the flange 40 and washer 53 urges the slideable rod 50 toward the bedroll 24 to a position in which the sliding segment 47 has the cam surface 47*b* in alignment with cam 43. The extent of the rod's movement in the direction of the bedroll 24 is limited by the washer 54 engaging with the side of the integral support 52. In this connection, the proper location of the washer 54 can be obtained by placing the side wall of the cam surface 47*b* flush with the corresponding side wall of the cam 43 and then affixing the washer, by means of set screws or the like, in a position where it touches the side of the integral support 52 most closely adjacent flange 40.

The rod 50, however, is normally held so as to maintain the spring 55 in a compressed condition and in a position in which the cam surface 47*a* completes the periphery of the cam 43, such holding being accomplished by means of stop finger 56 which enters a notch 57 in the lower surface of the slideable rod 50. Notch 57 is positioned so that the stop finger 56 holds the rod 50 with the side surface of the cam portion 47*a* of sliding segment 47 flush with the corresponding surface of cam 43, thereby completing and making the composite cam surface cylindrical.

The stop finger 56 slides within recess 52*a* in the integral support member 52. A solenoid 58 has its armature 58*a* secured to the lower end of the stop finger 56 and is of the type having its armature spring loaded or biased outwardly. Thus, the armature 58*a* normally urges the stop finger 56 upwardly, maintaining the finger in position in the notch 57. When the solenoid 58 is actuated the armature 58*a* is drawn downwardly and the attached stop finger 56 moved out of the notch 57 in the slideable rod 50. Then the force of the compressed spring 55 causes the slideable rod 50 and the sliding segment 47 to move to a position wherein cam surface 47*b* completes the periphery of the cam 43 as described above.

The solenoid 58 is actuated by a limit switch triggered once for each ⅙ revolution of the mandrel assembly 28 by the action of the Geneva mechanism. Such an arrangement of limit switches is described in some detail in the Kwitek et al. Patent 2,769,600.

A cam follower, indicated generally at 59, comprises a slotted link 60 with a rotatably mounted roller 61 thereon, and is positioned to follow the composite contour of the cam 43 and the cam surface 47*a* or 47*b* (depending upon the lateral position of sliding segment 47). The slotted link 60 is locked to a shaft 62, which in turn is pivotally mounted within the bedroll 24, extending full length thereacross. A plurality of knife support arms 63 are securely mounted at spaced intervals along the length of the shaft 62 by means of keys, set screws or the like. The knife support arms are each provided with a recess to receive the outer end of helical springs 64, which in turn are held in place by commonly used means such as support members and pins located within the bedroll but not shown in the drawing. The springs 64 bias the knife support arms outwardly of the bedroll 24 thus urging the shaft 62 (as shown in FIGURE 3) in a counter-clockwise direction to resiliently force the cam follower roller 61 into engagement with the composite cam surface. The support member and pins and the retaining springs 64 are positioned and the knife support arms 63 and the spring accepting recesses therein are sized to permit the knife support arm to move in a direction substantially radially inwardly a sufficient amount whereby interference will not be occasioned at the time that the cam follower 59 traces the rise portion of cam surface 47*b*.

A web severing knife 65 is fastened to the web sup-

port arms 63 by suitable means such as machine screws. Stiffening bar 66 is attached to the web severing knife 65 to prevent deflection of the knife when it is actuated.

A sectional bedroll cover plate is utilized to provide access to the chop-off and perforating mechanism located within the bedroll, while maintaining a cylindrical periphery on the bedroll 24, with the exception of the severing knife opening 68 extending thereacross. Cover plate 67 has a number of slots 69 machined into the top surface thereof, preferably one at each point corresponding with the location of a glue ring on the core being wound, and each providing a depressed area of sufficient depth to receive and mount a transfer strap 70 therein. Similar transfer straps 70 are known in the art and are desirably made of a flexible material having good wear characteristics, such as belting. The straps 70 are fastened within the slots 69 by any suitable means such as screws 71 at the angularly inclined end of the slot 69. The other end of each of the straps 70 is fastened to the web severing knife 65 also by means such as screws.

