June 23, 1942. E. J. ABBOTT 2,287,012

WINDING MACHINE

Filed Aug. 1, 1940 3 Sheets-Sheet 1

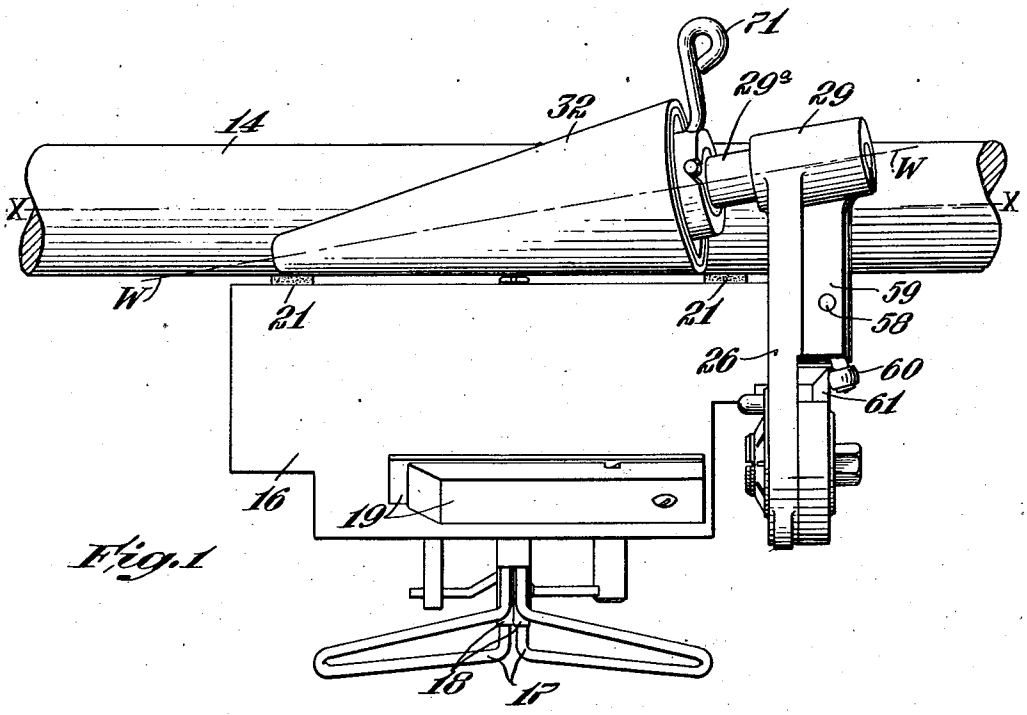


Fig. 1

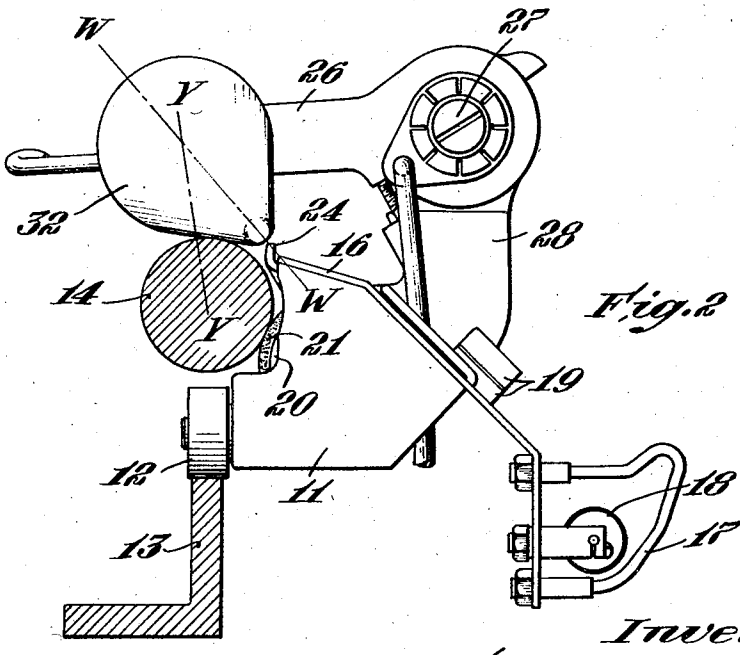


Fig. 2

Inventor
Edward J. Abbott
by Pollock, Cushman & Goodberry
Att'ys.

