Jan. 5, 1937. E. R. SWANSON 2,066,494

WINDING MACHINE

Filed March 26, 1934 4 Sheets-Sheet 1

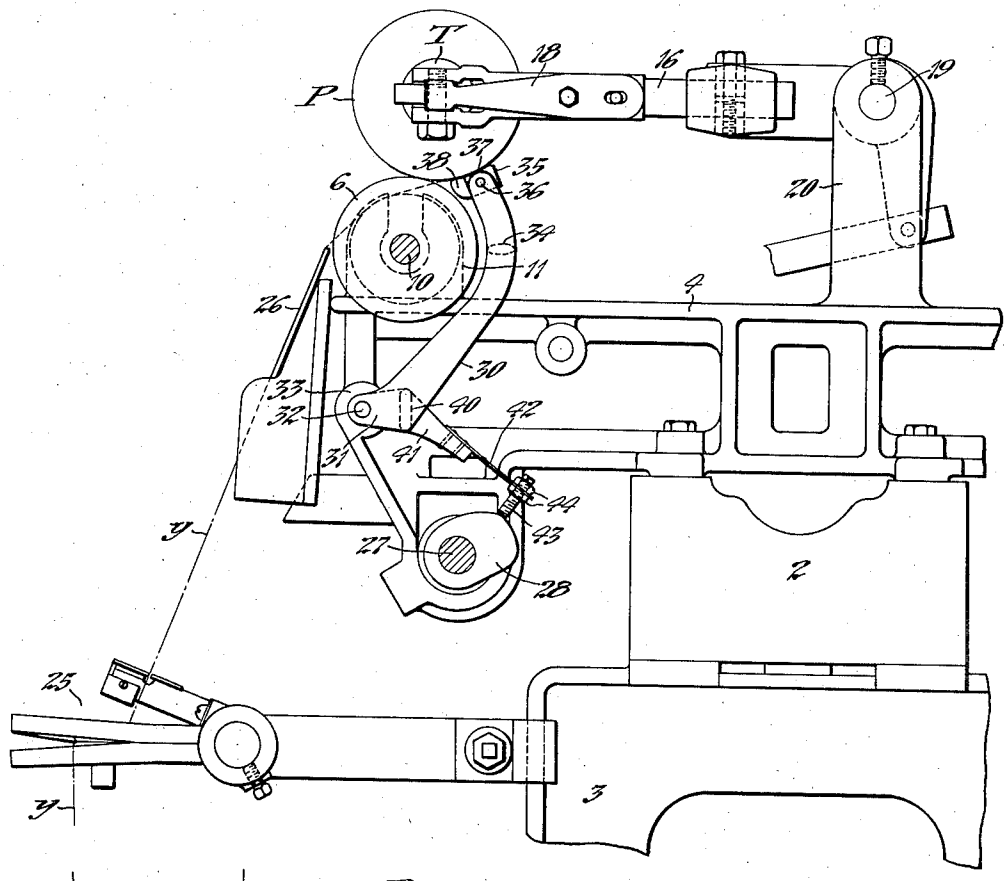

Fig. 1.

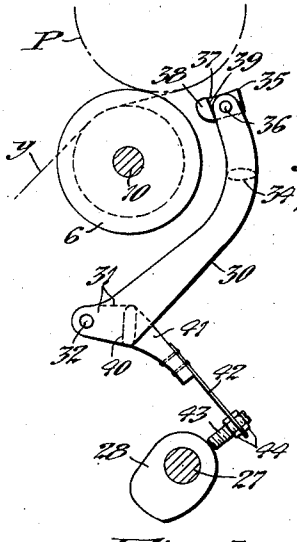

Fig. 5.

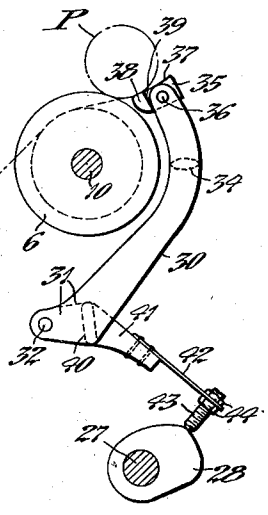

Fig. 4.

