METHOD OF AND MEANS FOR SEVERING WEB STRIP MATERIAL UPON COMPLETION OF WINDING A ROLL AND INITIATING WINDING OF A NEW ROLL

ABSTRACT: A strip of adhesive tape is applied across the full width of elongated web material at an angle to the transverse thereof, and the leading end of said tape is adhered to a new winding mandrel. As the web is moved past the mandrel, it is torn along the leading edge of the tape to finish a wound roll, and the tape-adhered-severed edge is wound on the new mandrel to initiate a new roll. A second tape may be applied to the web in overlapping relation to the leading edge of the first-mentioned tape so that an adhesive portion of said second tape is exposed as the web is severed and serves to secure the trailing end of the severed web on the completed wound roll. For very wide web material, tapes may be applied to the mandrel at both sides of the web and meet at an apex at the center of the web.
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BACKGROUND OF THE INVENTION

The most difficult and time-consuming operation in winding elongate web material into rolls of selected size is the operation of severing the web when the roll reaches desired size and initiating the winding of a new roll. This particularly is true in the winding of slit material wherein the web is slit into a plurality of side-by-side strips and wound into a plurality of side-by-side rolls independent of each other, because the strips must be accurately positioned when initiating a new roll or rolls. As a general rule, the slitting of the web is effected on a rewinding stand wherein the web is fed from a previously wound supply roll into the slitter-rewind apparatus. Therefore, the present invention will be described specifically with respect to a rewinding operation although, obviously, it is equally applicable to rewinding in any web winding operation.

The rewinding of web material usually is effected on a rewind stand comprising a horizontally disposed driven platen drum having indexing turret wheels at the respective ends thereof. A plurality of rewind mandrels are rotatably carried by the turret wheels for radial movement toward and from the drum and to be driven by frictional engagement with the drum. The web material is led into one side of the stand adjacent the bottom thereof, and then directed upwardly to the platen drum and over the drum to a rewinding roll engaging the upper periphery of the drum. A fresh rewinding mandrel is supported by the turret wheels in a position spaced from the platen drum, and on the side of the drum over which the web is led. Upon completion of the rewound roll on the upper side of the drum, the fresh mandrel is moved into proximity with the web and the drum to enable severing of the web and initiating a new rewinding roll.

If the web strip is solid completely across its width, it is the general practice to endeavor to sever the web and initiate the new rewind roll without stopping the machine and, for this purpose, the surface of the fresh mandrel is rendered tacky by a suitable adhesive, and as the mandrel moves into engagement with the web and drum, the operator will slash or nick one edge of the web to produce a flap or tab which, hopefully, will adhere to the fresh mandrel. If the operation works properly, the tab portion will attempt to move away from the body of the web and, in so doing, will tear the web, again hopefully, across its width. More frequently than not, however, the web tears longitudinally rather than transversely and, in such event, the machine must be stopped and the excess partial width of the web must be cut from both the tail end of the rewound web and the leading end of the remaining web for starting the new rewinding roll.

Frequently, sets of slitter knives are provided in the stand adjacent the bottom thereof, and between which the web is passed so that the web is cut longitudinally to produce a plurality of side-by-side strips each of which is to be rewound independently of the other. The individual strips must be accurately rewound to avoid overlapping and interleaving with adjacent strips on their respective rewind rolls, and to terminate one rewinding operation and initiate another requires stopping the machine so that the leading end of the new rewinding operation can be accurately positioned.

Although the foregoing description refers only to a mandrel, in actual fact, a cylindrical core is removably carried by the mandrel and, in a slitter machine, the core constitutes a plurality of separate cores corresponding to the width of an individual slit strip. Consequently, it is essential that the material be accurately positioned with respect to such a core in slitting machines.

SUMMARY OF THE INVENTION

According to the present invention, the web material may be accurately severed in continuous operation and the leading edge of the web for the new rewind roll may be accurately positioned with the minimum of effort and maximum efficiency. For this purpose, a strip of adhesive tape of a length somewhat greater than the total width of the web material may be disposed transversely of the web material on the side engaging the platen drum and one end of the tape is adhered to the fresh mandrel or the cylindrical core carried thereby. The tape is disposed at an angle to the transverse edge of the web material and, as a result, the end of the tape being adhered to the mandrel, the leading edge of the tape will serve to cut the web material transversely thereof as the tape is wound spirally around the mandrel. The tape may be positioned while the apparatus is running by means of two operators stretching the tape across the web, or the machine can be stopped and the tape applied manually by a single operator.

