Feb. 25, 1964 J. F. DUSENBERY ETAL 3,122,335

WEB SLITTER-REWINDER

Filed May 2, 1961

3 Sheets-Sheet 1

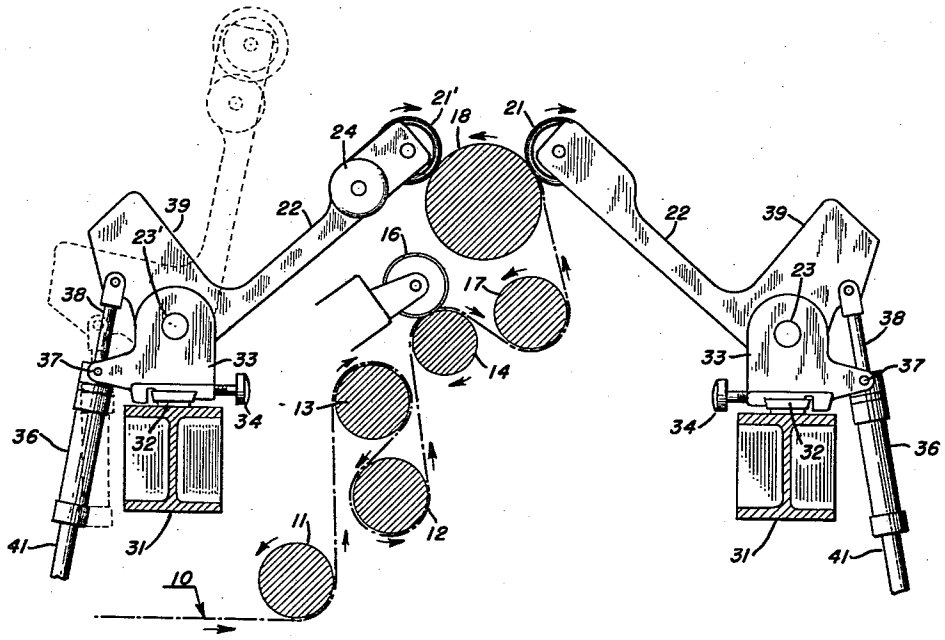


Fig-1

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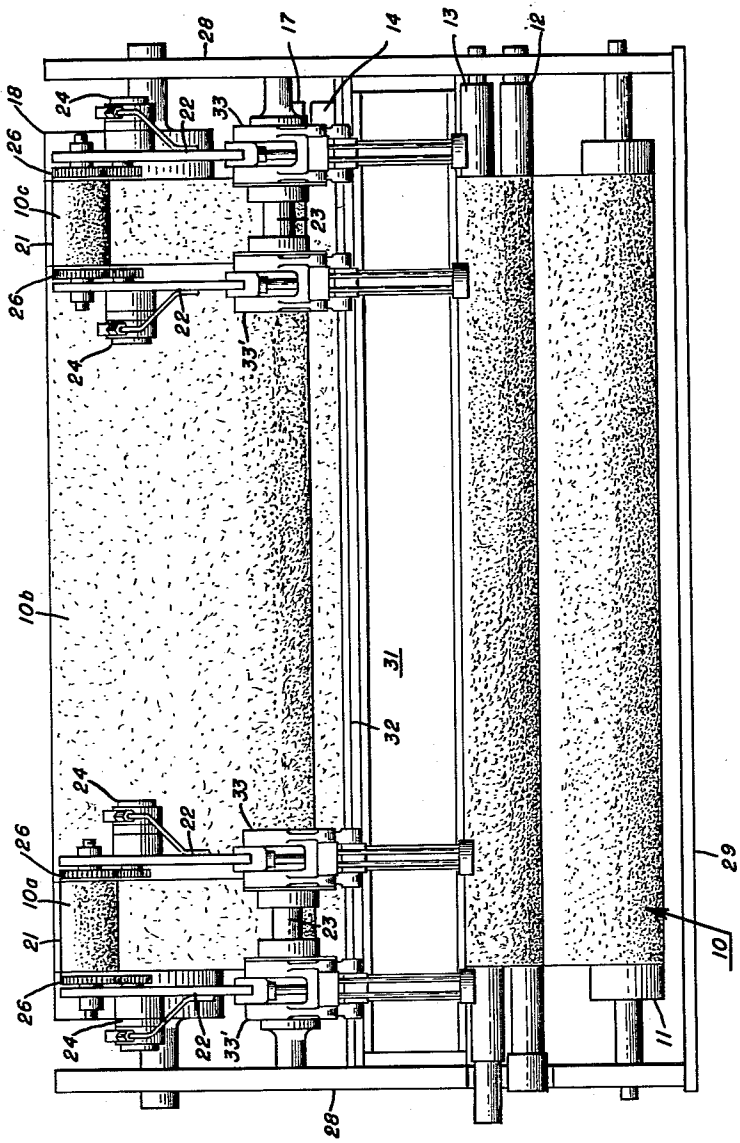


