Feb. 13, 1934. E. R. SWANSON ET AL 1,946,506

WINDING MACHINE

Original Filed Dec. 16, 1929 2 Sheets-Sheet 1

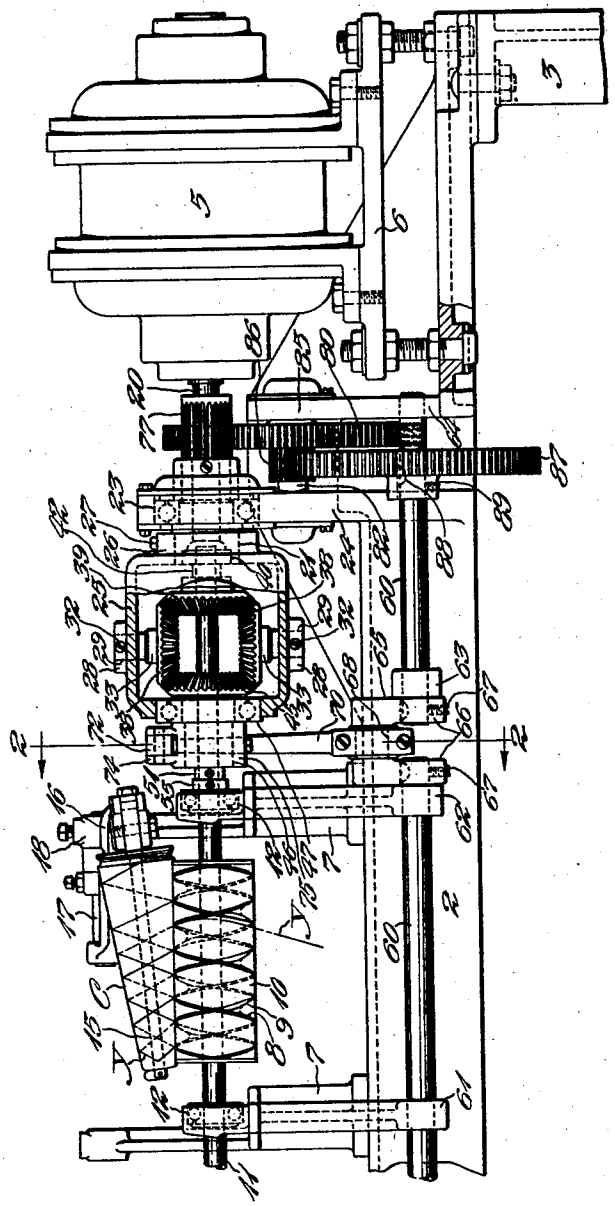


Fig. 1.

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Original Filed Dec. 16, 1929 2 Sheets-Sheet 2

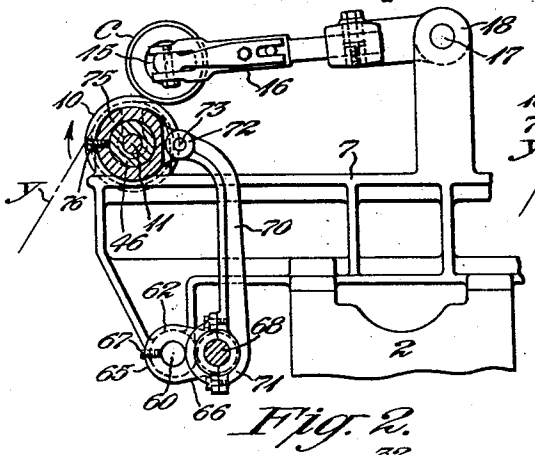


Fig. 2.

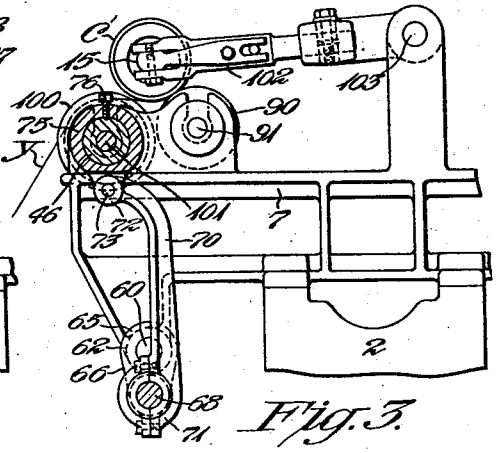


Fig. 3.