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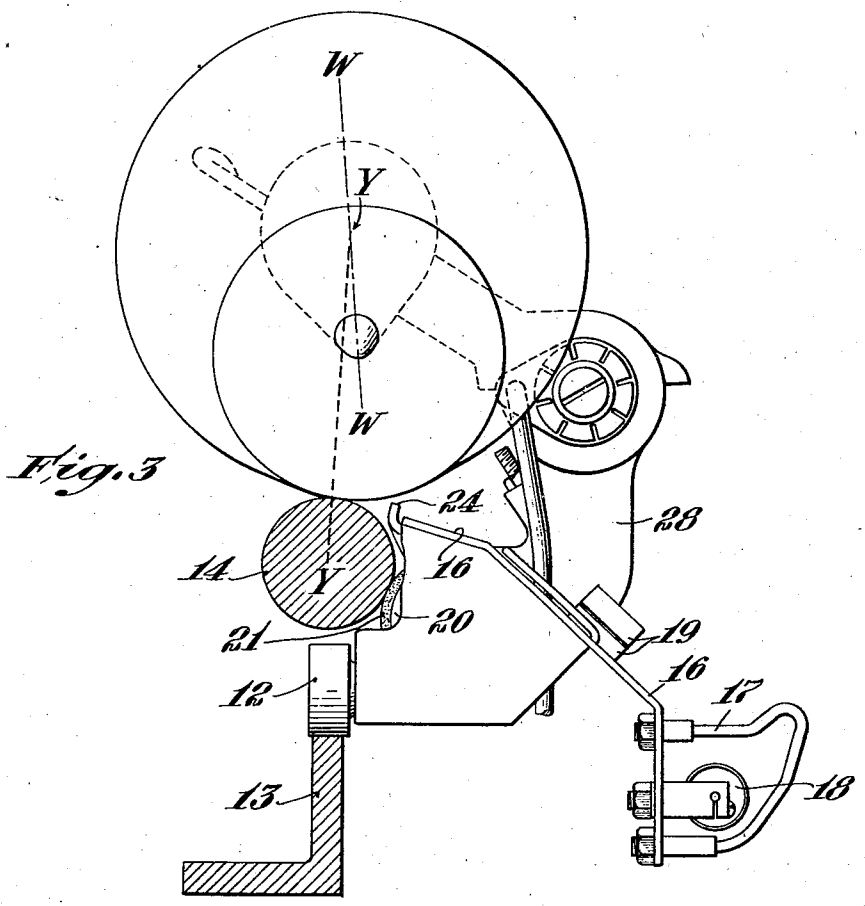


Fig. 3

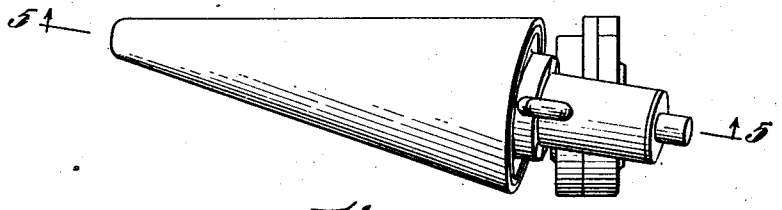


Fig. 4

Inventor
Edward J. Abbott
by Roberts, Cushman & Woodberry
Att'ys.