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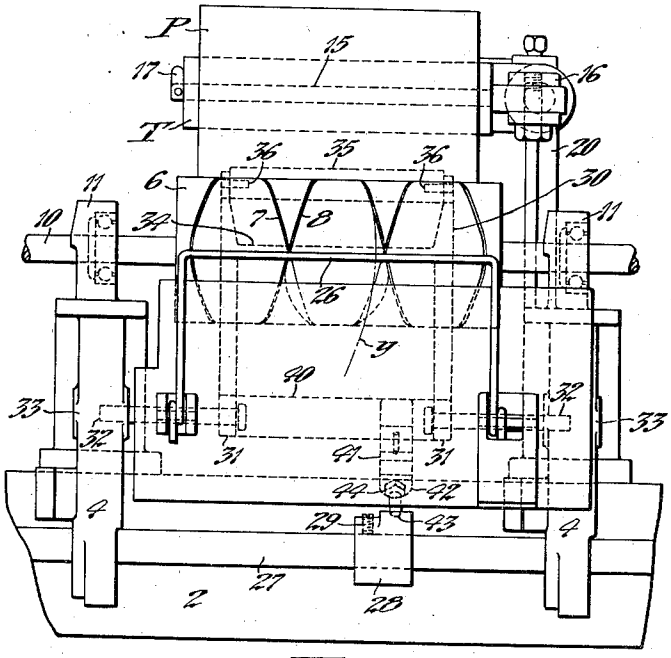

Fig. 2.

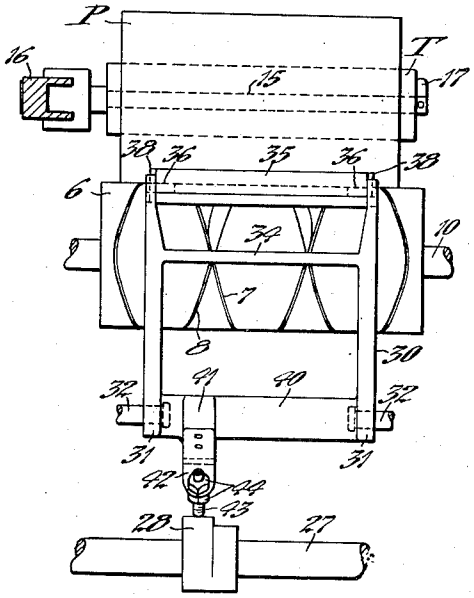

Fig. 3.

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WINDING MACHINE

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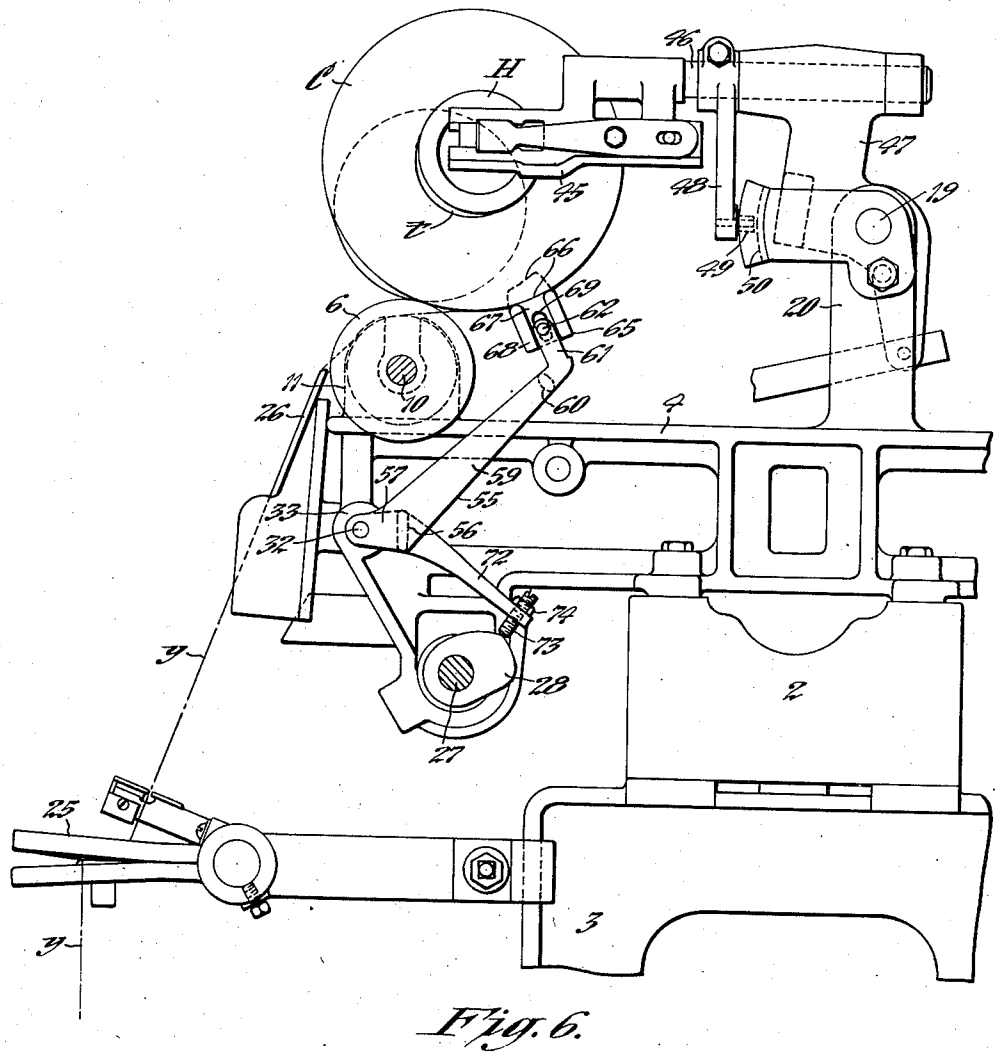

