June 20, 1933. F. A. REECE 1,915,241

WINDING MACHINE

Filed Sept. 28, 1931 2 Sheets-Sheet 1

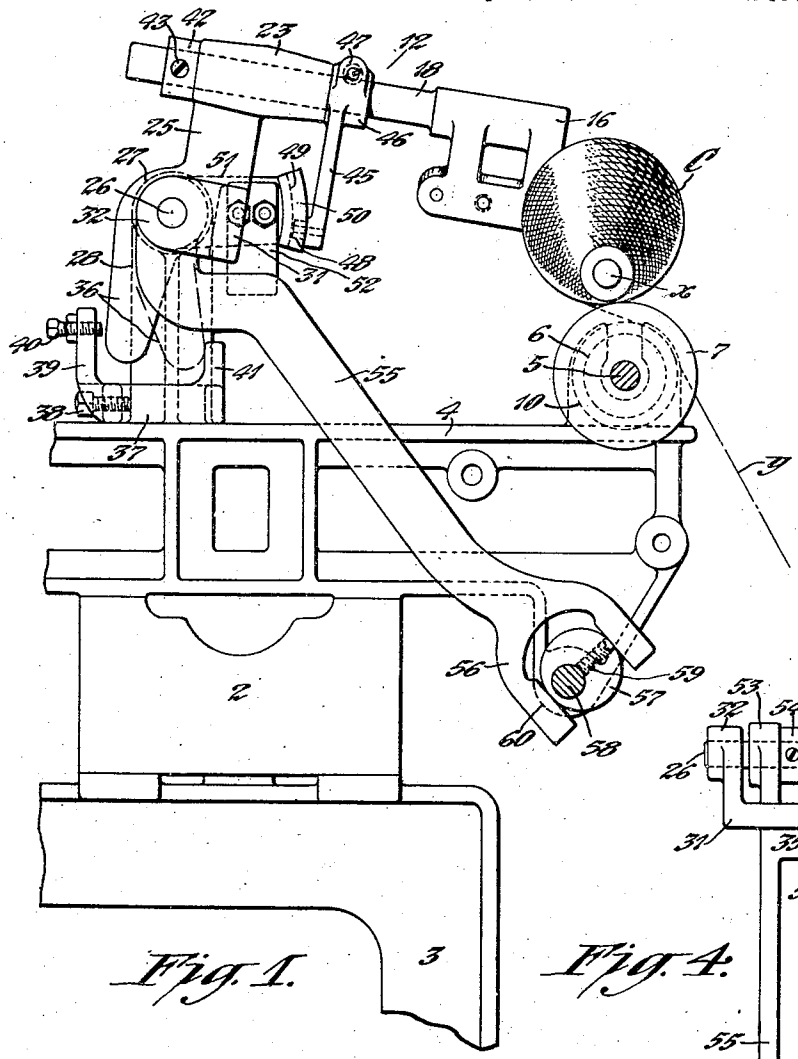


Fig. 1.

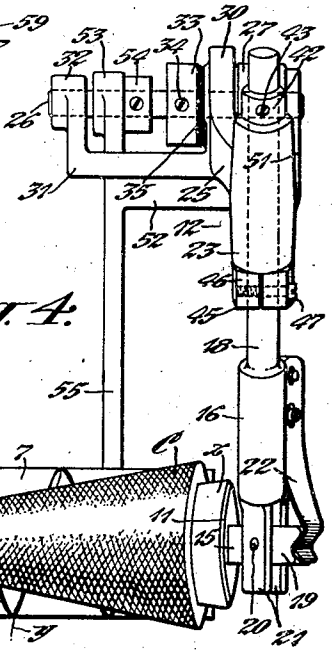


Fig. 4.

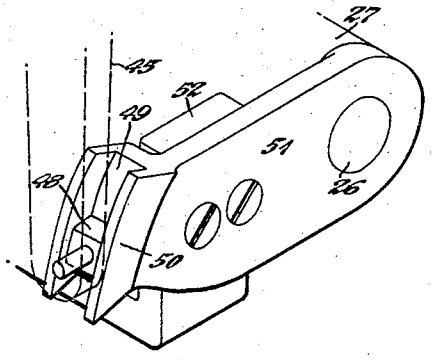


Fig. 5.