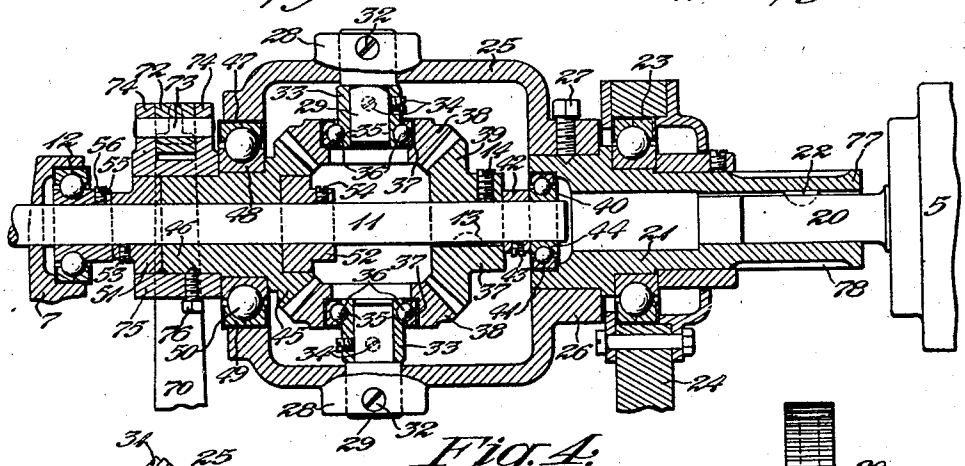


Fig. 4.

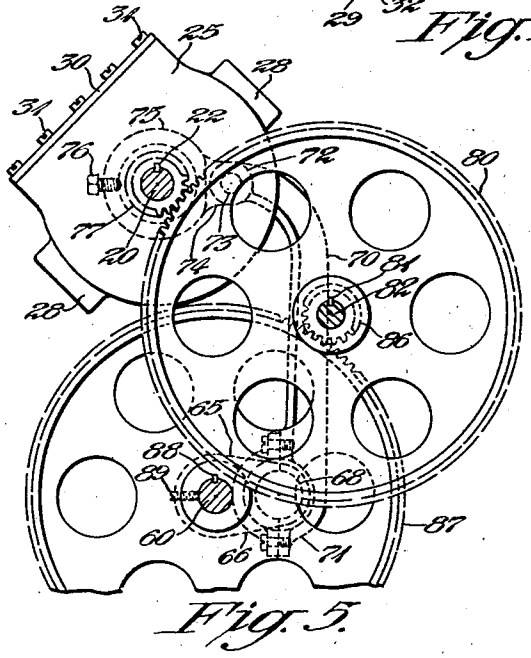


Fig. 5.

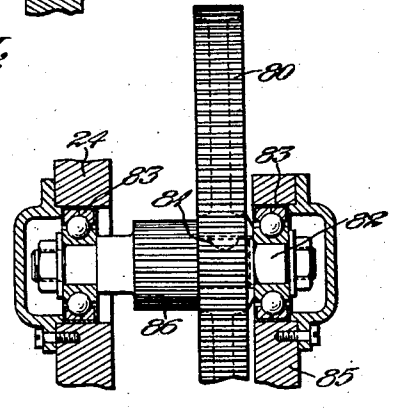


Fig. 6.

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# UNITED STATES PATENT OFFICE

1,946,506

## WINDING MACHINE

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Application December 16, 1929, Serial No. 414,527
Renewed June 23, 1933

9 Claims. (Cl. 242—18)

This invention relates to improvements in winding machines for winding cops, cones and packages of thread, yarn, cord and other strand material, hereinafter referred to generally by the term yarn, and particularly to winding machines wherein the package is rotated by contact with a drive-roll or drum. Specifically, the invention consists in a ribbon-breaker, so-called, which operates to control the disposition of the turns of winding on the surface of the package to prevent the formation of bands or ribbons in which the yarn coils are crowded together or piled.