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WINDING MACHINE

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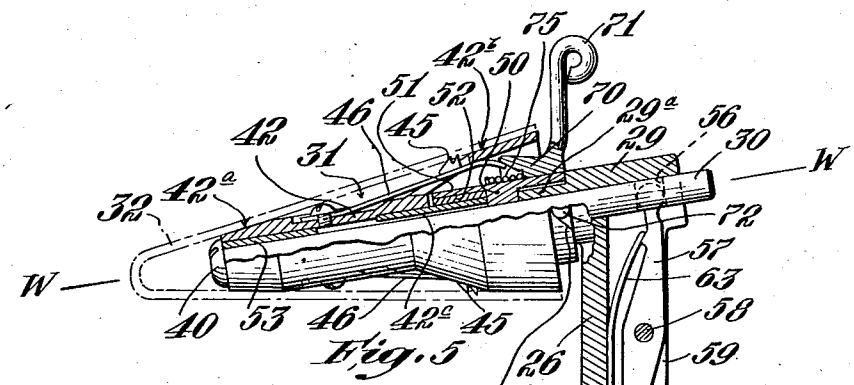


Fig. 5

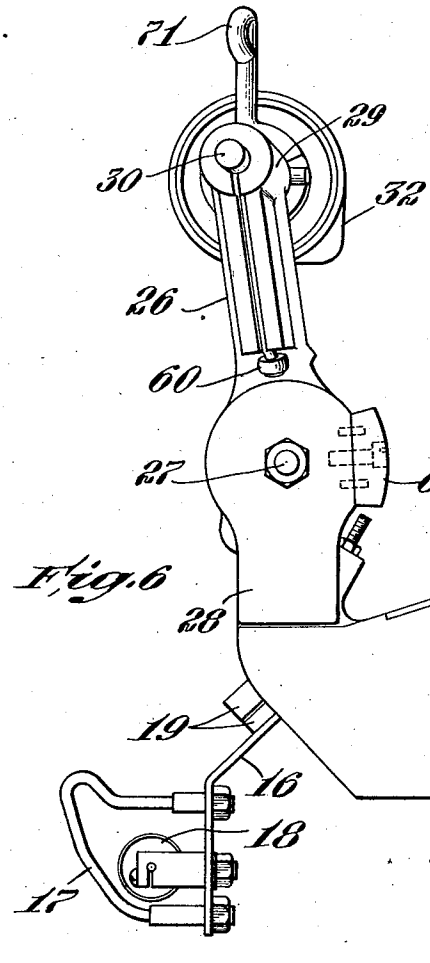


Fig. 6

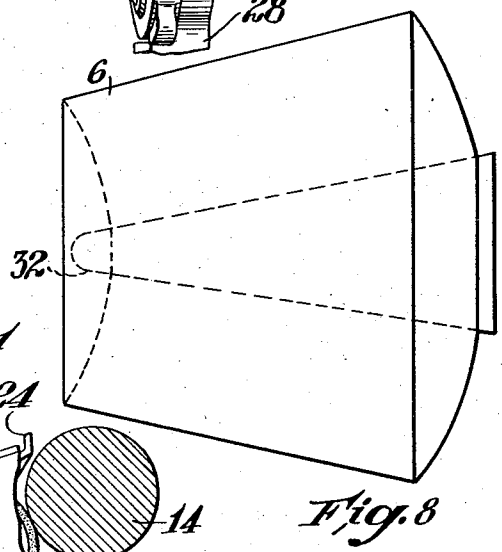


Fig. 8

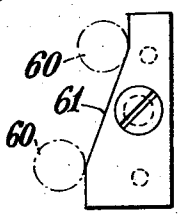


Fig. 7

Inventor
Edward J. Abbott
by Pollard, Cushman & Woodbury
Att'ys.

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2,287,012

UNITED STATES PATENT OFFICE

2,287,012

WINDING MACHINE

Edward J. Abbott, Wilton, N. H., assignor to Abbott Machine Company, Wilton, N. H., a corporation of New Hampshire

Application August 1, 1940, Serial No. 349,106

14 Claims. (Cl. 242—18)

This invention relates to yarn winding machines particularly cone winders, and has for one of its principal objects to provide a new and simplified construction of cone-holding and supporting mechanism adapted to increase or accelerate the taper of the winding cone as the package grows. It has long been recognized that an increase or acceleration in the taper of the winding cone is desirable and cone winders generally are equipped with some form of mechanism for manipulating the cone holder during the winding to increase its inclination to the winding package drive roll. An object of the present invention is to produce the desired increase in the taper of the winding cone without complicated mechanism by making use of a new relation between the cone holder, the winding package drive roll and the package arm which supports the cone holder.

