April 18, 1939. E. G. HILL ET AL 2,154,847

ATTACHMENT FOR WINDING TAPER ENDED PACKAGES

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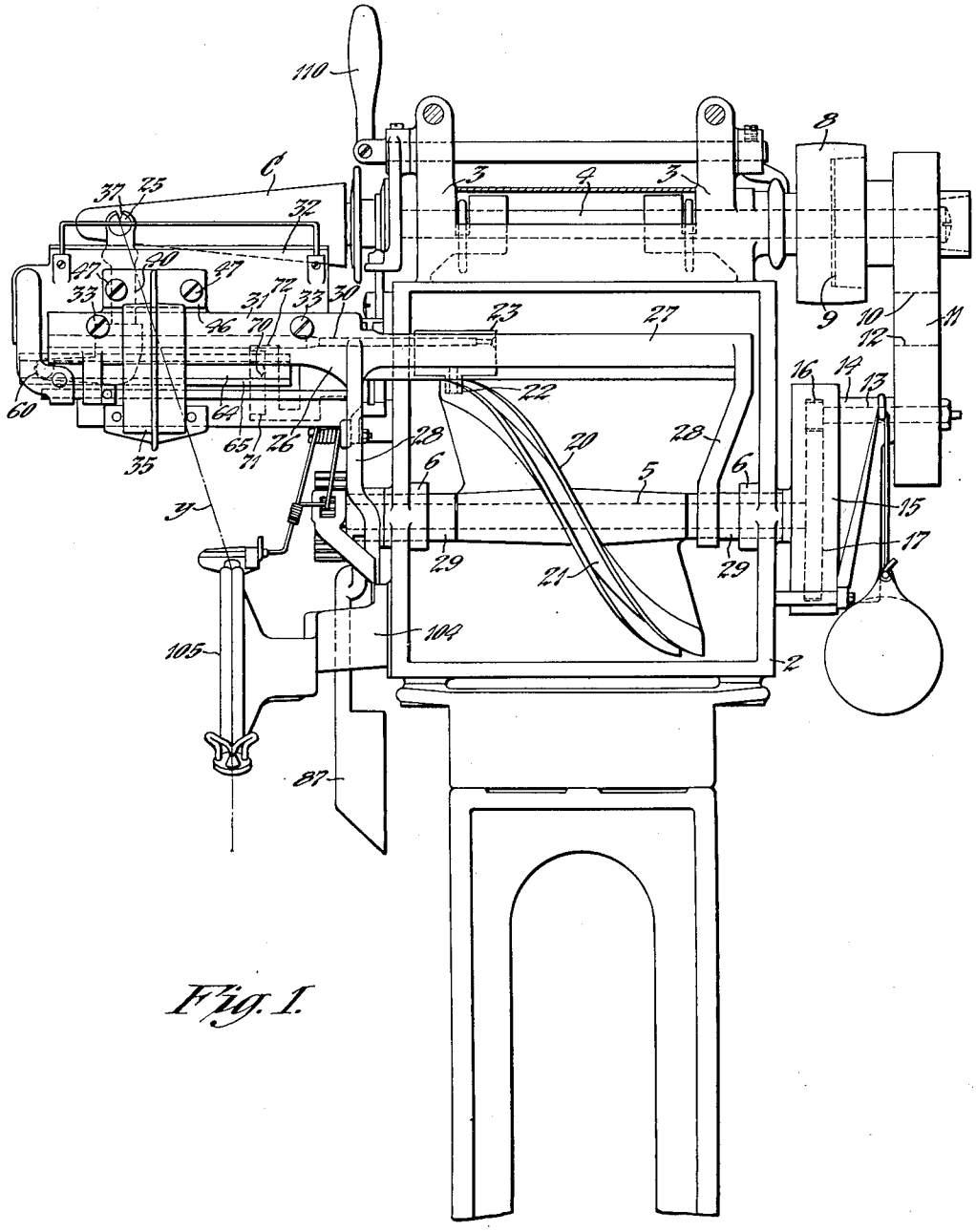


Fig. 1.

Inventors:
E. G. Hill
By H. A. Stem,
Watson, Coit, Moore & Grindle
Attorneys.