Fig. 6.

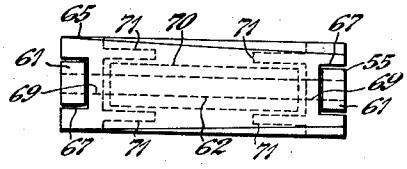

Fig. 11.

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WINDING MACHINE

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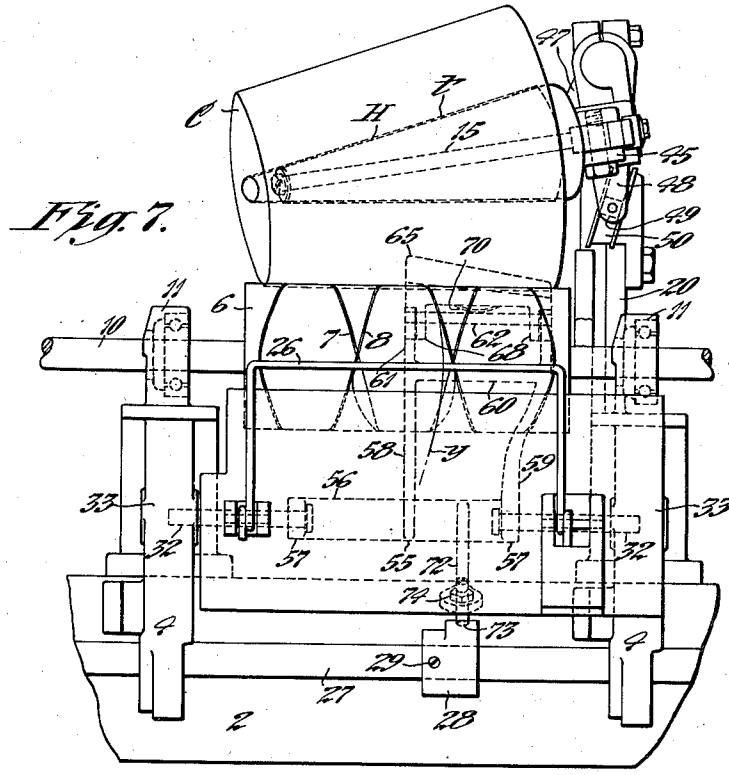

Fig. 7.

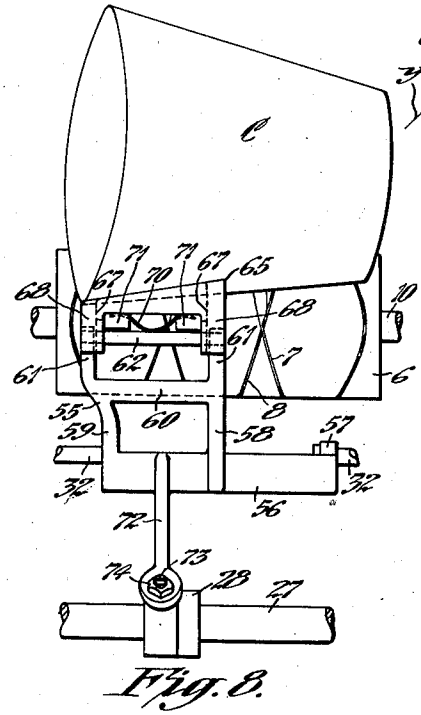

Fig. 8.