One object of the invention is to provide a simplified mechanism incorporated in the winding machine and operating to disrupt the synchrony between the rotating package and the traverse-means which deposits the coils of winding in place thereon.

Another object of the invention is to provide a mechanism of the type specified for periodically accelerating and decelerating the rate of movement of one or another of the cooperating winding elements, either the package-rotating means or the yarn-traversing means, at recurring cycles throughout the winding.

Another object of the invention is to provide automatically operated means in the driving-mechanism for rotating one element of the driving gears first in one direction and then in the opposite direction to effect an acceleration and deceleration in the speed of the driven element.

Another object of the invention is to provide a mechanism of the type specified which is completely automatic in its operation and which requires no adjustment or setting.

Further objects of the improvement are set forth in the following specification which describes a preferred form of construction of the invention, by way of example, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a front elevation of a portion of a winding frame or gang winder showing the essential elements of the winding mechanism of one unit in connection with its driving means which embodies the present improved ribbon-breaker or speed-changing device;

Fig. 2 is an end view of the same, part sectional on line 2—2 of Fig. 1, looking in the direction indicated by the arrow;

Fig. 3 is a view similar to Fig. 2 showing a modified form of winding mechanism including a drive-roll for rotating the package and a separate yarn-traversing roll with the improved ribbon-breaker applied thereto;

Fig. 4 is a view of the differential gearing of the ribbon-breaker showing its housing in section;

Fig. 5 is an end view of the train of gearing which drives the crank-motion; and

Fig. 6 is a detailed view of certain of the gears of said train.

The present invention relates particularly to means for imparting an alternately accelerated and retarded rate of speed to one of the cooperative winding elements of the machine, either the means for rotating the package or the means which traverses the yarn thereon, and in general consists in differential gearing incorporated in the driving-mechanism of the machine and operative to cause one of the gears in a train to be positively rotated first in one direction and then in the opposite direction to effect an acceleration and deceleration in the speed of the driven gear.

Referring to the drawings, the winding machine herein illustrated by way of example is of the double gang type having a plurality of winding units arranged in series along the sides of a horizontal frame or bed 2. The bed 2 is supported at its ends by suitable legs 3 and at one end is an electric motor 5 mounted on a base 6 which is adjustable with respect to the bed. Spaced along the top of the bed 2 are a series of brackets or standards 7 which embody bearings for the driving-shaft and other parts of the winding mechanism, two opposite units being located between each pair of brackets but only one unit being herein shown.

In the construction of the machine as shown in Figs. 1 and 2 the winding mechanism comprises only two principal elements, namely, the winding-mandrel or spindle 15 on which the yarn-receiver or cop-tube C rotates and the drive-roll 10 for rotating the yarn-receiver, and in which is embodied the means for traversing the yarn back and forth axially of the package being wound. In this construction the usual reciprocating thread-guide is dispensed with and the drive-roll has its peripheral surface provided with connected helical grooves 8 and 9 extending in opposite directions and adapted to receive the strand of yarn to guide it back and forth between the ends of the package. This form of traversing-means for the yarn is fully shown and described in an application for United States Letters Patent Serial No. 342,544, filed February 25, 1929, now Patent No. 1,749,355, issued March 4, 1930. It is to be understood however that the present ribbon-breaker or speed-changing device is adapted for use on winding machines of other

types, such as those wherein the package is driven by contact with a drive-roll and the yarn traversed by means of a reciprocating guide, or with any other construction of drum-driven winders.