FIG-2

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WEB SLITTER-REWINDER

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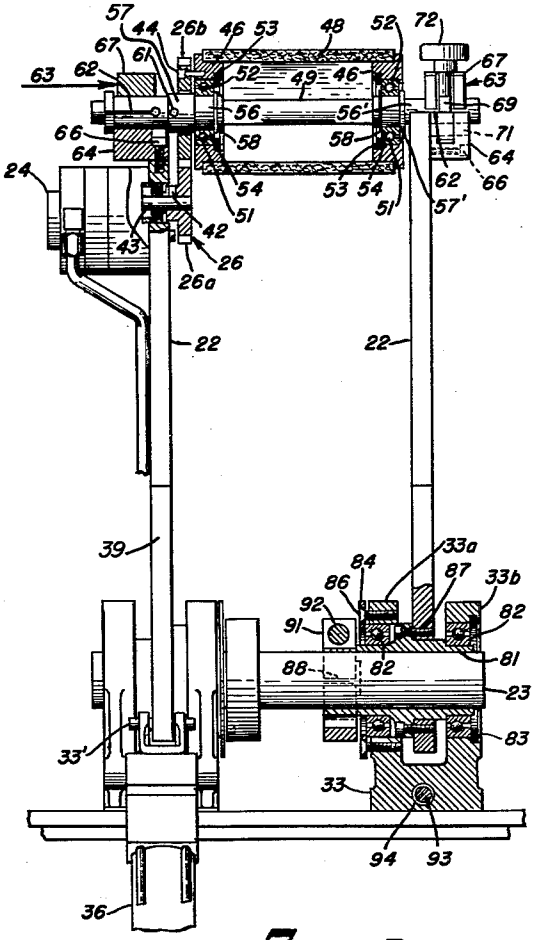


Fig-3

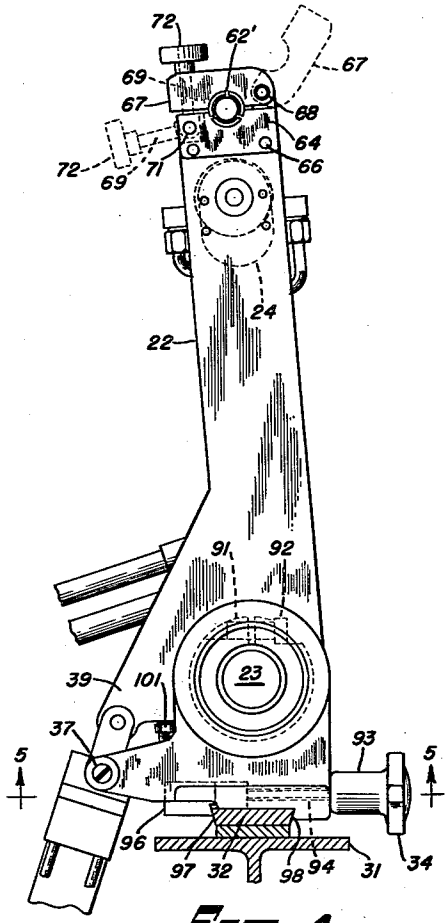


Fig-4

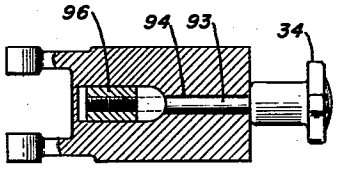


Fig-5

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3,122,335

WEB SLITTER-REWINDER

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3 Claims. (Cl. 242—56.2)

This invention relates to a slitter-rewinder machine for slitting and rewinding webs of flexible sheet material such as paper, plastic, foil, laminates, and the like, and more particularly to a rewind apparatus for winding the split strips on individual cores which cores are both controllably driven to provide controlled center wind tension, and also controllably pressed against the web winding drum for maximum uniformity and smoothness of rolls.