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WINDING MACHINE

Filed Sept. 28, 1931 2 Sheets-Sheet 2

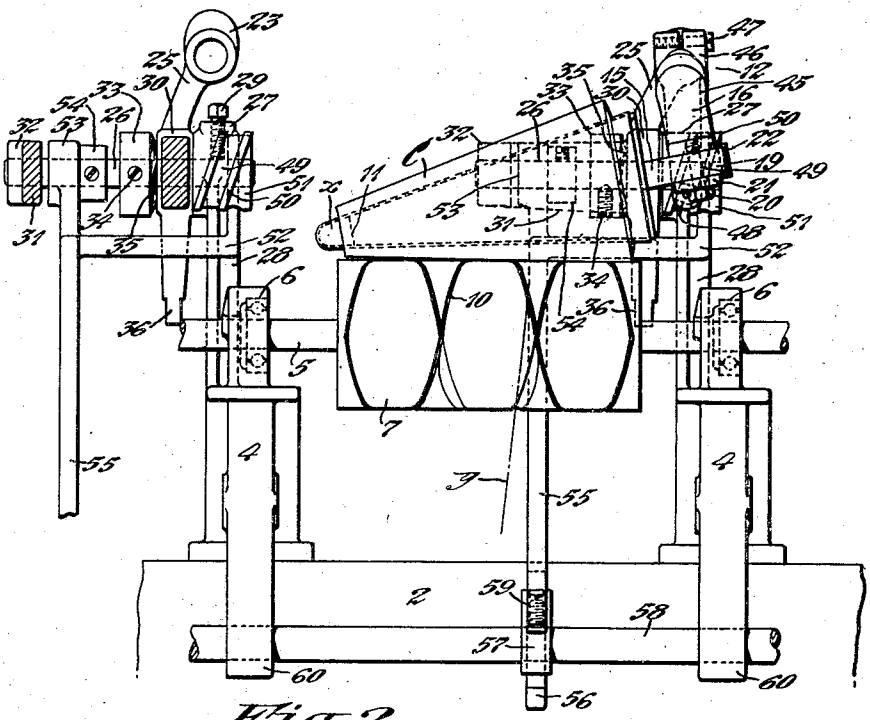


Fig. 2.

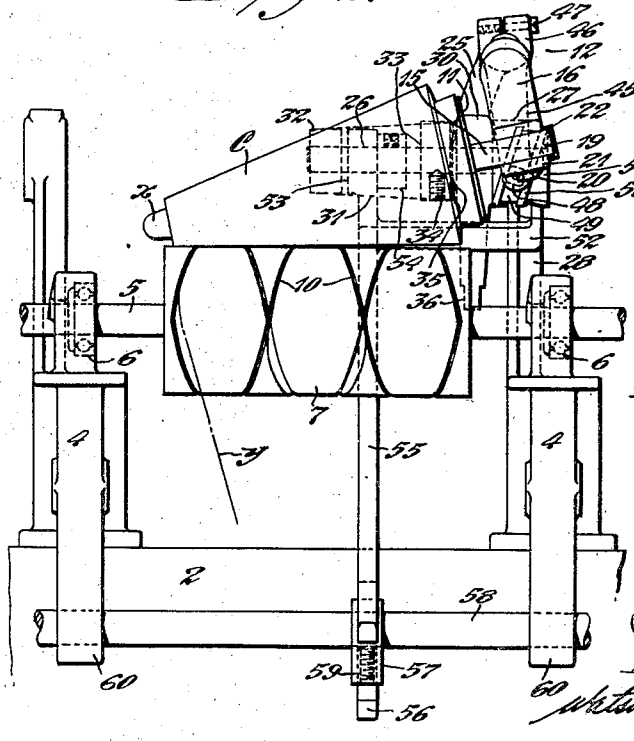


Fig. 3.