In the construction shown in Figs. 1 and 2 the drive-roll 10 is carried on and rotated by a horizontal shaft 11 journaled in ball-bearings 12 which are mounted on the brackets 7; it being noted that the shaft 11 is extended throughout the whole length of the machine and adapted to support the drive-rolls for any desired number of winding units. The present machine is shown as adapted for winding packages of conical form in which the yarn body is built up on any suitable support or receiver, a wooden or fiber cone C being illustrated in Fig. 1 as mounted to rotate on the winding-spindle or mandrel 15. As shown most clearly in Fig. 2, the winding-spindle 15 is pivotally mounted on the forked end of an arm 16 which is hinged on a rod or stud 17 held in a bearing 18 projecting from the top of the bracket 7, this construction being common to machines of the present type. The arm 16 is usually weighted to cause the surface of the wooden cone or yarn-receiver C to be held firmly in contact with the periphery of the drive-roll 10, and as the yarn is built up on the receiver it forces the latter upwardly with the arm 16 pivoting on its stud 17.

The driving-mechanism for the whole series of winding units is connected to drive the shaft 11 through differential gearing arranged as next described. Referring particularly to Figs. 1 and 4 of the drawings, as herein shown the armature-shaft 20 of the motor 5 is connected directly to a hollow spindle or sleeve 21 which carries a casing or housing 25 containing the differential gearing. As shown in Fig. 4, the end of the armature-shaft 20 is received within the axial bore of the spindle or sleeve 21 and keyed thereto at 22. The spindle 21 is journaled in a ball-bearing 23 supported from an upright or standard 24 formed as a part of the main bed 2. The gear-housing or casing 25 has a hub 26 at one end which fits over the end of the spindle or sleeve 21 and is secured fast therewith by means of a set-screw 27. On the opposite sides of the housing 25 are hubs 28 bored to receive two axially-alining studs 29 which support the journals for certain of the differential gears to be later described. Preferably, the casing 25 has an opening on one side which is closed by a suitable cover 30 attached thereto by screws 31 as shown in Fig. 5.

The studs 29 are held in the hubs 28 by means of set-screws 32, their inner ends being reduced in diameter to receive sleeves 33 which are secured fixedly thereon by set-screws 34. The ends of the sleeves 33 are formed with races 35 for balls 36 which run in opposite races 37 inserted in the bores of a pair of bevel-gears 38. The bevel-gears 38 mesh with a third bevel-gear 39 having its hub 37 keyed fast to the end of the drive-roll shaft 11 at 13 and held longitudinally thereof by a set-screw 14. The drive-roll shaft 11 projects beyond its bearing 12 axially through the gear-housing 25 and its end is supported by a ball-bearing 40 mounted within a counterbore 41 at the end of the spindle or sleeve 21. A collar 42 secured to the shaft 11 by a set-screw 43 is employed to space the bearing-race 44 from the end of the hub 37 of the housing 25. It will thus be seen that the drive-roll shaft 11 is arranged in axial alinement with the armature-shaft 20, but is rotatable independently thereof to provide for a differential speed-ratio between these two parts.

The two intermediate gears 38 mesh with a fourth relatively fixed gear 45 which is supported free to turn on the drive-roll shaft 11. The gear 45 has an extended hub 46 projecting through a ball-bearing 47 at the end of the gear-housing 25. The ball-bearing 47 is of the same construction as those previously referred to, having its inner race 48 fast on the hub 46 and the outer race 49 held in the bore of the housing 25 with balls 50 revoluble therebetween. The gear 45 is held longitudinally of the shaft 11 by means of thrust-collars 51 and 52 at either end of its hub 46, the collars being secured fast to the shaft by set-screws 53 and 54. Abutting the collar 51 is the inner race 55 of the ball-bearing 12 held fast with the shaft 11 by a set-screw 56.

It is to be observed that through the above-described arrangement the armature-shaft 20 is connected to revolve the gear-housing 25 to cause the intermediate bevel-gears 38 to travel around the relatively fixed gear 45 and thereby impart rotary motion to the driven gear 39 which is fast on the shaft 11. With the gear 45 held fast the motion transmitted from the shaft 20 to the shaft 11 would be constant and at the same rate of speed, but to give the differential motion to the shaft 11, that is to alternately accelerate and decelerate its rate of rotation, the gear 45 is oscillated to-and-fro to vary the driving action of the gears 38. The gear 45 is turned back and forth about the shaft 11 through one-half a revolution by means of a crank-motion as next described.