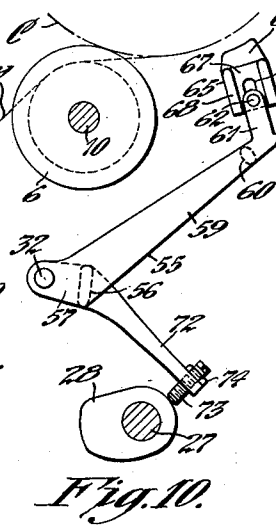

Fig. 10.

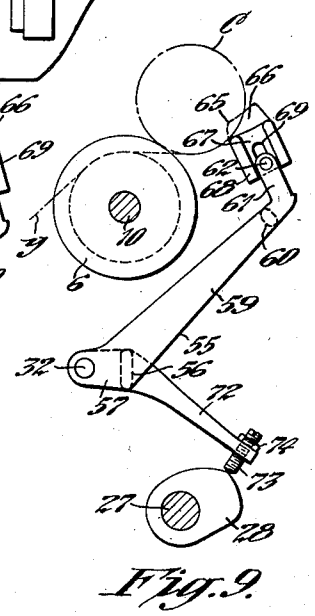

Fig. 9.

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UNITED STATES PATENT OFFICE

2,066,494

WINDING MACHINE

Ernest R. Swanson, Cranston, R. I., assignor to Universal Winding Company, Boston, Mass., a corporation of Massachusetts

Application March 26, 1934, Serial No. 717,468

8 Claims. (Cl. 242—18)

This invention is an improvement over the invention disclosed in my prior copending application, now Patent No. 1,955,778 issued April 24, 1934, and is a continuation of said prior application as to all common subject matter. As in the prior application the present invention relates to winding machines for winding cops, cones, cheeses and other forms of packages of thread, yarn, cord and similar strand material, hereinafter referred to generally by the term "yarn"; and particularly to a ribbon breaker for drum winders in which the package is driven by surface contact with a rotating drum or drive-roll.

Various types of ribbon-breakers have been devised for disrupting the synchronism between the rotation of the package and the traverse of the yarn thereon, whereby to regulate or control the disposition of the helical turns of winding to prevent the formation of bands or "ribbons" in which the yarn coils are crowded together or "piled".

In the invention of the copending application an automatically-operated brake is provided for periodically retarding the speed of the package, the brake being arranged to coact with a brake-disk on the yarn-receiver or other support for the package being wound. In the present invention the brake is applied directly to the surface of the package being wound, thus avoiding the need for a brake-wheel or -disk on the yarn-receiver or cop-holder; and as a further feature of improvement, the brake is arranged to relieve the pressure of the package on the drive-roll or drum to assist in effecting slippage between the surface of the package and the periphery of the drum.

In one preferred form of construction the present braking means bearing against the under side of the package and tends to lift the latter away from the drum, the extent of such lifting motion being adjustable as required, although it has been determined that a very slight lateral displacement of the package with respect to the drum is all that is required to obtain satisfactory results.

The objects and advantages of the present invention are substantially the same as stated in my previous application.

The present specification describes a device as adapted for use on machines for winding packages of either cylindrical or conical shape and the drawings illustrate a preferred form of construction of the invention, by way of example. In the drawings:

Fig. 1 is an end elevation of a portion of a winding frame or gang winder showing the essential elements of the winding mechanism of one unit thereof with the present ribbon-breaker applied to use therewith;

Fig. 2 is a front elevation of one of the winding units shown as adapted for winding cylindrical packages and illustrating the invention in connection therewith;

Fig. 3 is a rear elevation of the winding mechanism illustrating the construction of the braking means which operates directly on the surface of the package driven from the drive-roll;

Fig. 4 is a detailed side view of the braking means illustrating the brake as applied to the surface of the package during the initial stages of the winding;

Fig. 5 is a similar view illustrating the brake released from the package which is shown as of increased diameter at a later stage in the winding;

Fig. 6 is a view similar to Fig. 1 showing the ribbon-breaking mechanism as applied to use on a machine equipped for winding packages of conical form;

Fig. 7 is a front elevation of the same;

Fig 8 is a rear elevation of a portion of the winding unit illustrating the braking means as applied to the surface of the cone at its larger end;

Fig. 9 is a detailed side view of the braking means shown as operative on the cone at the commencement of the winding;

Fig. 10 is a similar view showing the brake removed from the package which is illustrated as having increased in diameter; and

Fig. 11 is a detailed view of the brake-shoe and its mounting as used on machines for winding conical packages.