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UNITED STATES PATENT OFFICE

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WINDING MACHINE

Application filed September 28, 1931. Serial No. 565,593.

This invention relates to improvements in winding machines for winding cops, cones, and similar forms of packages of thread, yarn, cord and other strand material, and particularly to winding machines wherein the package is rotated by surface contact with a drive-roll or drum.

In the following specification and claims the term "yarn" is used in a generic sense to designate the material to be wound, whatever its character; and the term "package" is to be interpreted broadly as designating the product of the winding machine whatever form it may take.

Specifically, the present invention consists in a "ribbon-breaker", so-called, for controlling the disposition of the turns of winding on the surface of the package to prevent the formation of bands or "ribbons" by the crowding together or piling of the coils.

As is well known to those versed in the art of winding, in drum-driven winders the speed of rotation of the package diminishes with its increase in diameter during the progress of the winding and this causes a change in the ratio between the angular velocity of the package and the rate of traverse of the yarn back and forth along its length. In consequence of this the character of the winding on the surface of the package is constantly changing. The turns of yarn may be spaced relatively far apart at the start of the package, but as the speed of rotation of the latter decreases the yarn coils will be laid closer together until they crowd and "pile". As the winding proceeds the coils are disposed farther apart again and this closing and opening of the "wind" repeats at intervals.

A package in which the ribbon wind is prevalent is defective in that the yarn is stretched and strained as the coils crowd together and pile and, furthermore, the yarn will not deliver freely therefrom under uniform tension. It has therefore been the practice to apply ribbon-breakers to drum-winders, such devices operating to disrupt the synchrony between the rotation of the package and the traverse of the yarn whereby to prevent crowding or piling of the coils and defective winding.

Heretofore in ribbon-breakers embodied in winding machines for preventing piling or crowding of the coils, speed-changing mechanisms have usually been employed for alternately increasing and diminishing the speed of one of the winding elements, either the package-support or the traversing-means which deposits the yarn in place on the package. Such mechanisms require a complication of gearing, cams, crank-motions and the like, and it is a principal object of the present invention to provide a ribbon-breaking device of simpler construction with the elimination of gearing, coned pulleys, belt-shifting means and like apparatus.

To accomplish the above-stated object the present invention contemplates the provision of means for periodically altering the position of the package in its contact on the driving-drum whereby to vary the speed of rotation of the package to disrupt its synchrony with the traverse of the yarn.

Another object of the invention is to provide a mechanism of the type specified which acts to periodically oscillate or tilt the package with respect to the surface of the driving-drum, whereby first one end and then the other end thereof is engaged with the drum to alternately accelerate and decelerate the speed of rotation of the package.

Another object of the invention is to provide means of the type specified for effecting what may be termed a "heel-and-toe" action of a cone package on the driving-drum; that is, a rocking motion of the cone to cause it to engage the driving-drum first with its larger end and then with its smaller end to vary the speed of rotation of the cone.

Another object of the invention is to provide a mechanism of the type specified adapted to be operated from the builder-motion of the winding machine which determines the ultimate form of the cone by gradually increasing the inclination of its axis to the periphery of the driving-drum to increase the taper on its surface.

Another object of the invention is to provide a mechanism of the type specified which may be applied to winding machines of

standard design without material alteration in the structure or arrangement thereof.

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 an end elevation of a winding machine of the drum-driven type showing the present improved ribbon-breaker as applied to use therewith;

Fig. 2 is a front elevation illustrating one winding unit of the machine with certain parts of the next unit in the series, and showing the cone or package as tilted with its larger or base-end bearing on the driving-drum;

Fig. 3 is a similar view showing the cone tilted to effect driving contact of its smaller end with the drum or drive-roll;

Fig. 4 is a plan view of the swinging arm or support for the cone-holder which adapts the latter to move away from the drive-roll as the package increases in diameter; and

Fig. 5 is a perspective view showing part of the builder-mechanism which acts to periodically tilt the cone to vary the angularity of its axis with respect to the surface of the drive-roll.