A multiplicity of split hub actuators 72 are secured to the shaft 62 along the length thereof clamped thereon, for example, by recessed socket head machine screws. A split hub actuator 72 is positioned directly underneath each transfer strap 70 except in locations where bearings or other structural members located within bedroll 24 prevent this, in which case the actuator is placed as closely as possible to the transfer strap. One corner 72*a* constitutes a camming surface for a purpose to be later clarified. Contiguous to and directly overlying the outermost side of each actuator 72 is a piercing punch 73 the inner end or shank of which is fastened in a cantilevered chordlike position to the lower surface of the sectional bedroll cover plate 67 by means such as machine screw 73*a*. The piercing punch may comprise a .020" thick piece of spring steel having its outer or piercing end portion 73*b* bent upwardly so as to lie in a plane normal to the shank of the punch. At the distal end of the portion 73*b* the punch has one or more sharp points formed therein as by making a right angled notch 73*c* therein connecting the side edges of the punch. Thus formed, when the punch 73 is fastened to the cover plate 67 the portion 73*b* lies in a radial plane within the confines of the bedroll 24, the pointed ends thereof being located contiguous to the periphery of the roll. Due to the positioning of many of the actuators 72 directly beneath transfer strap 70, and since a piercing punch 73 lies directly over each of the actuators 72, there will be interference between the end portions 73*b* of such punches 73 and the transfer straps 70 unless suitable provision is made to permit the punch to extend through the strap 70. As shown most clearly in FIGURE 2, such provision may constitute the use of a cut-out 70*a* in each of the straps with which such interference is presented. It should be understood that where a cut-out 70*a* is used in a strap 70, the width of the strap should be substantially greater than that of the piercing punch 73 so as to avoid excessive weakening of the strap. Thus, the end portion 73*b* projects through the cut-outs 70*a* in each of the straps which overlie a punch. Where a punch 73 lies to the side of a transfer strap, as at 73*d*, no cut-out need be made in the strap. Alternatively, two narrow straps could be used instead of one wide strap where such interference arises, the straps being parallel and spaced apart by a distance slightly in excess of the width of piercing punches 73.

Wherever a punch 73 is located, a lower slot 74 is provided in the inner surface of the sectional bedroll cover plate 67. The slot 74 is of sufficient width to accept the punch 73 when and as it is actuated and has a depth permitting full actuation of the punch 73 without interference therewith.

On the side wall of the cam surface 47*a* of sliding segment 47 is provided an integrally formed lug 75 constituting a cam follower having an inclined lead-in surface 75*a*. The lead-in surface 75*a* extends from the outermost side of the lug 75 (closest to the bedroll 24) and tapers inwardly toward the sidewall of the camming surface 47*a* on the side of the lug 75 which would be termed the leading edge thereof in consideration of the relative motion of the bedroll 24 and the spool-shaped member 38. A cam 76 is mounted on the end of the bedroll at a radial distance from the axis of rotation which corresponds with that of the lug 75. The cam 76 is also provided with an inclined lead-in surface 76*a* at its leading end. The combined interference heights of the lug 75 and cam 76 are equal to the width of each of the cam surfaces 47*a* or 47*b*, or in other words, to the distance which rod 50 must be moved in selectively changing the position of sliding segment 47.

It will be understood that in operation the bedroll rotates in a direction shown by the arrows in the drawings, and that the spool-shaped member 38 and its apurtenance are so mounted on the machine as to prevent rotation thereof. Consequently, during the operation of the machine the cam follower roller 61 moves along the stationary composite cam surface formed by the cam 43 and the sliding segment 47. As a core is being wound, the bedroll will make a predetermined number of revolutions with the cam follower roller 61 traveling in a circular path due to the positioning of the sliding segment 47 whereby circular cam surface 47*a* is in operating position. Then, at an instant during which the cam follower roller 61 is located along a portion of the cylindrical periphery of cam 43, and at which the cam 76 is beyond the sliding segment 47 in the direction of rotation, a limit switch actuated by the Geneva driving mechanism sends a signal to the solenoid 58 causing the armature 58*a* to be drawn into the solenoid coil and thereby pulling the stop finger 56 from its position in notch 57 of the rod 50. Upon withdrawal of the stop finger, compressed helical spring member 55 resiliently urges rod 50 in a direction toward the bedroll 24, thus quickly shifting sliding segment 47 to its innermost position wherein cam surface 47*b* thereon is in alignment with the periphery of cam 43.