Preferably, a second tape is applied to the web material in overlapping relation with the leading edge of the first mentioned tape so that the leading portion of the second tape will be adhered to the trailing end of the web material as the material is severed; whereas the trailing portion of the second tape will be exposed beyond the severed edge of the web material as the second tape is peeled from the first tape. The second tape is of a length less than the width of the web material so that its ends cannot become engaged with the fresh mandrel. However, as the trailing end of the web material is wound on the completed rewound roll, the exposed edge portion of the second tape will adhere to the outer convolution of the completed rewound roll so that the roll can be handled and removed from the machine without the outer convolution becoming loosened. For very wide webs, tapes may be trained from both edges of the web to an apex centrally of the web to avoid excessive buildup of the rewound web at one end of the roll.

To facilitate application of the tapes, the machine may be provided with a rotatable tape bar which preferably is carried by a support that is movable between an operating position closely adjacent the web material and a loading position at a point adjacent the opposite side of the machine and at which the bar is readily accessible. The bar is removable and carried by the aforementioned support so that it can be removed from the machine and the tape or tapes wound spirally thereon. The leading end of the first tape may be so arranged that the operator can readily grasp and adhere it to the fresh mandrel without stopping the machine. Preferably, the bar is suitably scored or otherwise marked with a spiral guideline to be followed in winding the tapes on the bar and also end lines at the location for the trailing end of the tape indicating the end positions for the respective tapes. The winding of the tapes on the bar conveniently may be initiated from the trailing end. The spirally scored line ensures that the tape will be applied to the web strip material at a proper angle and will extend completely across the web strip material. For the application of dual tapes from both edges of the web, the bar may be centrally divided with two relatively rotatable sections.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end view in elevation, diagrammatical in nature, of a standard rewinding apparatus and indicating thereon the respective positions of a tape bar in accordance with the present invention;

FIG. 2 is a schematic view in elevation illustrating the application of tapes according to the invention across slit web material and approximately a view taken from the direction of the arrow F2 in FIG. 1;

FIG. 3 is an enlarged fragmentary end view of the platen drum and fresh mandrel and illustrating the severing of the web material;

FIG. 4 is a schematic view in perspective of the drum and mandrel shown in FIG. 3, and showing the initiation of the
new rewind roll along with the termination of the completed rewind roll; FIG. 5 is a plan view of a tape bar and illustrating the guidelines thereon; FIG. 6 is a view of the tape bar with the tapes applied thereon; FIG. 7 is an end elevational view of FIG. 6; FIG. 8 is a side view in elevation of the tape bar and its support in operative position within the apparatus; FIG. 9 is a schematic view in elevation illustrating the application of tapes across a slit web of wide material; FIG. 10 is a view in elevation of a tape bar for use in applying tapes in the manner illustrated in FIG. 9; and FIG. 11 is an enlarged fragmentary cross-sectional view taken on line 11-11 of FIG. 10.

DETAILED DESCRIPTION OF THE INVENTION

Referring specifically to the drawings, and particularly to FIG. 1, a conventional rewind stand 10 includes a base 12 rotatably supporting a driven platen drum 14 and indexing turret wheels 16 respectively disposed at opposite ends of said drum. Each of the turret wheels comprises a plurality of radially disposed, angularly spaced support means 18 which are respectively aligned to cooperatively support therebetween a mandrel 20 parallel to the plane of the platen drum, and accommodating movement of said mandrel between loading and unloading positions at the periphery of the wheels, and a working position in frictional driving engagement with the drum.

The wheels 16 are adapted for indexing successively from a loading and transfer station A to a winding station B and an unloading station C. In the stand illustrated in FIG. 1, there are four of the mandrel support means 18 disposed 90° apart so that there also is an idler station D. The indexing wheels may comprise different numbers of support means but such means are uniformly spaced for uniform indexing movement. In addition, the stand may be provided with idlers 22 and 24 and the latter may comprise, in cooperation with a companion idle 24’, pairs of circular, rotary slitter knives.

In the rewind operation, a web W is trained around the idlers 22 and 24, and over the platen drum 14 to the rewind roll at station B, at which the mandrel and web convolutions thereon are driven by the platen drum until the rewind roll reaches the desired size. When the rewind roll at station B reaches the desired size, the web W is severed and the new leading end is attached to a new mandrel 20 at station A, whereupon the wheels 16 are indexed to move the newly started roll from station A to station B, and the completed rewind roll from station B to station C. At station C, the completed roll may be unloaded onto a carriage 26 and removed from the stand. At station A, the new mandrel 20 is spaced from the drum 14 by stationary cam, not shown, and does not start rotation until indexing of the turret wheels 16 is initiated.