The present improved ribbon-breaker is adapted for use with practically all types of drum-driven winding machines but I have preferred to illustrate herein, by way of example, a standard type of winder as next described. Referring to Figs. 1 and 2 of the drawings, the gang winding machine herein shown comprises a horizontal bed or table 2 supported from legs or standards 3 and mounting a series of cross frames 4. The several winding units, any number of which may be provided, are arranged along the opposite sides of the bed 2 with their mechanisms supported from the cross frames 4. As all of the winding units are of the same construction it has been considered sufficient to illustrate and describe only one of them.

Opposite horizontal driving-shafts 5 extend along the sides of the bed 2, being journaled in suitable bearings 6 at the outer end of the cross frames 4, only one of these shafts being herein illustrated. The shaft 5 carries the drums or drive-rolls for the series of winding units on one side of the machine, each drum 7 being secured fast on the shaft between a pair of the journals 6. The two parallel drum-shafts 5 may be driven from any suitable source of power such as an electric motor coupled to the shafts at the end of the frame, these connections not being herein shown and described as they are of usual arrangement.

In the present type of winding machine the drum or drive-roll 7 also constitutes the traversing-means for disposing the yarn in helical coils extending from end to end of the package and crossing each other at intervals in the usual manner of a cross wind. For this purpose the drum or drive-roll 7 is constructed in accordance with the invention described and illustrated in my United States Letters Patent No. 1,749,355 dated March 4, 1930; that is, as comprising a helical groove or grooves on its peripheral surface in which the yarn is received and guided onto the package being wound. The groove 10 is continuous, extending from end to end of the roll in opposite directions. Means are provided at the points where the opposite helices of the groove cross each other to maintain the yarn in that portion of the groove in which it is traveling and prevent it from being diverted into another portion of the groove to reverse its direction of traverse, all as fully set forth in the patent above referred to.

The winding machine as herein shown is adapted for winding frusto-conically shaped packages, commonly called cones. The cone C is rotatively supported to adapt its surface to contact with the periphery of the drum or drive-roll 7, while permitting the axis of the cone to recede from the drive-roll with the growth in the winding. For this purpose it is usual to employ a rotatable cop- or cone-holder 11 for the cop-tube or support x on which the cone is wound, with the holder mounted on a swinging arm 12. As herein illustrated the cone-holder 11 is journaled on a spindle 15 which is swiveled in the forked end of a member 16 forming an extension of a rod 18. Referring to Fig. 4, the spindle 15 has a squared butt-end 19 pivoted on a pin 20 extending through the sides of the fork 21, whereby the cone-holder 11 may be swung outwardly for convenience in applying the cone-tube thereto and doffing or removing the completed package therefrom. A flat spring 22, secured to the side of the extension or member 16, has its end formed with a V-shaped detent adapted to snap into a similarly shaped notch in the end of the butt of the spindle 15 to normally maintain the latter in parallel relation to the axis of the drive-roll or drum 7.

The rod 18 constitutes the main element of the supporting arm 12 for the cop-holder 11, being mounted for rotation in a bearing 23 to adapt it to swivel so that the axis of the cone may be tilted or inclined with respect to the surface of the driving-drum 7. The bearing 23 is formed as a part of an arm 25 which is pivoted on a stud 26 fixedly held in a hub 27 supported from one of the cross members 4 of the machine frame. As shown at the left-hand in Fig. 2, the hub 27 is supported at the top of an upright arm or extension 28 on the bracket 4 and the stud or rod 26 is held fast in a bore in the hub by means of a set-screw 29.

The arm 25 has a hub 30 pivoted on the rod 26 abutting the side of the hub 27. The arm 25 is extended laterally in a yoke 31 carrying a hub 32 at its outer end which also pivots on the rod 26. A collar 33 is secured to the rod 26 by a set-screw 34, and between the collar and the hub 30 of the arm 25 is a crimped or fluted spring-plate or washer 35 which acts to resiliently hold the hub 30 against the stationary hub 27. Through this arrangement the arm 25 is adapted to pivot on the rod 26 with a slight frictional resistance applied to its movement as the cone-holder 11 is raised away from the driving-drum 7 during the growth in diameter of the package being wound.