As is well known to those versed in the art of winding, in drum winders the speed of rotation of the package varies inversely with its increase in diameter and this results in a variation in the ratio between the angular velocity of the package and the traverse of the yarn back and forth thereon. As a consequence thereof, the character of the winding on the surface of the package constantly undergoes a change throughout the winding. While the helical coils or turns of yarn may be spaced at a distance apart at the start of the winding, as the rotative speed of the package decreases the coils will be laid closer together until they tend to crowd and "pile". Then, as the winding proceeds, the coils are disposed farther apart again and this closing and opening of the "wind" repeats at intervals.

If the disposition of the coils of yarn is not controlled or regulated in some manner throughout the winding of the package, the coils will crowd together to form bands or "ribbons" which render the package defective in that the yarn is stretched and strained and its delivery from the package will be impeded during unwinding. It is therefore the usual practice to provide drum winders with "ribbon-breakers", such devices op-

erating to disrupt the synchronism between the speed of rotation of the package and the rate of traverse of the yarn to control the disposition of the coils.

As in my copending application hereinbefore referred to, the present invention provides means for disrupting the synchronism between the rotative speed of the package and the rate of traverse of the yarn by intermittently applying a brake to retard the speed of the package. The means for applying the brake may be automatically operated from any going part of the winding mechanism.

Referring to Figs. 1 and 2 of the drawings, these views illustrate one of a plurality of units of a gang winding machine which are mounted on a horizontal bed or table 2 supported from the floor by legs or standards 3. In gang machines of this type the several winding units are arranged along the opposite sides of the bed 2 with their mechanisms supported from cross-frames 4 attached to the bed.

In the machine herein illustrated the winding mechanism comprises two principal elements, namely, means for rotatably supporting the package to be wound and a continuously driven drum or drive-roll 6 for rotating the package by surface contact therewith. The drive-roll 6 as herein shown has means incorporated therein for traversing the yarn on the package, for this purpose the roll being formed with helical grooves 7 and 8 extended 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 traverse-roll is shown and described in United States Letters Patent No. 1,749,355, of March 4, 1930. The traverse-roll 6 is carried on and rotated by a horizontally extending shaft 10 which is common to all the winding units of the series. The shaft 10 is journaled in bearings 11 in the cross-frames or brackets 4 and arranged to be driven from a suitable source of power such as an electric motor, not herein shown, mounted at one end of the bed 2.

In the embodiment of the invention shown in Figs. 1 and 2 of the drawings, the machine is fitted for winding a cylindrical package P on a suitable core or holder such as a wooden tube T adapted to rotate on a dead spindle 15 carried at the end of a swinging arm 16. The shank-end of the spindle 15 is usually hingedly joined to the end of the arm 16 to adapt it to be swung outwardly at the front of the machine whereby to facilitate the placing of the cop-tube T thereon; the tube being retained in place on the spindle by suitable means such as a latch 17 at its outer end. Suitable detent-means, indicated generally at 18, act to maintain the spindle 15 in parallel relation to the axis of the drive-roll 6, these parts being more particularly described in my prior application hereinbefore referred to. The package supporting arm 16 is pivoted on a rod 19 held fast in an upright 20 on the cross-frame 4. Through this construction the spindle 15 and the cop-tube T carried thereon are adapted to move upwardly away from the drive-roll 6 as the winding increases in diameter with the arm 16 pivoting on the rod 19.

A suitable tension-device, indicated generally at 25, is provided for each winding unit, being arranged to apply tension to the strand of yarn y as the latter delivers from its source of supply, not herein shown, and draws upwardly across a thread-bail 26 to feed through the grooves of the traverse-roll 6 to be wound onto the cop-tube T. The thread-bail 26 is usually connected to operate the stopping mechanism of the machine when the strand breaks or its supply is exhausted; and further automatically-operated means are provided for arresting the winding when the package reaches a predetermined size. Such forms of stopping mechanisms are well known to those versed in the art and therefore are not herein shown or described in detail. Suffice it to state, that the stopping mechanism of the machine is usually actuated from a bunter-cam carried by a continuously rotated shaft 27 journaled in bearings in the frames 4 and common to all of the units of the gang winder. In the present invention the shaft 27 is utilized to carry and rotate a cam 28 which actuates the braking means; the cam being secured to the shaft 27 by a set-screw 29 in its hub or other suitable means.