The foregoing description sets forth the characteristic structure and operation of the conventional rewind stand, and the principal problem involved has been in connection with the severance of the web and attaching the leading end of the severed web to a new mandrel 20 at station A. The present invention is directed to the method and means for accomplishing such severance and attaching the leading end to the new mandrel without having to stop operation of the machine, and assuring accurate initial winding on the new mandrel even if the web has been slit into a plurality of side-by-side strips. The means for accomplishing this highly advantageous operation is best illustrated in FIGS. 2-4 wherein the web W is shown as having been slit into a plurality of side-by-side strips S. The slit web is illustrated primarily because this has been the most difficult to the prior practice. According to the present invention, a pressure sensitive tape 30 is adhered at an angle to the transverse of the web W to the face of the web opposite the new mandrel 20 with an end portion 30’ of the tape at the leading end thereof extend-
aligned with the end line 40. At one end adjacent the leading tape end 30', the bar 36 is provided with a tangentially extending finger 44 to which the end 30' may be applied, as shown in FIG. 7, and then dipped in a loop with the extremities and the peripheries of the knives 56 are spaced from the platen drum 14 a distance slightly less than the diameter of the new core. Thus, as the new mandrel passes the knives 56 the latter penetrate the periphery of the core and the speed of the mandrel effects at least one complete revolution of the mandrel while engaging the knives 56 so that the strips 5 are slit into sections corresponding to the width of the strips 5. When the tape cutting operation is completed, the knives 56 are retracted to station R.

The seving of the web by means of the tear tape 30 has proved highly efficient with all types of web materials including paper, metal foil, synthetic plastics and the like, including laminates thereof. Observe that the web 30 must have a tear strength at least as great as and preferably greater than that of the web material, and different tape types may be employed for different web materials. Moreover, the web material must have a surface to which the tape will adhere and, therefore, normally is free of release coatings.

It has been found that with very wide webs, for example 8 feet wide, a single tape along the same line completely across the web material will cause accumulation on the new mandrel of several convolutions of material at the side of the web at which the tear is initiated before the other side of the web is completely severed. This causes unevenness of winding of the web material, resulting in a slightly conical roll. To eliminate such uneven winding and provide a roll of substantially uniform thickness, the tearing edge of the web may be initiated at both side edges simultaneously. To accomplish the dual-tearing operation, as shown in FIG. 9, two tear tapes 130 may be disposed across the web W at an angle to each other to define a V-shaped tear edge 130, the apex of which is located substantially centrally of the web W. If the operation is to be performed on a slit web, the apex formed by the inner ends 130' should coincide with the slit between the two strips 130 and their inner ends 130' meeting at the apex of the tapes.

Normally, the two tapes are disposed so that their leading outer ends 130' traverse the respective opposite edges of the web W at points substantially transverse the web so that tearing will be initiated simultaneously at both edges. A pair of securing tapes 134 may be applied over the tear tapes 130 in the manner as previously described, with subsequently to be exposed adhesive portions 134a overlying the tape 130, and the peripheries of the knives 56 are spaced from the platen drum 14 a diameter to receive the bearing 170, a counterbore 176 of a

The indexing movement of the wheels 16 is relatively slow whereas the rotational speed of the platen drum 14 and the new mandrel is relatively fast. Consequently, the initial winding of the strips on the new mandrel is very rapid and a sufficient number of convolutions of the strips to bind them on the core are wound thereon during only a small angular movement of the new mandrel from station A to station B. Theoperative position of the slitter knives 56 at station E is spaced above station A a distance sufficient to enable the new mandrel and core to initiate the winding of the strips 5 thereon,
diameter to receive the bearing 166, and a shoulder 178 between the bore and counterbore and against which the bearing 166 is retained by a snap ring 180 seated in a groove 182 in the counterbore.

The foregoing mounting assembly enables relative rotation between the sections 136', 136" to accommodate any slight variation in the angulation of the tapes wound thereon and/or any difference longitudinally of the web, in the points of adhesion at the respective web edges. Preferably, the adjacent ends of the cylinders 138', 138" are slightly spaced to enable insertion of a blade therebetween to sever overlapping portions of the tapes, particularly for use with slitters.

Although the foregoing disclosure is limited to use of the invention in a rewind stand, the invention equally is as effective in severing webs in connection with other operations and types of apparatus, such as initial winding, as long as the web is maintained under tension and the path of the web diverges from the periphery of the new mandrel.