The arm 25 has a downwardly projecting extension or tailpiece 36 which acts to limit its swinging movement. Fixedly mounted on the top of the cross frame 4 is a member 37. A set-screw 38 passing through the side of the member 37 engages against the edge of the upright arm 28 to clamp the member 37 to the cross frame 4. The member 37 has an upwardly extending arm 39 through which projects a set-screw 40 adapted to make contact with the end of the tailpiece 36 on the arm 25 to limit the swinging movement of the arm in one direction as the cop-holder is lowered towards the driving-drum or roll 7. The end of the tailpiece 36 is also adapted to strike against a raised ledge or finger 41 on the opposite side of the member 37 to limit the swinging movement of the arm 25 in the opposite direction when the cone-holder is raised away from the drive-roll 7; the extreme position of the tailpiece in this direction being illustrated by dash lines in Fig. 1 of the drawings.

The rod 18 which forms the main arm or support for the cone-holder 11 is held in its bearing 23 on the arm 25 by means of a collar 42 secured to the rod by a set-screw 43. The collar 42 abuts one end of the hub or bearing 23 to take the end thrust of the rod in one direction and at the opposite end of the bearing an arm 45 has its hub 46 clamped to the rod 18 by a binder-screw 47 to take the end thrust in the opposite direction. The arm 45 constitutes one element of the builder-motion of the winding machine which acts to tilt the cone-holder to vary the inclination of its axis with respect to the surface of the drive-roll during the winding, whereby to control or regulate the degree of taper on the surface of the cone being wound. As is well known to those versed in the winding art it is desirable that the cone be wound with a gradually increasing taper on its surface whereby the yarn will unwind therefrom with greater freedom as it is delivered from the outer layers of the cone.

Builder-motions of various types have been employed on winding machines for increasing the taper of the cone, and in the machine herein illustrated this mechanism is constructed and arranged in accordance with the invention disclosed in United States Letters Patent No. 1,658,400, granted to E. R. Swanson, February 7, 1928. The cone-holder 11 is rocked by the arm 45 previously described, the end of the arm carrying a follower 48 adapted to travel in an inclined groove or double-sided trackway 49 in a cam 50, shown in perspective view in Fig. 5. The grooved cam 50 is of arcuate shape, arranged concentric to the axis on which the cone-holder arm 12 swings, and in the device of the patent previously referred to the cam is held fixed with respect to the cone-holder arm.

With the arrangement as above described it will be observed that as the cone-holder 11 rises away from the drive-roll 7 with the growth in the winding the follower 48, traveling in the inclined groove 49 of the cam 50, will cause the arm 45 to rock the cone-holder arm 12 with the rod 18 turning in its bearing in the hub 23 of the arm 25. This rocking motion imparted to the rod 18 and the cone-holder arm 12 serves to gradually tilt the cone-holder 11 to increase the inclination of its axis to the surface of the drive-roll. As the cone-holder is thus tilted to incline its axis at a greater angle to the surface of the drive-roll the yarn will be built up faster at the base-end of the cone so that the taper on its surface will be gradually increased, this method of operation being well known to those versed in the present art.

In the present invention, as a simple and direct means for effecting a continuous tilting action of the cone-holder with respect to the drive-roll whereby to periodically alter the contact of the cone thereon to vary its speed of rotation, I make use of the elements 45 and 50 of the builder-motion in a manner as next described. Instead of mounting the cam 50 stationary, as in the prior construction referred to, I pivot the cam on the rod 26 whereby it may be given an up and down oscillating movement in the manner and for the purpose as later explained.