As the follower roller 61 traveling with the bedroll 24 proceeds over the leading edge of cam surface 47*b*, the rise thereon causes the follower roller 61 to move radially outwardly. Such movement is transmitted to the shaft 62 causing a partial rotation thereof in a clockwise direction. The clockwise rotation of the shaft 62 simultaneously causes the knife support arms 63 to retract slightly and the acuators 72 to turn clockwise. Due to the rotational movement of actuators 72, the cam surfaces 72*a* thereon sweep into contact with piercing punches 73 to thereby cause the punches to bend outwardly and force the end portion 73*b* upwardly against the paper traveling over the bedroll to a position wherein the piercing end portion 73*b* protrudes from the bedroll 24.

At the time that the piercing punches 73 are at their fully extended position, the distal end of the punch is in the position indicated at *p* on the drawings. The position is slightly in advance of the guide roll 25 and because of its adjacency the guide roll 25 tends to maintain the web in position against the bedroll 24 surface so as to permit easy penetration thereof by the punches. If by chance penetration is not obtained at point *p* due to the resiliency of the web 13 permitting it to be pushed outwardly by the punch, the configuration of the cam 47*b* rise is such to cause the punch to remain in an extended position during the portion of the revolution in which the punch passes beneath the roll 25. In such a case, the bristles of the brush 25 force the web 13 back against the bedroll 24 thereby causing the extended end of the punch to pierce the web. Thus, the brush roll 25 provides a back-up action and ensures a positive and complete punch through. In penetrating the web, the sharp points on the punch cause fibers of the web 13 ply which is contiguous to the bedroll 24 surface to be drawn through

the other ply and lie exposed on the opposite surface of the web. At the same time the brushing by the bristles of guide roll **25** "work" the torn edges of the aperture to result in maximum exposure of such fibers.

Following completion of the piercing operation, the cam follower roller **61** rides off the rise of cam surface **47***b* and proceeds into the depressed portion thereof. As the follower enters the depression, it moves radially inwardly of the bedroll causing a rotation of the shaft **62** in a counter-clockwise direction. The counter-clockwise rotation of the shaft causes the knife support arms **63** to swing outwardly with its associated web severing knife **65** to thereby sever the web on a transverse line of perforations made by perforating mechanism **22**. Since the periphery of the bedroll is traveling at the same speed as the web **13**, and in view of the relative location of punches **73** and severing knife **65**, the severing of the web **13** occurs at a position slightly in advance of the apertures made in the web by the piercing punches. In its outermost position the transfer straps **70** attached to the web severing knife **65** press the apertured leading end of the web **13** against the outer surface of the core **77** which has been positioned for reception thereof during the synchronized movement of mandrel assembly **28**. It is important in this connection that the apertures which are aligned with the adhesive rings on the core **77** be pressed against the rings during this operation to ensure adhesive contact with the fibers of both plies of web **13**.

In the embodiment shown the counter-clockwise rotation of shaft **62** will also cause the actuator **72** to turn in the same direction. By reason of the rounded corner **72***b*, however, no actuation of the punches occurs and the punch remains substantially stationary at this time.

The straps **70** as previously stated, are located along the sectional bedroll cover plate **67** at positions in alignment with each of the rings of adhesive applied to the core by means of the glue applying rollers **29**. In view of the prior recited relationships of the piercing punches **73** and the transfer straps **70**, it will be understood that the majority of the apertures in the web **13** will be in alignment with the rings of adhesive on the core at the time of transfer. Due partly to the interlocking (because of the apertures made by the piercing punches) of fibers of the plies comprising the web prior to the application thereof to the core **77**, but principally because fibers of the ply which is to constitute the outer ply of the core **77** being wound are presented to the adhesive thereon and thereby bond both plies thereto, separation of the plies at commencement of the winding cycle is prevented.

Following the start of the winding cycle of the new core **77**, further rotation of the bedroll brings the cam **76** into position where it contacts lug **75** on the sliding segment **47**. The interaction of the mutually opposed lead-in surfaces **76***a* and **75***a* forces the sliding segment **47** to move away from the bedroll **24**, compressing spring **55**, until the rod **50** is in a position whereby the stop finger **56** moves into the notch **57**, thus locking the segment **47** in place with cam surface **47***a* aligned with cam **43**, resetting the perforating and severing mechanism.

By means of the subject device a sure and positive control is exerted over the leading edge of the outer ply of the web being wound on a core, substantially eliminating the problem of break-out previously mentioned and permitting the equipment to be operated consistently at higher efficiencies than were heretofore obtainable.

Many modifications of the above invention may be used and it is not intended to hereby limit it to the particular embodiments shown or described. The terms used in describing the invention are used in their descriptive sense and not as terms of limitation, it being intended that all equivalents thereof be included within the scope of the appended claims.