A further object of the invention is to provide an improved and simplified mechanism for retracting the cone holder during the growth of the cone so as to produce a retracted cone.

Other objects of the invention and features of advantage and utility will be apparent from this specification and its drawings wherein the invention is explained by way of example.

In the drawings:

Fig. 1 is a plan view of a winding unit according to the present invention with the cone holder bare and resting on the winding package drive roll;

Fig. 2 is a left elevation of the unit of Fig. 1;

Fig. 3 is a left elevation of the unit showing the unit carrying a fully wound conical package;

Fig. 4 is a fragmentary plan view of the package arm and the cone holder fully raised and carrying a bare cone;

Fig. 5 is a sectional view on the line 5—5 of Fig. 4 showing the cone holder in the raised position.

Fig. 6 is a right elevation of the unit of Fig. 1 with the package arm and the cone holder fully raised and carrying a bare cone;

Fig. 7 is a development of the cone-retracting cam of Fig. 6; and

Fig. 8 is a side elevation of the completed cone.

The invention is shown by way of example as applied to a traveling spindle winding machine of the general type disclosed in my United States Patent No. 2,135,485 dated November 8, 1938, in which the winding packages are carried by individual units which travel along a guideway while the winding packages rest upon a winding package drive roll.

Referring to Figs. 1 and 2, the head portion 11 of the winding unit is provided with wheels 12 adapted to run on a track or guideway 13 over which there is arranged a long winding package drive roll 14. A cover plate 16 on the head of the winding unit forms a support for suitable yarn guides 17, tension disks 18, and a slub catcher 19; a traverse cam 20 mounted in the head of the winding unit carries cork tires 21 which are frictionally engaged by the roll 14 so as to rotate the cam, and the cam reciprocates a traverse yarn guide 24 closely adjacent to the roll 14.

A package arm 26, pivotally mounted at 27 on a vertical extension 28 of the head of the unit, has integral therewith a sleeve 29 which as indicated in Fig. 5 carries a spindle 30 on which the cone holder indicated generally at 31 is mounted.

In the various figures, the axis of the sleeve 29, spindle 30, cone holder 31 and cone 32 is indicated by a line W—W and the axis of the winding package drive roll is indicated by a line X—X.

A preferred construction of the cone holder 31 is shown in Fig. 5. The spindle 30 extends throughout the length of the cone holder and carries at its left end a headed screw 40 adapted to retain the rotatable portion of the cone holder on the spindle. A sleeve 42 is mounted for rotation around the spindle 30 and is provided with conical portions 42^a and 42^b adapted to fit the inner surface of the paper cone 32. The cone is detachably secured to the cone holder by means of prongs 45 pressed outwardly by springs 46 which are secured to the sleeve 42. The bearings on which the sleeve 42 turns on the spindle 30 are preferably constructed according to the principle described in my copending United States patent application Serial No. 193,006 filed February 28, 1938. A sleeve 50 fast on the spindle 30 is provided with a cup-shaped portion 51 holding a wooden or fiber bushing 52. A tubular element 42^c preferably of steel and fast on the sleeve 42, extends within the bushing 52 so that the bushing thus constitutes an external bearing surface for the right end of the sleeve 42. The left end of the sleeve 42 runs on the internal bearing surface afforded by a wooden or fiber bushing 53, held by the spindle. Thus the sleeve 42 which turns with the paper cone 32 is mounted for rotation on one external bearing and one internal bearing. As explained in said application Serial No. 193,006 (Patent No. 2,249,735), this manner of supporting the package prevents unintended backward rotation of

the package when raised to its idle position. For unlocking the prongs 45 from the paper cone, there is preferably provided a cup-shaped unlocking member 70 rotatably mounted on the sleeve 50 and having a handle 71. A pin 72, fast in the sleeve 50 engages in a cam slot 73 in the member 70 to force this member 70 over to the left when the handle is pushed away from the observer in Fig. 5, thus causing the member 70 to force the springs 46 inwardly and disengage the prongs 45 from the cone. A spring 7 is employed to restore the member 70 to the right when the handle 71 is swung back toward the observer.