As best shown in Fig. 5 of the drawings, the cam 50 is formed as a part of an arm 51 which is pivoted to the right-hand end of the rod 26. Fastened to the side of the arm 51 is a yoke 52 having a hub 53 pivoted on the rod 26 abutting the side of a fixed collar 54 which, with the hub 27 on the upward extension of the frame member 4, takes the lateral thrust of the yoke, see Fig. 5. Referring to Fig. 1, the yoke 52 has an elbow-shaped arm 55 extending downwardly at an angle and formed at its end with a forked bearing 56. The inner sides of the bearing 56 engage the periphery of an eccentric 57 carried on a rotating shaft 58, the eccentric being fastened to the shaft by means of a suitable set-screw 59. The shaft 58 extends through bearings 60 depending from the

cross members 4 of the machine frame, being rotated at a relatively slow rate of speed to cause the eccentric 57 to rock the arm 55. The shaft 60 may be driven from the drum-shaft 5 or directly from the power-applying means through any suitable connections not herein shown.

It will be apparent that as the eccentric 57 is slowly rotated the arm 55 will be given a limited oscillating movement to rock the cam-track 50 up and down on its pivot. The rocking action of the cam 50 imparts a slight oscillatory movement to the arm 45, and thereby the rod 18 carrying the member 16 is rocked to oscillate the cone-holder 11 with respect to the driving drum. This method of operation of the device and its resulting effect on the cone being wound is explained in connection with the winding operation as follows:

The machine is prepared for winding by placing a cop-tube or other package-support on the rotatable holder 11, the spindle 15 being swung outwardly on its pivot 20 on the arm 12 while the latter is raised away from the drive-roll to facilitate this operation. After the cop-tube x has been placed on the holder 11 in this manner the spindle 15 is swung back to engage the V-shaped portion of the spring 22 with the notch in the end of the spindle to hold the latter in operative position. The yarn y is drawn from its source of supply, usually arranged below, led through a tension-device as generally provided, but not herein shown, and the end of the strand attached to the tube x in any suitable manner. The surface of the cop-tube x is then placed in contact with the drive-roll or drum 7 by swinging the arm 12 downwardly and through this engagement the tube and its holder will be rotated from the drum.

As the yarn y leads from the tension-device to the tube x it draws across the surface of the drum or drive-roll 7 and the rotation of the latter will cause the strand to be picked up in the groove 10 on the surface of the roll to traverse it back and forth on the cop-tube in the usual manner. As the yarn is fed to the rotating cop-tube x and traversed back and forth thereon in an axial direction it will be laid in a series of helical turns or convolutions which build up courses or layers of crossing coils. As the courses of winding are deposited in overlying relationship on the tube x the winding increases in diameter and thereby the cone-holder 11 is caused to recede from the surface of the drum or roll 7 with the arm 12 swinging upwardly on its pivot on the rod 26. As the cop-holder arm 12 moves upwardly in this manner the inclined cam 50 operates on the follower 48 to rock the arm 45 in a contraclockwise direction as viewed in Figs. 2 and 3 of the drawings. This rocking motion of the arm 45 turns the rod 18 in its bearing 23 whereby to tilt the cone-holder 11 to incline its axis at an increasing angle with respect to the surface of the drive-roll 7. The gradual tilting of the cone-holder causes the package to be built with a progressively increasing taper on its surface in the manner and for the purpose as more fully explained in United States Patent No. 1,658,400 hereinbefore referred to.

The tilting of the cone-holder in the manner as above described is gradual from start to finish of the winding, but meanwhile a further tilting motion of the holder is effected by the ribbon-breaking device to impart an intermittent oscillating or rocking motion to the package being wound. That is to say, as the follower 48 makes its gradual rise in the inclined slot 49 of the cam 50 the cam is given an up and down oscillating movement as imparted to it by action of the arm 55 oscillated from the eccentric 57. This intermittent up and down rocking motion of the cam 50 causes the follower 48 to slide in the cam-groove to impart a relatively slow oscillatory motion to the rod 18 in its bearing 23 and thereby its end-member 16 is rocked on an axis crossing the axis of the drive-roll 7. The effect of this rocking or oscillating motion of the member 16 is to rock the cone-holder 11 to lift first one end and then the other end of the cone away from the drive-roll 7.