As before stated, the present ribbon-breaker consists of an intermittently actuated brake adapted to engage directly with the surface of the package being wound to retard its rotation; and also tending to release the package from surface contact with the drive-roll 6. The brake is actuated by a bifurcated frame or bracket 30 having its legs 31 pivoted on studs 32 secured in bosses 33 on the opposite cross-frames 4 beneath the traverse-roll 6. The upper portions of the legs 31 of the frame 30 are braced by a cross-strip 34 and are shaped thereabove to curve around the drive-roll 6 at the rearward side thereof. Mounted between the upper extremities of the legs 31 of the bracket 30 is a brake-shoe 35 pivoted on pins 36. The brake-shoe 35 has a concaved upper face 37 nearly equal in extent to the length of the package P and adapted to contact with the peripheral surface thereof. The brake-shoe 35 is slightly rounded at its forward edge and formed with a projecting lug or abutment 38 at each end providing a shoulder 39 adapted to engage with the edge of the legs 31 of the bracket 30 to limit the rocking movement of the brake on its pivots 36.

Referring to Figs. 3, 4 and 5, the legs 31 of the frame 30 are connected at the bottom by a cross-strip or brace 40, and projecting laterally therefrom is an arm 41. Riveted or otherwise suitably secured to the end of the arm 41 is a strip of spring metal 42 which constitutes a resilient extension of the arm. A stud 43 projects through the end of the resilient extension 42 and is secured in place to adapt it for adjustment by means of oppositely arranged nuts 44 set up against the sides of the strip. The stud 43 has a rounded end adapted to bear on the periphery of the cam 28, previously referred to, whereby as the latter rotates the frame 30 will be rocked therefrom to intermittently press the brake-shoe 35 against the under side of the package P.

The resilient extension 42 of the arm 41 on the frame 30 flexes as indicated in Fig. 1 of the drawings, whereby to allow the brake to yield slightly under the weight of the package P as the latter grows in bulk. By adjusting the set-screw 43 at the end of the extension 42 on the arm 41 the range of movement of the frame 30, and thereby the degree of pressure exerted on the package, may be varied as required and so regulated that the brake will effect a slight lifting action on the package to relieve its contact on the periphery of the drum or drive-roll 6. Consequently, as the brake is applied and the rotation of the package retarded the surface of the winding will be allowed to slip or skid on the periphery of the drive-roll 6 so as to prevent un-

due friction between the package and the roll.

In operation, after a cop-tube T has been placed on the spindle 15 and the arm 16 lowered to bring the periphery of the tube into contact with the drive-roll 6, the rotation of the roll causes the tube to be rotated to wind on the yarn; the strand *y* having previously been drawn up from its supply across the top of the thread-bail 26 and its end attached to the tube T. In threading up the machine the yarn *y* is simply laid across the bail 26 and after its end has been secured to the tube T the rotation of the traverse-roll 6 will cause the strand to be picked up in one of the grooves 7 or 8 on the roll to be thereafter traversed thereby from end to end of the tube.

As the winding continues the cam 28 is rotated at a relatively slow rate of speed which may be regulated as required by suitable means such as a train of gearing connecting the shaft 27 with the traverse-roll shaft 10; such gearing being usual to the present type of machine and therefore not herein shown in detail. At each complete rotation of the shaft 27 the cam 28 acts on the stud 43 to oscillate the frame 30 in the manner indicated in Figs. 1 to 5, inclusive. Under this actuation of the frame 30 the brake-shoe 35 is carried against the surface of the package P with a firm but yielding pressure, whereby resistance is applied to the rotation of the package and its periphery relieved from driving contact on the drum or roll 6. The rotation of the package is thus periodically retarded so that, in effect, the drive-roll runs ahead of the package and while the traverse of the yarn is maintained constant the reduction in speed of the package alters the ratio therebetween to disrupt the synchronism and thereby prevent ribbon winding.