What is claimed is:

1. In a paper winding machine having a bedroll about which a multiple ply web of paper passes and a plurality of mandrels adapted to successively and continuously receive and wind predetermined lengths of paper upon cores, the combination comprising:

(A) adhesive applicating means for applying adhesive to a multiplicity of continuous ring-shaped areas on the periphery of a core prior to winding,

(B) intermittently actuated piercing means for producing apertures in said web at a multiplicity of points spaced transversely across said web, said piercing means comprising a multiplicity of punches each aligned with one of the ring-shaped adhesive areas of said core, said punches being positioned to penetrate the web from the side thereof which is to be outermost when the web is wound on a core, to thereby cause fibers from the outermost ply of the web to be exposed on the innermost side of said web, said punches being actuated only once during the winding of each core,

(C) severing means for cutting said web in timed relationship with the operation of said piercing means and at a position on the web slightly in advance of said apertures, and

(D) transfer means for causing the apertured and severed end of said web to be pressed against said core with said apertures directly contacting the aligned rings of adhesive on said core,

whereby fibers from the outermost ply of said web become adhered to said core so as to prevent separation of said plies during the initial stages of the winding operation.

2. In a paper winding machine having a bedroll about which a multiple ply web of paper passes and a plurality of mandrels adapted to successively and continuously receive and wind predetermined lengths of paper upon cores, the combination comprising:

(A) adhesive applicating means for applying adhesive to a multiplicity of continuous ring-shaped areas on the periphery of a core prior to winding,

(B) piercing means for producing apertures in said web at a multiplicity of points spaced transversely across said web, said piercing means comprising a multiplicity of punches mounted within said bedroll with the piercing end portions normally below the periphery of the bedroll, said punches being simultaneously actuatable to cause said piercing end portions to be elevated to piercing position wherein said piercing end portions protrude from said bedroll, said punches each being aligned with one of the ring-shaped adhesive areas of said core, said punches being positioned to penetrate the web from the side thereof which is to be outermost when the web is wound on a core, to thereby cause fibers in the outermost ply of the web to be exposed on the innermost side of said web,

(C) severing means for cutting said web in timed relationship with the operation of said piercing means and at a position on the web slightly in advance of said apertures, and

(D) transfer means for causing the apertured and severed end of said web to be pressed against said core with said apertures directly contacting the aligned rings of adhesive on said core,

whereby fibers from the outermost ply of said web become adhered to said core so as to prevent separation of said plies during the initial stages of the winding operation.

3. The combination of claim 2 in which said punches are actuated to piercing position once for each predetermined length of paper wound, by means of a cam operating in timed relationship with the operation of said mandrels.

4. The combination of claim 3 in which each of said punches is constructed of spring steel and is cantilever mounted within said bedroll, the shank of said punch lying in a chordlike position with the piercing end portion

thereof bent upwardly to lie normal to said shank and in a substantially radial plane, said punch being movable to piercing position by the bending of said shank outwardly.

5. In a rewinder adapted to wind upon a core a predetermined length of a web comprising a plurality of plies and having a bedroll about which the paper passes in progressing to said core, the combination of:

(A) adhesive applicating means for applying adhesive to a multiplicity of continuous ring-shaped areas on the periphery of said core prior to winding,

(B) intermittently actuated piercing means for producing apertures in said web at a multiplicity of points spaced transversely across said web, said piercing means comprising a multiplicity of punches each aligned with one of the ring-shaped adhesive areas of said core, said punches being positioned to be extended to penetrate the web from the side thereof which is to be outermost when the web is wound on a core, to thereby cause fibers from the outermost ply of the web to be exposed on the innermost side of said web, said punches being actuated only once during the winding of each core,

(C) a moving brush means in contact with said innermost side of the portion of said web acted on by said punches while said punches are in an extended position to thereby insure a positive and complete penetration and to work the torn edges of the aperture to result in a maximum exposure of said fibers,

(D) severing means for cutting said web in timed relationship with the operation of said piercing means and at a position on the web slightly in advance of said apertures, and

(E) transfer means for causing the apertured and severed end of said web to be pressed against said core with said apertures directly contacting the aligned rings of adhesive on said core,

whereby fibers from the outermost ply of said web become adhered to said core so as to prevent separation of said plies during the initial stages of the winding operation.

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