It will be observed that since the cup-shaped member 70 is mounted to turn about the axis of the straight spindle 30, this cup-shaped member regardless of the position of the spindle, is always in alignment with the springs 46, ready to act on these springs when suitably turned by the handle 71. Moreover, in connection with the feature of endwise shifting of the spindle and winding cone during the winding, now to be described, it is to be noted that the cup-shaped member 70 accompanies the spindle in such shifting movement, so that operation of the unlocking handle 71 neither tends to shift the spindle nor reacts upon the mechanism for causing such shift of the spindle.

As indicated above, the device preferably includes a means operated by the swinging of the package arm 26 to shift the cone-holder and winding cone endwise with respect to the package arm, and my copending United States application Serial No. 47,247 filed October 29, 1935, Patent No. 2,157,105 may be referred to as claiming this preferred feature broadly. In the illustrated device, this endwise shift of the cone-holder is to the right or toward the package arm 26 as the winding cone grows, and is sufficient in amount to produce the concavity of the cone nose and convexity of the cone base shown in Fig. 8. Referring to Fig. 5 which shows the cone-holder in its fully retracted or right-hand position, the spindle 30 is recessed at 56 to receive the end of a lever 57 which is pivoted at 58 to a casing 59 fastened on the arm 26. The lever 57 thus prevents the spindle 30 from rotating with respect to the arm 26. A roller 60 at the opposite end of lever 57 runs in contact with the face of a cam 61 (Fig. 6) during the approximately 35° movement of the package arm from the start of winding until the completion of an eight inch package. The shape of this cam 61 (Fig. 7) is such that at the beginning of winding on a bare cone the cone holder is held by the lever 57 in its left hand position of Fig. 1 (a substantial part of the reduced diameter portion 29a of the sleeve 29 being exposed). During the growth of the cone, a spring 63 acting on the lever 57 within the casing 59 urges the lever 57 in a clockwise direction in Fig. 5 and thus progressively shifts the spindle 30 and cone holder 31 to the right. By the time of completion of an eight inch cone, the cam 61 has permitted the spring 63 to cause complete retraction of the cone holder to a position with reference to the package arm 26 such as shown in Fig. 5.

In addition to the force of the spring 63 tending to shift the spindle cone holder and winding package endwise toward the package arm, a similar force is exerted by the package drive roll directly upon the winding package due to the inclination of the spindle, cone holder and package with respect to the drive roll, described below. The cam 61, cam follower 60 and lever 57 act in a positive manner to control the endwise movement of the spindle, cone holder and package toward the package arm, so that the package is prevented from moving more quickly to the right than is necessary, to produce the desired shape of the ends of the package.

According to the present invention the cone holder 31 (and bare cone 32) is initially inclined to the drive roll 14 when the bare cone rests on the roll. The tip of the cone is inclined toward the side of the roll at which the arm 26 is pivotally mounted, the inclination being sufficient in amount so that substantially throughout the winding of a full cone, the axis of the cone (i. e. the line W—W) progressively approaches a plane passing through the axis of the drive roll (i. e. the plane Y—Y). In this way, by a simple pivotal movement of the package arm 26, the taper of the winding cone is accelerated substantially throughout the winding, in a continuous manner.

Referring to Fig. 1, the tip of the bare or approximately bare cone is inclined toward the pivot side of the machine approximately 9° with respect to the axis of the drive roll. Fig. 1 shows in plan view the approximately 9° inclination of the cone holder axis W—W with respect to the drive roll axis X—X, and this inclination can be seen in side elevation in Fig. 2. As the package grows, this inclination which initially has a large horizontal component is translated progressively into a downward inclination, as may be seen by a comparison of Figs. 2 and 3. The axis W—W of the cone progressively loses its horizontal inclination to the axis X—X of the drive roll and becomes more inclined to the drive roll in radial direction. The axis W—W of the cone continually approaches, but preferably does not quite reach, a radial plane Y—Y shown in Figs. 2 and 3 passing radially through the drive roll axis X—X. Obviously if the initial horizontal inclination of the cone holder axis W—W were not sufficiently large, a slight growth of the winding package would carry the cone holder axis W—W past some such radial plane Y—Y, with the result that during the subsequent growth of the package, the radial inclination of the cone holder axis W—W to the drive roll axis X—X would progressively decrease and become reflected in a progressively increased horizontal backward component of inclination, this movement decreasing the taper of the winding cone.