Stated briefly, the package being wound is rocked or oscillated to cause first one end and then the other to be released from contact with the surface of the drum or drive-roll 7 with a sort of heel-and-toe motion. In this manner the cone or package is engaged periodically with the driving-drum or roll 7 first at its larger end and then at its smaller end, and due to the disparity in the diameter of the cone at its opposite ends the result is that the speed of rotation of the package is constantly varied. In other words, with the larger end of the cone engaging the drum as illustrated in Fig. 2 the package will be rotated at a slower rate of speed than when the smaller end of the cone is in contact with the drum as shown in Fig. 3.

The periodic shifting of the engaging point of the cone with the roll between its extremes of diameter continues throughout the winding operation and in this way the angular velocity or speed of rotation of the package is varied to disrupt its synchrony with the traverse of the yarn as effected by the groove in the roll 7.

The disruption of the synchrony of motion between the package and the traversing-means acts to break up the regularity of the wind so that the coils of yarn are prevented from gradually crowding together and piling to form bands or ribbons on the surface of the package.

It is to be observed that the present improved ribbon-breaker operates on an entirely new principle to vary the speed of rotation of the package being wound whereby to accomplish the desired result. The operating mechanism of the device is extremely simple and compact and adds but a single moving part to the winding machine. The eccentric 57 which rocks the arm 55 to oscillate the cam 50 may be rotated from a going element of the base machine, that is, the longitudinal shaft which carries the buntercams employed in machines of the present type as a knock-off for the stopping mechanism of the winding units. Moreover, in its preferred form of construction as herein shown and described, the ribbon-breaker utilizes certain elements of the cone-builder mechanism so that its structure is further simplified and compacted within a minimum compass.

It is to be particularly noted that in the present improved ribbon-breaker the usual extended gear trains, cams and crank-motions are eliminated and the device operated with a very slight motion whereby to save power and friction and wear on the parts.

While I have herein described and illustrated my novel and improved ribbon-breaker as embodied in a preferred form of construction, it is to be observed that modifications may be made in the structure and arrangement of the device without departing from the spirit or scope of the broad invention. Therefore, without limiting myself in this respect, I claim:

1. In a winding machine, the combination of a driving-drum, means for rotatively supporting a package for surface contact with the drum, and means for changing the relative angular position of the axes of the package and drum at intervals during the winding to vary the speed of rotation of the package.

2. In a winding machine, the combination of a driving-drum, a cop-holder for rotatively supporting a package for peripheral contact with the drum, and means for intermittently changing the angular position of the axis of the cop-holder with respect to the drum to vary the speed of rotation of the package.

3. In a winding machine, the combination of a driving-drum, a cop-holder for supporting a package for surface contact with the drum while adapting its axis to recede therefrom with the growth in the winding, and means for changing the angular relationship of the axis of the package with respect to the drum at intervals during the progress of the winding to vary its speed of rotation to disrupt the synchrony of motion between the package and drum.

4. In a winding machine, the combination of a driving-drum having a helical groove on its periphery for receiving and guiding the yarn to traverse it to wind a package, means for rotatively supporting the package for surface contact with the drum, and means for tilting the package with respect to the drum at intervals during the winding to alter its point of engagement therewith to vary its speed of rotation.

5. In a winding machine, the combination of a driving-drum, means for rotatively supporting a package for surface contact with the drum, and means for continuously tilting the package to engage its opposite ends alternately with the drum whereby to vary the speed of rotation of the package.

6. In a winding machine, the combination of a driving-drum, means for rotatively supporting a conical package for surface contact with the drum, and means for periodically oscillating the package to cause it to contact with the drum alternately at its larger and smaller ends.

7. In a winding machine, the combination of a driving-drum, a cone-holder for supporting a conical package for surface contact with the drum, and means to periodically alter the angle of inclination of the cone-holder with respect to the drum to effect a heel-and-toe driving contact of the package on the drum.

8. In a winding machine, the combination of a driving-drum, a cone-holder for rotatively supporting a conical package in driving contact with the drum, means for permitting a relative receding movement of the cone-holder and drum during the growth of the package, and means for continuously oscillating the cone-holder to alter its angle of inclination with respect to the drum to change the point of contact of the package on the drum.