In machines of the class to which this invention relates, a web of flexible material is unwound from a supply roll and split longitudinally thereof into a plurality of ribbons of desired width, which ribbons are rewound upon individual cores. Since it is virtually impossible to rewind the individual ribbons on adjacent and abutting cores due to interleaving of the adjoining ribbons, the ribbons are separated before being rewound upon the respective cores, or rewind rolls. Due to undesired but generally unavoidable non-conformity of thickness across the web being slit, the individual rewind rolls may be increased in diameter at varying rates and for this reason, rewind rolls which are individually supported are preferably employed for proper rewinding of the split strips. The rewind mechanism of this invention employs rewind rolls which are not only individually supported, but which are individually driven and controllably biased against a winding drum. In addition, the means for biasing the rolls against the winding drum is adapted for moving the rewind rolls away from contact with the winding drum for ease in unloading finished rolls and placement of new cores on the core supporting, or rewind, arms.

Often, slitter-rewinder machines are adapted to slit the web of material into ribbons of any desired width. This invention relates to novel core supporting, or rewind, arms which are easily adapted for use in such machines to accommodate various widths of ribbon. The arms are adjustable longitudinally of the winding drum to support rewind cores of desired length. With this novel arrangement, no specially designed parts are necessary to obtain any desired arm separations to accommodate rewind cores of any length. Commercially available bar stock or tubes of proper diameter may be used in adapting the machine to the desired ribbon width.

An object of this invention is the provision of a rewind apparatus for winding a multiplicity of individual ribbons onto individual cores smoothly and wrinkle-free.

An object of this invention is the provision of a pivotally mounted core supporting arm which carries a core upon which a ribbon is to be wound, a motor mounted on the arm and coupled to the said core for producing a center-rewind torque on the rewind roll, a rotatably driven winding drum against which the rewind roll abuts, and means adjustably biasing the rewind roll against the said rewind drum.

An object of this invention is the provision of a removable means for pivotally mounting a pair of spaced rewind arms on a shaft of any desired length.

An object of this invention is the provision of means for mounting spaced core supporting members at any desired distance apart for supporting cores upon which ribbon is to be wound.

An object of this invention is the provision of a construction for releasably supporting a rewind core on a

rewind arm of a slitter-rewinder machine so that such a core may be quickly applied and removed.

These and other objects and advantages will become apparent from the following description when taken with the accompanying drawings. It will be understood, however, that the drawings are for purposes of illustration and are not to be construed as defining the scope or limits of the invention, reference being had for the latter purpose to the appended claims.

In the drawings wherein like reference characters denote like parts in the several views:

FIGURE 1 is a fragmentary diagrammatic broken view of a slitter-rewinder machine embodying this invention;

FIGURE 2 is a semi-diagrammatic front view of the machine;

FIGURE 3 is an enlarged fragmentary front view of a pair of rewind, or core supporting, arms made in accordance with this invention, parts being shown in section for clarity;

FIGURE 4 is an enlarged side view of the arms shown in FIGURE 3 with parts shown broken away; and

FIGURE 5 is a sectional view taken on line 5—5 of FIGURE 4.