According to the present invention, however, the axis of the cone holder, at the time of completion of the full package (such as an eight inch cone) does not quite attain or at least does not substantially pass any plane Y—Y which is radial to the drive roll axis X—X. Therefore, there is no loss of taper of the cone in the last steps of its growth.

The wound cone 6 is shown by way of example in Fig. 8 as being wound on a bare cone 32 whose surface has approximately a 10° inclination to its axis, with the outer surface of the wound cone having approximately a 13½° angle of inclination to the axis.

The invention improves the quality of the wound package by keeping the portion of the winding cone adjacent the tip thereof out of contact with the drive roll at the early stages of winding, and progressively bringing more of the length of the cone into contact with the roll until finally practically the entire length of the cone is in contact with the roll. Referring to Figs. 1 and 2, the cone holder is initially posi-

tioned so that the cone is driven by frictional contact of its base portion with the drive roll. The yarn wound on the tip portion of the cone is laid firmly and without any tendency for the cusps of yarn to be loosened by the drive roll which has a much faster surface speed than that of the tip portion of the winding cone. Then as the winding cone grows, and the surface speed of the smaller end approaches more nearly to the surface speed of the drive roll, the position of the cone with relation to the drive roll is progresively altered to bring substantially all or nearly all of the length of the cone into contact with the roll, as shown in Fig. 3.

I claim:

1. A cone winding machine having therein a winding package drive roll, a package arm pivoted at one side of the drive roll and a cone holder associated with tne arm and adapted to hold a winding cone in contact with the drive roll, the cone holder being so inclined to the roll when a bare or approximately bare cone rests on the roll that the tip of the cone is inclined toward the side of the roll at which the arm is pivoted, such inclination being sufficient in amount so that substantially throughout the winding of a full cone the axis of the cone progressively approaches a plane passing through the axis of the drive roll whereby the taper of the winding cone is accelerated substantially continuously throughout the winding.

2. A cone winding machine having therein a winding package drive roll, a package arm pivoted at one side of the drive roll and a cone holder having a substantially fixed inclination to the arm and adapted to hold a winding cone in contact with the drive roll, the cone holder being so inclined to the roll when a bare or approximately bare cone rests on the roll that the tip of the cone is inclined toward the side of the roll at which the arm is pivoted, such inclination being sufficient in amount so that substantially throughout the winding of a full cone the axis of the cone progressively approaches a plane passing through the axis of the drive roll whereby the taper of the winding cone is accelerated substantially continuously throughout the winding.

3. A cone winding machine having therein a winding package drive roll, a package arm pivoted at one side of the drive roll and a cone holder having a substantially fixed inclination to the arm and adapted to hold a winding cone in contact with the drive roll, the cone holder being so inclined to the roll when a bare or approximately bare cone rests on the roll that the tip of the cone is inclined toward the side of the roll at which the arm is pivoted, such inclination being sufficient in amount so that substantially throughout the winding of a full cone the axis of the cone progressively approaches a plane passing through the axis of the drive roll, and means for progressively shifting the cone holder endwise during the winding.

4. A cone winding machine having therein a winding package drive roll, a package arm pivoted at one side of the drive roll and a cone holder associated with the arm and adapted to hold a winding cone in contact with the drive roll, the cone holder being so inclined to the roll when a bare or approximately bare cone rests on the roll that the tip of the cone is inclined toward the side of the roll at which the arm is pivoted, such inclination being sufficient in amount so that substantially through the upward swinging of the package arm during the winding of a full cone the initial inclination toward the side of the roll is progressively converted to a radial inclination with respect to the drive roll.