Extending horizontally along the side of the bed 2 is a crank-shaft 60 journaled in bearings 61, 62, 63 and 64. The bearings 61 and 62 are formed as extensions depending from the brackets 7, while the bearing 63 is constructed as a part of or attached to the bed 2, and the end-bearing 64 is formed in a rib on the side of the bed. The crank 65 is preferably made separate from the two-part shaft 60 with its crank-arms 66 secured thereto by means of set-screws 67. A connecting-rod 70 has a split-bearing 71 at one end journaled on the crank-pin 68, see Fig. 2, and reaches upwardly with its curved end formed with a hub 72 which is connected to a pin 73 held in opposite ears 74 projecting from the side of a collar 75. Referring to Fig. 4, the collar 75 surrounds the end of the hub 46 of the gear 45 which projects beyond the end-hub of the gear-housing 25, being secured fast thereto by means of a set-screw 76. It will be observed by reference to Figs. 2 and 5 that as the crank-shaft 60 is rotated the connecting-rod 70 will be given a reciprocatory motion to oscillate the collar 75 and thereby turn the gear 45 throughout a half revolution and back again. The crank-shaft 60 is driven from the motor 5 through the means of a train of gearing as next described.

As shown in Figs. 1 and 4, the end of the spindle or sleeve 21 which surrounds the end of the armature-shaft 20 is formed as a gear-pinion 77, having teeth 78 cut into its periphery. The pinion 77 meshes with a gear 80 which is keyed at 81 to a stud-shaft 82, see Fig. 6. The stud-shaft 82 is journaled in ball-bearings 83 of the same construction as previously described and held in bores in the opposite uprights or ribs 24 and 85 on the side of the bed 2, see Fig. 1. Formed integral with the stud-shaft 82 is a pinion 86 arranged to mesh with a gear 87 which is keyed

fast to the end of the crank-shaft 60 at 88 and secured longitudinally thereof by means of a set-screw 89. It will thus be seen that the armature-shaft 20 drives the train of gearing last described to rotate the crank-shaft 60 at a greatly reduced rate of speed, and through the means of the crank 65 the bevel-gear 45 is given an intermittent to-and-fro rotation on the drive-roll shaft 11. The speed of rotation of the shaft 11 is thus periodically accelerated and decelerated through the differential gearing in the casing 25, the method of operation of the complete machine and the functioning of the ribbon-breaker being as next explained.

Referring to Figs. 1 and 2 of the drawings, the machine as herein shown is prepared for winding by mounting a wooden or fiber cone-tube or yarn-receiver C to rotate on the spindle 15. In applying the yarn-receiver C the arm 16 is raised and the spindle 15 swung outwardly on its swiveled joint at the end of the arm in accordance with the well known practice with winding machines of the present type. After the yarn-receiver C is in place the spindle 15 is swung back into parallel relation with respect to the axis of the drive-roll 10 and the arm 16 is then lowered to bring the surface of the receiver C into driving contact with the periphery of the roll. The strand of yarn *y* or other material is led up from a source of supply and through a tension-device, not herein illustrated, thence drawn across the periphery of the drive-roll 10 and its end fastened to the yarn-receiver C, for example, by winding it several times around the grooved base thereof. In machines of the present type the drive-roll is usually rotated continuously and the starting and stopping of the winding is controlled by moving the yarn-receiver C respectively toward or away from the roll. Means are usually provided for automatically lifting the package away from the drive-roll to arrest the winding operation, but such means are not herein shown and described as they do not relate to the present invention.

As the yarn-receiver C is brought into surface contact with the periphery of the drive-roll 10 it will be rotated from the roll to wind on the yarn. The roll 10 turns in the direction indicated by the arrow in Fig. 2 and as the yarn is taken up by the rotation of the receiver C the strand *y* will be picked up in one or the other of the crossing helical grooves 8 and 9 on the periphery of the roll. As the yarn feeds through the grooves it is traversed thereby back and forth longitudinally of the axis of the receiver C to deposit it thereon in helical coils which make several turns first in one direction and then in the opposite direction as indicated in Fig. 1. Means are provided at the crossing points of the oppositely extending grooves 8 and 9 to prevent the strand from being diverted from one groove into the other, in accordance with the construction described in the patent application hereinbefore referred to, and in this way the yarn is given a continuous traverse from one end of the receiver to the other and back again to build up a succession of courses forming overlying layers which constitute the yarn body or package.