Reference is first made to FIGURES 1 and 2 wherein there is shown a machine for slitting and rewinding a web, or sheet, designated 10, coming from any suitable supply source, not shown, and travelling in the direction of the arrows included in the drawings. The web 10 passes over a pair of idler rolls 11 and 12, a driven roll 13, and a backing roll 14 associated with cutting wheels 16 where the web is slit. The slitting mechanism forms no part of the invention and is not shown, therefore, in detail. The ribbons issuing from the cutting mechanism pass over an idler roll 17 and a rotatably driven winding drum 18 from which drum adjacent ribbons of material pass in different directions, thereby separating the same. For purposes of illustration, the web 10 in FIGURE 2 is shown slit into three ribbons, designated 10*a*, 10*b*, and 10*c*, with the ribbon 10*a* and 10*c* being wound upon rewind rolls 21, 21 at the front of the machine while the ribbon 10*b* is wound upon a rewind roll, designated 21′ at the rear of the machine, which may be of identical construction with the rolls 21.

The rewind rolls 21 and 21′, including their cores, are mounted at the ends of rewind arms 22 which are pivotable about shafts 23 and 23′. As seen in FIGURE 2, each shaft supports a pair of rewind arms, which pair of arms, in turn, supports a rewind roll, for independent support of each of the rewind rolls. In accordance with this invention, means, such as motors 24, may be included for rotatably driving the rewind rolls 21, 21′. The motors are mounted upon the rewind arms and are connected through gear coupling means 26 to the rewind rolls for drive-actuation thereof. The torque on the rewind rolls provided by the motors 24, which drive the cores upon which the material is being wound, provide a tension on the ribbons being wound thereon. By controlling the energization of the motors, a controlled center wind tension is possible.

As seen in FIGURE 2, the rolls or drums 11, 12, 13, 14, 17 and 18 are rotatably supported between the machine side walls 28 which extend upwardly from a base 29. Suitable means, not shown, rotatably drive the rolls 13, 14 and 18. I-shaped beams 31 also extend across the machine between the side walls adjacent the front and rear ends thereof, upon which dove-tailed ways 32 extending longitudinally therewith are secured, as by welding, for example. Pairs of bifurcated rewind arm base members 33, 33′ are slidably mounted on the ways 32 and are locked to the ways at any desired location thereon by means of rotatable handles 34 seen in FIGURE 1. The rewind arms 22 are pivotably supported on the base mem-

bers 33, 33', and since the base members 33, 33' are adjustable along the ways 32, the spacing between such arms is adjustable by movement of the said base members therealong. Rewind rolls of suitable length may thereby be supported by the rewind arms to accommodate ribbons of material of desired width.

Adjustable winding pressure between the rewind rolls 21, 21' and the winding drum 18 is provided by means of fluid cylinders 36 pivotably secured as at 37 to each of said base members. A piston having a piston rod 38 secured thereto is axially slidable within each of the cylinders, and the ends of the piston rods are pivotably attached to actuable crank arm portions 39 formed on or extended angularly from the rewind arms 22. The cylinders 36 are connected through lines 41 to a suitable fluid pressure supply source. Actuation of the pistons outwardly from the cylinders biases the rewind rolls against the winding drum and, by adjusting the cylinder pressure, the surface winding pressure is adjusted. In addition, the piston rods may be retracted by application of fluid pressure to the opposite piston face whereby the rewind arms and rolls are pivoted away from the winding drum for convenience in loading the empty cores and unloading the finished rolls. One rewind arm is shown in the raised position in broken lines in FIGURE 1.

Details of the rewind arms, together with the novel means for pivotally mounting the said arms on the machine and the means for rotatably supporting the rewind rolls on the said arms, are included in the description of FIGURES 3, 4 and 5. In FIGURE 3, there is shown a pair of rewind arms 22, 22, only one of which has a motor 24 mounted thereon. It will be understood that in applications where a single motor is capable of producing the required torque on the rewind roll for a well wound roll, it is necessary that only one rewind arm of each pair thereof be provided with a motor. As seen in FIGURE 3, one spur gear 26*a* is secured by a set screw 42 to the motor shaft 43, and engages a second spur gear 26*b* which is secured by bolts 44 to a core supporting collet 46. The ribbon of material is wound upon a core 48, which is often made of cardboard, which is easily cut to any desired length. The core is supported on a pair of such collets 46, with the ends of the core abutting a radial flange formed on each of the collets.