It will be understood that the term “mandrel” is used in a generic sense to encompass not only a mandrel per se but also the combination of a mandrel with a cylindrical core mounted thereon.

We Claim:

1. In the winding of elongated web material into rolls of selected size or web length, the method of severing the web to terminate one roll and initiate winding the web in a new roll comprising:
   adhering a leading end of at least one tape to one end portion of a mandrel on which a new roll is to be wound,
   adhering to the web surface opposite that engageable with said mandrel on which it is to be wound said at least one tape having a tear strength at least as great as that of the web and disposed at an angle to the transverse of the web and with at least the leading end of the tape extending beyond the adjacent edge of the web, and
   advancing said web under tension through a path diverging from the periphery of said mandrel while rotating said mandrel to wind the web helically and causing said web to sever into trailing and leading ends by tearing along the leading edge of said tape which extends transversely of the web at the point of divergency, with the leading end of the severed web winding on the mandrel with said tape.

2. The method of claim 1 comprising adhering to said web surface an overlapping relation with the leading tear edge of said at least one tape at least one second tape of a length less than the width of said web at the angle at which said tapes are disposed to expose, as said web is torn along said leading edge, an adhesive surface on said second tape for securing the trailing end of said, severed web on the one completely wound roll.

3. The method of claim 2 including providing the exposed surface of said first mentioned tear tape with a release coating to facilitate the stripping of the second mentioned tape therefrom.

4. The method of claim 1 comprising slitting said web into a plurality of side-by-side strips prior to the adherence of a tape therefrom.

5. The method of claim 4 comprising extending the trailing end of said tear tape beyond the adjacent edge of said web to be adhered to the mandrel and retain said strips in side-by-side relation as they are wound on the mandrel.

6. The method of claim 5 comprising slitting said tear tape in coincidence with the slits between said strips.

7. The method of claim 2 comprising slitting said web into a plurality of side-by-side strips prior to the adherence of a tape thereto.

8. The method of claim 7 comprising extending the trailing end of said tear tape beyond the adjacent edge of said web to be adhered to the mandrel and retain said strips in side-by-side relation as they are wound on the mandrel.

9. The method of claim 8 comprising slitting said tear tape in coincidence with the slits between said strips.

10. The method of claim 1 comprising adhering said tape to said web while continuously advancing said web.

11. The method of claim 10 comprising adhering said strips to said web while continuously advancing said web.

12. The method of claim 1 comprising adhering a second tape to said web and disposed at an angle relative to said at least one tape with the leading end of said second tape extending beyond the opposite edge of the web and the trailing ends of said tapes meeting in a apex centrally of said web.

13. The method of claim 12, comprising adhering to said web surface in overlapping relation with the leading tear edge of each of said at least one and second tapes other tapes of a length less than the length from said apex to the respective edges of said web and at the angle at which said at least one and second tapes are disposed to expose as said web is torn along said leading tape edges an adhesive surface on said other tapes for securing the trailing end of said severed web on the completely wound roll.

14. The method of claim 13 comprising slitting said tapes at their apex.

15. In apparatus for winding an elongate web into rolls of selected size or web length and including a first mandrel on which the web is wound in a roll and a second mandrel on which a new roll is to be wound, the improvement comprising a tape bar on which at least one tape is helically wound along the length of said bar, and means rotatably supporting said bar in an operative position adjacent said web and on the opposite side thereof from said second mandrel, whereby the leading end of the tape may be adhered to said second mandrel to be wound thereon and therefore to be adhered to the opposite side of the web to cause the web to tear along the leading edge of the tape to complete the roll on the first mandrel and initiate winding a roll on said second mandrel.

16. In apparatus according to claim 15 wherein said means is moveable between said operative position to a loading position spaced from the web path to facilitate the winding of fresh tape thereon.

17. In apparatus according to claim 16 wherein said bar is removably mounted on said means to facilitate the winding of fresh tape thereon.

18. In apparatus according to claim 17 wherein said bar has guide means on its surface for guiding the application of fresh tape thereon.

19. In apparatus according to claim 15 wherein the tape supporting surface of said bar is provided with a release coating.

20. In apparatus according to claim 15 wherein the tape supporting surface of said bar is roughened to reduce contact area for the tape.

21. In apparatus according to claim 15 wherein said tape bar comprises two axially disposed, relatively rotatable sections having their adjacent ends located centrally of said bar.

22. In apparatus according to claim 21 wherein said adjacent section ends are spaced sufficiently to accomplish a blade therebetween.