At the start of the winding the speed of the yarn-receiver C is approximately the same as that of the drive-roll 10 and the yarn will be laid from end to end of the receiver with a number of coils equal to the number of turns in the grooves 8 and 9 extending from one end of the roll 10 to the other end. As the yarn builds up on the receiver C the latter recedes from the drive-roll 10 and with the increase in diameter of the package its angular velocity or speed of rotation is gradually lessened due to the increasing disparity between its diameter and that of the drive-roll. In other words, there is a constant change in ratio between the speed of rotation of the package and that of the drive-roll and, consequently, there will be a corresponding variation in the number of turns laid on the surface of the package, or in the "wind" as it is called. For example, if the winding is started with four "winds", or four turns on the surface of the yarn-receiver C as shown in Fig. 1, as the package increases in size and its speed of rotation is retarded the number of winds will be gradually lessened with the yarn making in some cases only one-half of one turn about the cop at its completion.

At the start of the winding the coils are laid in "open" or spaced relation, but when the "wind" changes the spacing between the turns becomes lessened and the coils gradually close up and eventually tend to crowd or pile on each other. This crowding or piling of the turns of winding takes place each time the wind changes from a greater to a lesser number of even turns and causes what is termed a "ribbon wind" on the surface of the package. In a package of considerable size there may be a large number of these ribbons and at such points the winding is defective. That is to say, where the coils of winding are crowded and piled the yarn is stretched and strained and the turns will not hold in place as well as when spaced apart. When several coils are laid over each other in the "ribbon" they tend to slip and slide out of place and roll on the surface of the package. This disturbs the twist of the yarn and tends to weaken it so that its quality is impaired and, as another serious defect, the "ribbon" prevents the yarn from delivering freely when it is drawn off over the end of the package.

It has been stated that one object of the present invention is to cure this defect in "drum-wound" packages by eliminating the "ribbon wind" and the means for accomplishing this purpose consists in the automatically-operated differential driving-gear for the roll 10 which traverses the yarn on the package. The armature-shaft 20 rotates at a constant rate of speed and through the train of gearing 77, 80, 86 and 87 drives the crank-shaft 60 at a constant but greatly reduced rate. The shaft 20 is connected to rotate the sleeve or spindle 21 and thereby the gear-housing 25 carried fast on its end. As the gear-housing 25 is rotated the intermediate gears 38 are carried bodily around the axis of the drive-roll shaft 11 with a planetary motion and through the engagement of their teeth with the relatively fixed gear 45 the gears 38 are rotated on their own axes to cause them to drive the gear 39. The gear 39 is fast on the drive-roll shaft 11 and is therefore caused to turn this shaft to rotate the roll 10, and as the four gears in the differential train are equal in size the speed of the shaft 11 under normal conditions is the same as that of the armature-shaft 20.

The shaft 11 turns within the gear 45 and the latter has a slow to-and-fro rotative movement imparted to it by the crank-motion which actuates the connecting-rod 70. The connecting-rod 70 is eccentrically connected to the hub or collar 75 which is fast with the hub of the gear 45 and as the crank 65 is turned slowly from its shaft 60 the gear 45 is given a forward and back-

ward motion about its axis throughout one-half of a complete revolution. The effect of this oscillation or to-and-fro movement of the gear 45 is to cause the rotation of the driven gear 39 to be accelerated or retarded in accordance with the direction of movement of the gear 45. That is to say, as the crank 65 turns downwardly from top center and the gear 45 is turned in the same direction as the shaft 11 the intermediate gears 38 will have a proportionately less rotative effect on the gear 39. On the other hand, as the crank 65 rises from bottom center and the connecting-rod 70 turns the gear 45 back in the opposite direction a faster rate of speed will be imparted to the gears 38 as they travel around the gear 45 and consequently the speed of the gear 39, and thereby the velocity of the shaft 11 and roll 10, will be accelerated.