The collets 46 are rotatably mounted on a mandrel 49 and with their cores 48 removably clamped to the ends of the rewind arms 22. The rotatable mounting may include ball bearings 51 each having an outer race mounted within an axial base in the collets. The outer race 52 abuts an inwardly directed flange on the collet at one end thereof and a split retaining ring 53 seated in a groove at the other end. The inner races 54 of the bearings are mounted on journal sleeves 56, 56' between flanges 57, 57' formed on the sleeves split retaining rings 58 seated in grooves in the sleeve. A wider flange 57 is provided on the sleeve 56 than the flange 57' on the sleeve 56' in order to lengthen the sleeve 56 for accommodation of the spur gear 26*b*. A set screw 61 may be provided in the one sleeve 56 for securing the same to the mandrel 49.

The journal sleeves 56, 56' are here shown provided with elongated axial or longitudinal slots 62 which extend from one end thereof, thereby giving them the necessary flexibility for being contracted on the mandrel 49. The bore of the sleeve is sufficiently larger than the mandrel diameter whereby the sleeves are adapted to easily slide thereon. The sleeves 56, 56' are locked in position on the mandrel 49 and the mandrel and sleeves are secured to the rewind arms by clamping devices 63 attached to the ends of the said arms. The clamping elements of the devices include clamping bases 64 secured by bolts 66 to the arms 22, and clamping arms 67 pivotally secured to the bases 64 by hinge pins 68 (seen in FIGURE 4). Cooperating desirably semi-cylindrical cut out portions are formed on each base 64 and arm 67 through which the sleeve carrying mandrel extends. A locking device, here shown as a bolt 69, is pivotably mounted on one of the elements of each clamping device, here shown as each base 64 about a hinge pin 71. The device 69 is adapted to latch with respect to the other element of the device, as by extending through the bifurcated end of its clamp arm 67. Upon tightening of the hand nuts or knobs 72 threaded to the bolts 69, after said bolts are positioned as illustrated in full lines in FIGURES 3 and 4, the pivoted clamping arms and bases are brought together in clamping relation over the end portions of the sleeves 56 and 56' to tend to close the slots 62 and thereby clamp the said sleeves and mandrel to the rewind arms. The core supporting collets 46 are thereby axially fixed with respect to the said rewind arms for proper location of the core 48.

In order to remove the core from the arms, the hand nuts 72 are rotated to a release position and the devices 69 swung out or unlatched from the bifurcated clamping arms 67 to a position illustrated in broken lines in FIGURE 4. The clamping arms 67 can then be raised to the broken line position also illustrated in FIGURE 4. The mandrel 49, with the sleeves 56, 56' and core 48 thereon may then be freely lifted from the rewind arms. The sleeve 56', with the attached ball bearing 51 and one collet 46 to the right, as viewed in FIGURE 3, may then be slid off the mandrel. The full core 48 is then removed from the collet 46 mounted on the sleeve 56, and a new core is placed on the mandrel by a reversal of the above-described procedure. Not only are the finished rolls easily unloaded and the machine reloaded again, but the arrangement is easily adaptable for accommodating rolls 48 of any desired length. The mandrel 49 comprises ordinary commercially available bar stock which may be cut to proper length for use on the machine. The cardboard cores upon which the material is wound are also easily cut to the desired length. Thus, by adjusting the spacing of pairs of rewind arms 22, 22 (in a manner described in detail hereinbelow) cores of desired length to suit the ribbon width may be employed and hold clamped between the collets 46.

The pivotal mounting arrangement for the rewind arms 22 includes a journal sleeve 81 which extends through a bore formed in the spaced arm members 33*a*, and 33*b* of the base 33 (the base member 33' is similar to the base 33 and is therefore not described in detail.) The sleeve 81 is rotatably mounted on the arms 33*a*, 33*b* by ball bearings 82. The inner race on each ball bearing abuts a flange formed on the sleeve while the outer race of the bearing to the right, as viewed in FIGURE 3, abuts a split resilient bearing retainer ring 83, and the outer race of the other bearing 82 abuts a retaining ring 84 secured by bolts 86 to the base arm 33*a*. The rewind arm 22 is secured by bolts 87 to a flange formed on the journal sleeve. T-shaped slots 88 are formed in the journal sleeve 81 and extend to one end thereof to allow it to be contracted on the mandrel 23. A split collar 91 surrounds the split sleeve 81 and clamps the sleeve to the mandrel, or shaft, 23 upon tightening of a clamping bolt 92. The sleeve bore is slightly larger than the mandrel 23 diameter whereby the sleeve is easily slid onto and off from the mandrel upon loosening of the clamping bolt 92. It will be apparent, then, that the sleeves 81 with the pivotally attached rewind arms 22 may be readily secured to a mandrel 23 of any desired length. The mandrel 23 is made of commercialy available cylindrical bar stock or tube which is cut to the desired length. No specially machined parts are necessary when changing the spacing between rewind arms.