9. In a winding machine, the combination of a driving-drum, a rotatable cop-holder, an arm for supporting the cop-holder to adapt it to recede from the drum during the growth in the winding, and means to oscillate said arm to rock the cop-holder to alter the point of contact of the package on the drum.

10. In a winding machine, the combination of a driving-drum, a rotatable cop-holder, means for supporting the cop-holder to adapt it to recede from the drum with the growth in the winding, means to tilt the cop-holder to change its angle of inclination with respect to the drum during its recession therefrom, and means for operating said last-named means to effect a continuous oscillation of the cop-holder during the progress of the winding.

11. In a winding machine, the combination of a driving-drum, a cop-holder for supporting a package for surface contact with the drum, means for supporting the cop-holder to adapt it to recede from the drum during the growth in the winding and to allow it to rock with respect thereto, and means for con-

tinuously rocking the cop-holder during its recession from the drum to alternately remove the opposite ends of the package from contact with the drum.

12. In a winding machine, the combination of a driving-drum, means for supporting a package for surface contact with the drum, a continuously oscillated element, and means connecting said element to rock the package to alternately remove its opposite ends from contact with the driving-drum.

13. In a winding machine, the combination of a driving-drum, a rotatable and tiltable cop-holder for supporting a package for surface contact with the drum, and continuously operated means for tilting the cop-holder to cause the package being wound to engage the driving-drum first at one end and then at the opposite end.

14. In a winding machine, the combination of a driving-drum, a cop-holder for supporting a package for surface contact with the drum, means for supporting the cop-holder to adapt it to rock in a direction toward and away from the drum, and a cam for rocking said cop-holder to cause the package to engage the drum first at one end and then at its opposite end.

15. In a winding machine, the combination of a driving-drum, means for supporting a package for surface contact with the drum, means for oscillating the package to engage it first at one end and then at the opposite end with the drum, and a cam for operating the oscillating means.

16. In a winding machine, the combination of a driving-drum, an arm pivoted to swing away from said drum, a cop-holder supported by the arm to maintain the package in surface contact with the drum and to rock on an axis crossing the axis of the drum, means for oscillating the cop-holder, and a cam for operating the oscillating means to rock the cop-holder to cause the package to engage the drum first at one end and then at its opposite end.

17. In a winding machine, the combination of a driving-drum, an arm pivoted on an axis parallel with the axis of the drum, a cop-holder swiveled on said arm to adapt it to support a package in surface contact with the drum and to rock in an axial plane, a cam, a follower engaging the cam to rock the cop-holder, and means to oscillate the cam to rock the cop-holder to cause the package to engage the drum first at one end and then at the opposite end.

18. In a winding machine, the combination of a driving-drum, an arm pivoted to swing away from the drum, a cop-holder swiveled on the arm to adapt it to recede from the drive-roll and to rock on an axis crossing the axis of the drum, an arm for rocking the cop-holder, a follower on said last-named arm, a cam engaging the follower, and means to actuate the cam to continuously oscillate the cop-holder to alternately release its opposite ends from contact with the drum.

19. In a winding machine, the combination of a driving-drum, a cop-holder for supporting a package in surface contact with the drum, a movable support for the cop-holder for adapting it to recede from the drum during the growth in the package, means for mounting the cop-holder to adapt it to rock on its support, a cam, means engaging the cam to oscillate the cop-holder during its recession from the drum, and means for actuating the cam to oscillate the cop-holder to cause the package to engage the drum first at one end and then at its opposite end.

20. In a winding machine, the combination of a driving-drum, an arm pivoted on an axis parallel with the axis of the drum, a cop-holder swiveled on said arm to adapt it to recede from the driving-drum and to rock with respect thereto during its receding movement, an arm connected to rock the cop-holder, a follower on said arm, a cam having an inclined face engaging the follower, and means to oscillate the cam to rock the cop-holder to alternately remove first one end of the package and then its other end from engagement with the driving-drum.

In testimony whereof I hereunto affix my signature.

FRANKLIN A. REECE.