Now it would appear that since the yarn-receiver C and the package wound thereon are rotated directly from the roll 10 the peripheral speed of rotation of the package would be the same as that of the roll and any acceleration or deceleration of the latter would be imparted to the package. This is not the case however because the package is driven by frictional contact of the drive-roll with its surface and there is necessarily some slippage at this point when the speed of the drive-roll is altered. The yarn-receiver C and the yarn wound thereon are of considerable mass and the weight thereof increases with the growth in the winding. Furthermore, the package is rotated at a high rate of speed, and the force of momentum is therefore very considerable. Hence, when the speed of the drive-roll 10 is retarded the package will tend to continue its rotation at the maximum and in practice it has been determined that due to the slippage between the surface of the package and the periphery of the drive-roll the slowing up of the roll has little or no effect to change the speed of the package. Likewise, when the speed of the roll is accelerated for a brief period it will fail to have any material effect in increasing the speed of the package due to the force of inertia, slippage taking place between the periphery of the roll and the surface of the package. It can therefore be stated that the intermittent change in speed of the roll 10, as controlled by the differential gearing hereinbefore described, has only one effect, that is, to change the ratio of the traverse of the yarn with respect to the rotation of the package being wound. Stated more specifically, the action of the differential mechanism is to intermittently speed up and slow down the traverse of the yarn on the package while the speed of rotation of the latter remains unaffected and in this way the synchronization of the traverse with the rotation of the package is disrupted. The effect of this disruption in the synchronous movement between the two cooperative elements of the winding mechanism, that is, the rotating package and the traversing-means for the yarn, has the result to prevent the crowding and piling of the turns or coils of winding to thus eliminate the "ribbon wind" usually present in drum-wound packages.

Fig. 3 of the drawings illustrates a modified form of winding mechanism having the drive-roll constructed as a separate element from the traverse-roll. In this embodiment of the invention the drive-roll 90 is mounted on and rotated by its own shaft 91 which is driven at a constant rate of speed, either by connecting it directly with the armature of the electric motor or gearing it thereto. The traverse-roll 100 is mounted on an independent shaft 101 extending parallel with and located in front of the drive-roll shaft 91. The cop-tube or yarn-receiver C' is carried at the end of an arm 102 pivoted at 103, being so supported as to adapt it to contact with the periphery of the drive-roll 90, but to be free from contact with the traverse-roll 100. The periphery of the traverse-roll 100, however, is adjacent to the surface on which the winding is performed in whatever position the yarn-receiver C' may assume so that the yarn $y$ is fed through the grooves of the traverse-roll 100 directly to the package in such manner as to deposit the coils precisely in place thereon as described in connection with Fig. 1 of the drawings.

In the modified form of construction shown in Fig. 3, the traverse-roll shaft 101 corresponds to the shaft 11 referred to in connection with other views of the drawings, and the differential gearing is carried on this shaft and arranged in exactly the same manner as shown in Fig. 4 and previously described. The winding mechanism in this last described embodiment of the invention will therefore operate to cause the yarn-receiver C' to be rotated from the drive-roll 90 at a constantly decreasing rate of speed while the yarn $y$ is traversed longitudinally of the receiver by the separate traverse-roll 100 which has a periodically accelerated and decelerated rate of movement under the action of the differential mechanism previously explained. The result will be the same, that is, a disruption of the synchronization between the rotation of the package and the traversing movement of the yarn with respect thereto so that the piling and crowding of the coils is avoided and ribbon winding eliminated.

It will be observed from the foregoing that the present invention provides a particularly simple and efficient means for periodically varying the speed of any certain rotating element constituting a part of the drive for the winding machine whereby to effect a disruption in the synchronization between two cooperating parts of the winding mechanism. The improved differential mechanism may be embodied directly in the drive of the machine and comprises a minimum number of elements compacted within a relatively small space. The rapidly rotating gears of the device are entirely enclosed to provide for their lubrication and to prevent injury to the operator of the machine, and the mechanism is free from complication and not liable to become deranged or to get out of order.