As mentioned above, the base members 33, 33' are movably positioned along the ways 32 extending across the machine. As best seen in FIGURES 4 and 5, a threaded shaft 93 extends through a hole 94 formed in the base and carries a handle 34 at one end and a locking member 96 having an inclined edge 97 at the other end. An inclined wall 98 formed on the base 33 engages one

edge of the dovetail way 32 while the locking member 96 engages an opposite edge thereon. By tightening the handle 34 on the bolt 93, the locking member 96 is drawn up to clamp the member 33 to the way 32. To slide the member 33 along the way, the locking member 96 is first released from clamping engagement with the way by rotation of the handle 34 in the proper direction.

In FIGURE 4, the rewind arms 22 are shown in a raised position wherein the crank portion 39 of the arms abuts a stop member 101 comprising a bolt threaded to the base member. In this position, the axis of the arm is inclined slightly from a vertical position about the mandrel 23 in a counter-clockwise direction. Even if the piston retracting pressure at the cylinder 36 is cut off or released, the rewind arm remains in the illustrated position against the stop member 101 without falling freely.

With the controlled center rewind torque on each of the cores 48 as provided by one or two constant torque rewind motors 24 smooth, wrinkle-free rolls are produced having a desired hardness. Since the rewind rolls are individually mounted, all the rewind rolls positively contact the rewind drum 18 for smooth rolls. Further, the individual rewind rolls are more easily handled than a single mandrel containing a plurality of such rewind rolls. Also, pivoting of the rewind arms to a raised position is simply provided by the fluid pressure means including the cylinders 36. The spacing between rewind arms 22 for ribbons of different widths is therefore easily adjusted with our arrangement.

Having now described our invention in detail in accordance with the requirements of the patent statutes, various changes and modifications will suggest themselves to those skilled in this art, and it is intended that such changes and modifications shall fall within the spirit and scope of the invention as recited in the following claims.

We claim:

1. In a winding apparatus for winding a web of material on a core, which apparatus includes a pair of spaced and pivotably mounted rewind arms rotatably supporting the core at the outer free ends thereof, the improvement comprising a way extending across the apparatus, a pair of base members mounted on the way and movable longitudinally thereof, means clamping the base members to the way, a pair of split journal sleeves pivotally mounted on the base members, a shaft extending through the sleeves, means releasably clamping the sleeves to the shaft, and means securing the rewind arms to the individual journal sleeves.

2. In a winding apparatus as recited in claim 1, wherein there is fluid-actuated means for biasing said rewind arms in a selected direction about said shaft.

3. In a web slitter-rewinder machine of the class comprising means for slitting a web into a plurality of ribbons, a positively-driven winding drum over which the ribbons pass, and rewind cores corresponding in number to the number of ribbons and over which the ribbons are wound; the improvement comprising,

(*a*) a plurality of pairs of pivotally mounted rewind arms, each pair of arms having aligned transverse grooves formed at the free ends thereof,

(*b*) a plurality of mandrels, each mandrel disposed within aligned grooves of an associated pair of rewind arms and rotatably carrying a single rewind core,

(*c*) means clamping each mandrel in fixed position to the associated pair of rewind arms,

(*d*) means independently biasing each pair of rewind arms in a direction to maintain a predetermined pressure between the associated rewind core and the winding drum,

(*e*) a plurality of drive motors with at least one motor mounted on one rewind arm of each pair thereof and proximate to the associated mandrel, and

(*f*) means connecting each motor to the associated rewind core for drive rotation thereof at a speed to maintain a tension on the associated ribbon being wound thereon.

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