In the embodiment of the invention illustrated in Figs. 6 to 11 of the present drawings the machine is fitted to wind conical packages and the brake for retarding the rotation of the package takes a somewhat different form. For this type of winding a conical cop-holder H is rotatively mounted on the spindle 15 to adapt it to receive a paper cone-tube *t* secured rotatively therewith by any suitable means. The dead spindle 15 has its shank hinged to the end of a bracket 45 fast with an extension-rod 46 which is swiveled in a bearing in an elbow-shaped arm 47, see Figs. 6 and 7. The arm 47 is pivoted on the stud 19, previously referred to as mounted in the upright arm 20 on the main frame bracket 4. Through this arrangement the outer end of the spindle 15 is adapted to tilt downwardly towards the traverse-roll 6 with the rod 46 rocking in its bearing in the arm 47. During the winding the spindle 15 is positively tilted to increase its inclination to the axis of the drive-roll 6 whereby to cause the cone to be built with an increasingly greater pitch or taper on its surface, this being the usual practice in machines of the present type. The positive tilting action of the spindle 15 carrying the cone-holder H may be effected by means of an arm 48 extending downwardly from the rod 46 with a follower 49 at its end arranged to slide in an inclined groove or trackway 50; this form of cone-builder being shown and described in United States Letters Patent No. 1,658,400 of February 7, 1928.

Referring particularly to Figs. 8, 9 and 10, the rockable frame 55 which carries the brake for the package is similar to the frame 30 previously described. It consists of opposite legs joined by a cross-strip 56 formed with ears 57 at its ends which are pivoted on the studs 32, previously referred to as projecting from the sides of the brackets 4. Projecting upwardly from the cross-strip 56 are two legs or arms 58 and 59, one of said arms 58 being positioned centrally of the pivots for the frame and the other arm 59 offset to one side thereof. The arms 58 and 59 project upwardly at the rearward side of the drive-roll 6 and are connected by a cross-strip or brace 60. At their upper ends the arms 58 and 59 are formed with elbow portions 61 connected by a cross-rod 62.

Referring now to Figs. 8 and 11, the brake-shoe 65 is of angular shape in side view having a concave upper face 66 shaped to conform substantially to the contour of the periphery of the conical package C. The brake-shoe 65 has a length approximately one-half the whole length of the cone C and is arranged to contact with the larger end thereof. The shoe 65 has slots or openings 67 at both ends adapted to receive the ends of the elbow portions 61 of the arms 58 and 59, this form of construction providing a sliding connection between the shoe and the frame 30. The slots 67 are formed in legs 68 at the ends of the brake-shoe 65 and the legs also have lateral slots 69 through which the cross-rod 62 projects.

The under side of the brake-shoe 65 is cut away to receive a bow-shaped spring 70 which bears at its center against the rod 62 to cause its ends to press the brake-shoe upwardly; this movement being limited by the ends of the slots 69 bringing up against the rod 62. The spring 70 is held in position by means of opposite ears 71 on the under side of the mid portion of the brake-shoe 65 which straddle the ends of the spring. It will be observed that through this arrangement the brake-shoe 65 has an articulated connection with the frame 55 whereby it may slide up and down on the ends of the arms 58 and 59 and also rock or cant slightly to aline its contact face 66 with the periphery of the cone C during the change in shape of the latter.

The above-described resilient or yieldable connection of the brake-shoe with its actuating frame 55 takes the place of the resilient extension 42 on the arm 41 of the frame 30 previously described. The frame 55 is provided with a rigid arm 72 projecting laterally from the cross-strip 56 and carrying a stud 73 at its end for engaging the periphery of the cam 28. The stud 73 is adjustable in the end of the arm 72, being held in its adjusted position by a check-nut 74 to adapt its end to bear on the peripheral edge of the cam 28.

The last-described form of construction of the device operates in substantially the same manner as that first explained, the rotation of the cam 28 serving to rock the frame 55 to periodically press the brake-shoe 65 against the surface of the cone C. As the winding increases in diameter and the cone changes slightly in form and contour, due to the tilting of its axis and the increase in the taper of its surface, the brake-shoe 65 rocks on the frame 55 to adjust its bearing face 66 to substantially full contact with the surface of the cone. The brake is thus alternately applied and released to periodically retard the rotation of the cone and, meanwhile, the package is lifted slightly to relieve its pressure on the drive-roll 6 so that its surface will slip or skid readily with respect thereto.