While the invention is herein shown and described as embodied in a preferred form of construction and adapted for use with a certain style of winding machine, it is to be understood that various modifications may be made in the form and arrangement of the parts of the device and its method of application which will fall within the scope and spirit of the appended claims. Therefore, without limiting ourselves in this respect, we claim:

1. In a winding machine, the combination of means for rotatably supporting a yarn-package, a grooved traverse-roll for rotating the package by surface contact therewith while acting to traverse the yarn longitudinally thereof, and means for driving the traverse-roll at such a variable speed that the package is rotated at substantially constant peripheral speed due to the slippage between the surface of the package and the traverse-roll whereby a periodic change

in ratio between the speed of the package and the traverse of the yarn axially thereof is obtained to prevent ribbon winding.

2. In a winding machine, the combination of means for rotatably supporting the package being wound, a traverse-roll for rotating the package by surface contact therewith, said roll embodying means for traversing the yarn from end to end of the package, means for rotating the traverse-roll, and means for varying the speed of the traverse-roll with a rapid intermittent acceleration and deceleration to cause slippage between the roll and the package whereby the latter continues to rotate at substantially constant speed and the ratio between the speed of the package and the traverse of the yarn is periodically altered to prevent ribbon winding.

3. In a winding machine, the combination of means for rotatably supporting the package being wound, a traverse-roll for rotating the package by surface contact therewith and provided with means on its periphery for traversing the yarn from end to end of the package, means for rotating the traverse-roll, and means for periodically accelerating and decelerating the speed of the traverse-roll to cause slippage between the roll and the surface of the package whereby the latter continues to rotate at substantially constant speed and the rate of traverse of the yarn is periodically altered in ratio with the speed of rotation of the package.

4. In a winding machine, the combination of means for rotatably supporting the package being wound, a traverse-roll having surface contact with the package to drive the latter and provided with helical grooves on its periphery for traversing the yarn from end to end of the package, means for driving the traverse-roll, and epicyclic gearing in said driving-means for varying the rate of speed of the traverse-roll to effect an intermittent acceleration and deceleration thereof to cause slippage between the traverse-roll and the package whereby the latter will be driven at a substantially constant speed while the rate of traverse of the yarn is periodically altered to disrupt the synchronism between the rotation of the package and the traverse of the yarn to prevent ribbon winding.

5. In a winding machine, the combination of a traverse-roll having helical grooves on its periphery for receiving a strand of yarn or the like to guide it back and forth axially thereof, means for rotatably supporting a package in surface contact with the traverse-roll, means for driving the traverse-roll to cause it to rotate the package while traversing the yarn from end to end thereof, and means for periodically accelerating and decelerating the speed of the traverse-roll to cause the package to slip on the roll while rotating at a substantially constant speed as the rate of traverse of the yarn is altered to disrupt the synchronism to prevent ribbon winding on the surface of the package.

6. In a winding machine, in combination, means for rotatably supporting a yarn package, a grooved traverse roll arranged to rotate the package by contact with the periphery thereof while acting to traverse the yarn longitudinally thereof, means to rotate the traverse roll, and means producing intermittent slippage between the traverse roll and package periphery to change the ratio of package peripheral speed to axial yarn traverse to prevent ribbon winding.

7. In a winding machine, in combination, means for rotatably supporting a yarn package, a grooved traverse roll arranged to rotate the package by contact with the periphery thereof while acting to traverse the yarn longitudinally thereof, means to rotate the traverse roll, and means producing recurrent fluctuation between the peripheral speeds of the two rotating parts to produce changes in ratio between the speed of the package and the traverse of the yarn to prevent ribbon winding.

8. In a winding machine, the combination of means for rotatably supporting a yarn package, means to rotate the package by peripheral contact therewith, means for traversing yarn on the package, and means for periodically disrupting the synchronism between the package and its drive means to thereby change the ratio of package peripheral speed to traverse thereon.

9. In a winding machine, the combination of means for rotatably supporting a yarn package, means to rotate the package by contact with the periphery thereof, means for traversing yarn on the package, and means to vary the speed of the package rotating means with sufficient rapidity to produce slippage for periodically disrupting the synchronism between the package and its drive means to thereby change the ratio of package peripheral speed to yarn traverse thereon.

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