5. A cone winding machine having therein a winding package drive roll, a package arm pivoted at one side of the drive roll and a cone holder having a substantially fixed inclination to the arm and adapted to hold a winding cone in contact with the drive roll, the cone holder being so inclined to the roll when a bare or approximately bare cone rests on the roll that the tip of the cone is inclined toward the side of the roll at which the arm is pivoted, such inclination being sufficient in amount so that substantially throughout the upward swinging of the package arm during the winding of a full cone the initial inclination toward the side of the roll is progressively converted to a radial inclination with respect to the drive roll.

6. A cone winding machine having therein a winding package drive roll, a package arm pivoted at one side of the drive roll and a cone holder having a substantially fixed inclination to the arm and adapted to hold a winding cone in contact with the drive roll, the cone holder being so inclined to the roll when a bare or approximately bare cone rests on the roll that the tip of the cone is inclined toward the side of the roll at which the arm is pivoted, such inclination being sufficient in amount so that substantially throughout the upward swinging of the package arm during the winding of a full cone the initial inclination toward the side of the roll is progressively converted to a radial inclination with respect to the drive roll, and means for progressively shifting the cone holder endwise during winding.

7. A winding machine having therein a rotatable roll on which the winding package rests, a swinging arm, a winding package holder, a connection between said swinging arm and the package holder permitting approximately endwise movement of the package holder bodily toward and away from the swinging arm to shift the package along the roll, a stationary cam, a lever associated with the swinging arm, a cam follower carried by one end of the lever and adapted to move over the cam as the arm swings, the other end of the lever being connected to the package holder to shift the latter endwise.

8. A cone winding machine having therein a spindle, means for progressively shifting the spindle endwise during the winding, a cone holder mounted on the spindle and movable endwise therewith, said cone holder including cone locking means adapted to be disengaged from the cone to release the same, and unlocking means movable endwise with the spindle and cone holder and adapted to cooperate with the cone locking means to disengage the latter from the cone.

9. A cone winding machine having therein a substantially straight spindle, means for progressively shifting said spindle in the direction of its axis during winding, a rotatable cone holder mounted on the spindle and movable endwise therewith, said cone holder including cone locking elements, a cup-shaped member coaxial with the spindle and movable endwise therewith and with the cone holder, the cup-shaped member being adapted to be turned manually about the spindle, and means whereby such turning in one direction causes the cup-shaped member to engage the cone holding elements and move them to unlock the cone.

10. A cone winding machine having therein a

movable package arm, a spindle mounted for endwise movement in said arm, a rotatable cone holder on said spindle, and means including a lever carried by the package arm for shifting the spindle endwise during the winding, said lever extending into a recess in the spindle and preventing the spindle from rotating with respect to the package arm.

11. A cone winding machine having therein a winding package drive roll, a package arm, a cone holder associated with the arm and so inclined to the drive roll that when a bare or approximately bare cone rests on the roll the tip of the cone is inclined toward one side of the roll, the cone holder being mounted for movement in an endwise direction toward and from said arm, and means for positively controlling movement of the cone holder in the direction toward said arm.

12. A cone winding machine having therein a winding package drive roll, a package arm, a spindle mounted in said arm for endwise movement therein and so inclined to the drive roll that at the beginning of winding the tip of the spindle is inclined toward one side of the roll, a rotatable cone holder on the spindle, and means for positively controlling movement of the spindle in the direction in which the cone holder approaches the package arm.

13. A cone winding machine having therein a winding package drive roll, a cone holder, means for positioning the cone holder at the start of winding with a part of the conical portion of the winding cone adjacent to the tip thereof out of contact with the drive roll, and means for progressively altering the position of the cone holder with relation to the drive roll in such manner as to bring practically the entire length of the conical surface of the winding package into contact with the drive roll.

14. A cone winding machine having therein a winding package drive roll, a cone holder, means for positioning the cone holder at the start of winding with the axis of the cone holder in a sufficiently skewed relation to the axis of the drive roll to cause a part of the conical portion of the winding cone adjacent to the tip thereof to be out of contact with the drive roll, and means for progressively lessening the extent of said skewed relation so as to bring practically the entire length of the conical surface of the winding package into contact with the drive roll.

EDWARD J. ABBOTT.