At the commencement of winding when the diameter of the cone is relatively small the brake-shoe 65 will have only a slight contact with the surface of the package at the forward end of the

shoe, see Fig. 9. As the cone increases in diameter a greater portion of the surface **66** of the brake-shoe **65** comes into contact with the surface of the winding and the pressure of the brake-shoe on the cone tends to increase. This increase in pressure is due to the fact that the periphery of the cone will extend farther within the range of movement of the brake-shoe **65** so that besides increasing the contact of the shoe on the surface of the package, the pressure tending to lift the cone away from the drive-roll is augmented. Under the increased pressure of the brake-shoe **65** on the cone C the spring **70** yields slightly, and due to the fact that the weight of the cone is constantly increasing, this has the effect to counteract the increase pressure of the brake-shoe so that the cone will not be lifted away from the drive-roll to an extent appreciably greater than that at the beginning of the winding. The increase in the pressure of the brake-shoe has the effect, however, to apply a greater braking force to the rotation of the package as it increases in diameter in proportion to the increment in momentum of the package due to its greater weight. In this manner the brake has a compensating effect to increase the braking force as the package grows in diameter and its momentum is increased, but without causing the package to be lifted beyond the required extent.

It will be observed from the foregoing that the present invention provides an extremely simple device for disrupting the synchronism between the speed of rotation of the package and the rate of traverse of the yarn thereon to prevent ribbon winding. The improved ribbon-breaker adds practically only one additional moving part to the winding mechanism, the rockable frame or lever which applies the brake to the surface of the package, this element being driven from a going part of the machine such as the continuously rotating shaft **27**.

When once adjusted the improved ribbon-breaker operates efficiently without care or attention and with a minimum of wear on the parts.

The invention provides a device which may be applied to standard types of winding machines already in use, requiring practically no change in construction and arrangement thereof and very little fitting or adjustment.

While the device is herein shown and described as embodied in a preferred form of construction with one modification illustrated, it is to be understood that further changes may be made in the structure and arrangement of the elements without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In a winding machine, the combination of a frame, a rotatable cop-holder, a roll for rotating the cop-holder by contact with the yarn wound thereon, means for traversing yarn longitudinally of the cop-holder to wind a package, means for supporting the cop-holder from the frame to adapt it to recede from the roll during the increase in diameter of the package, a brake mounted on the frame to adapt it to move independently of the movement of the cop-holder to engage with the surface of the package being wound to retard the rotation of the latter, and means for actuating the brake at intervals continuously during the winding of each package to interrupt the synchronism between the rotation of the package and the traverse of the yarn.

2. In a winding machine, the combination of means for rotating a package, means for traversing yarn on the package, a brake movably mounted on a stationary support and adapted to engage the surface of the package, and means for periodically moving the brake at intervals continuously during the winding of each package to cause it to engage the package to retard its rotation whereby to interrupt the synchronism between the rotation of the package and the traverse of the yarn.

3. In a winding machine, the combination of a drive-roll, means for rotatably supporting a package in surface contact with the drive-roll, means for traversing yarn on the package, a lever pivotally mounted on a fixed support independently of the package-supporting means, a brake-shoe carried by said lever for engaging the surface of the package, and a cam for rocking the lever on its pivot to press the brake-shoe against the surface of the package at intervals continuously during the winding of each package.

4. In a winding machine, the combination of means for rotatably supporting a package, means for rotating the package, means for traversing yarn on the package, a movable member, a brake-shoe carried by said member, means for actuating said member to apply the brake to the package at intervals during the winding, and resilient means between the brake and said member for yieldingly applying the brake.

5. In a winding machine, the combination of means for rotatably supporting a package, means for rotating the package, means for traversing yarn on the package, a movable member, a brake-shoe carried by said member and engageable with the package, a cam for actuating said movable member to apply the brake at regular intervals during the winding, and resilient means between the movable member and cam.

6. In a winding machine, the combination of means for rotatably supporting a package, means for rotating the package, means for traversing yarn on the package, a brake mounted independently of the package-supporting means and movable to engage the surface of the package, means for moving the brake into contact with the surface of the package at intervals during the winding, and means for adjusting the extent of movement of the brake.

7. In a winding machine, the combination of means for rotatably supporting a package, means for rotating the package, means for traversing yarn on the package, a brake mounted for oscillatory movement and so constructed and arranged as to engage the surface of the package on its side, and means for operating the brake at intervals during the winding to cause it to bear against the package to release the latter from its rotating means.

8. In a winding machine, the combination of means for rotatably supporting a package, a drive-roll for rotating the package, means for traversing yarn on the package, a brake-shoe engageable with the package to retard its motion, means pivotally mounted on a stationary support and carrying the brake-shoe to adapt it to engage the package in such manner as to displace the latter to relieve its contact with the drive-roll, and means for operating the brake at intervals during the winding.

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