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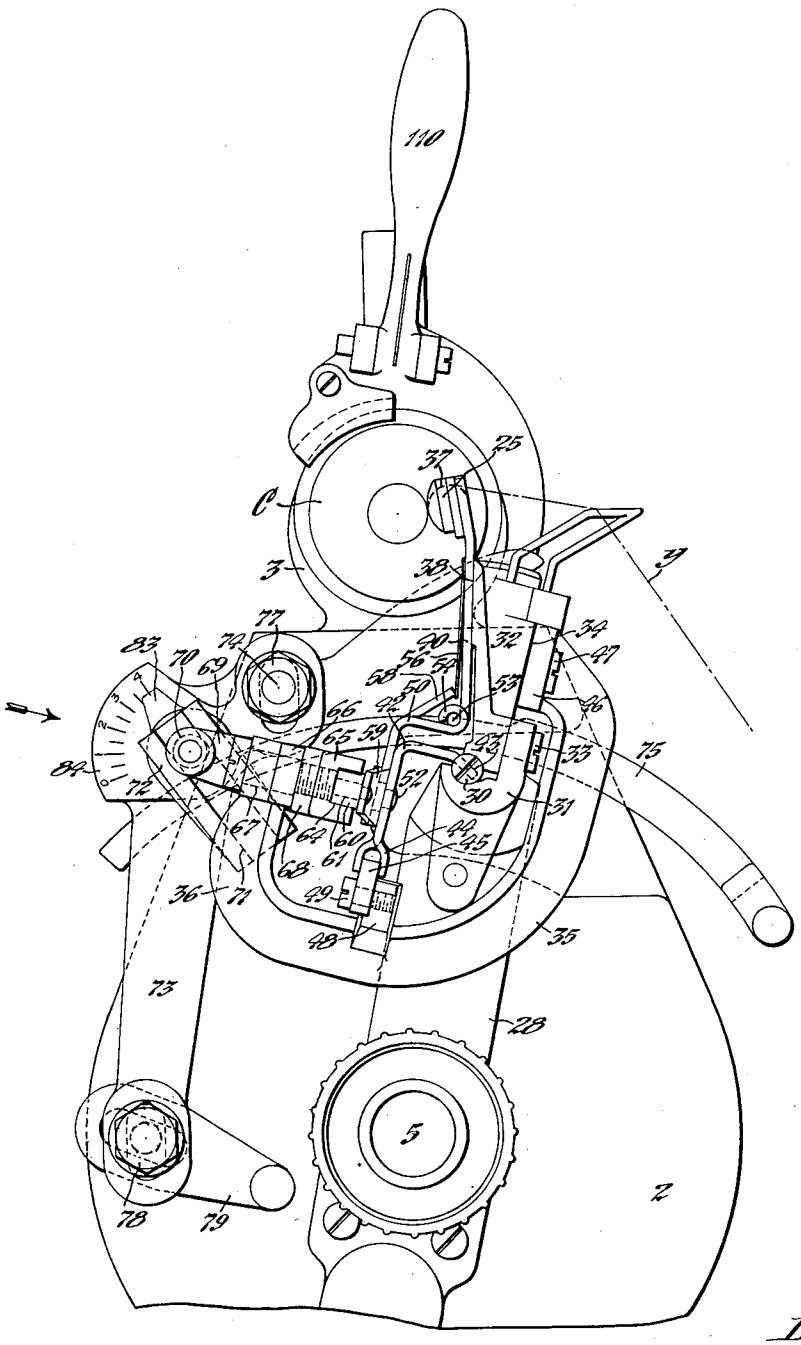


Fig. 2.

Inventors:
E. G. Hill
By H. A. Stem
Watson, Coit, Morse & Grindle
Attorneys.

April 18, 1939. E. G. HILL ET AL 2,154,847

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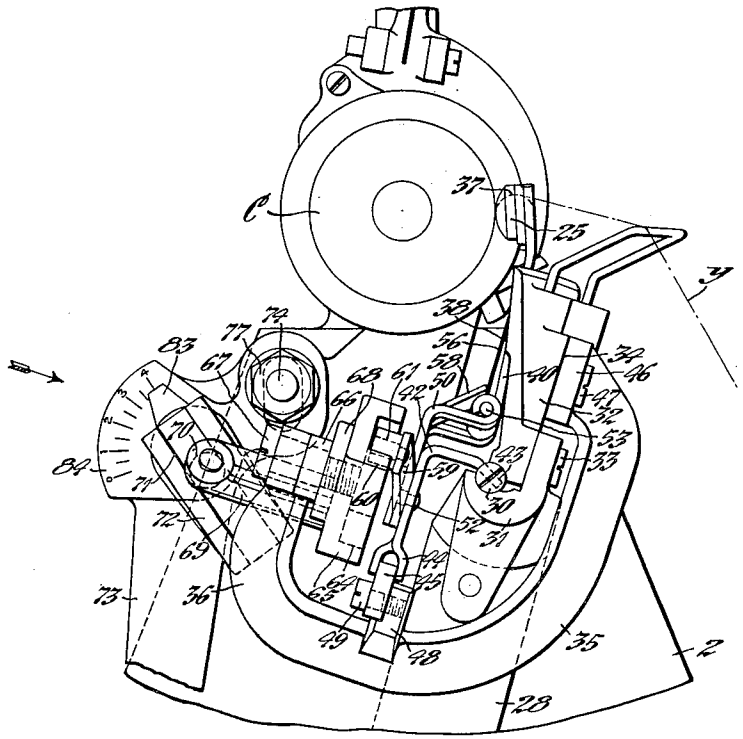


Fig. 3.

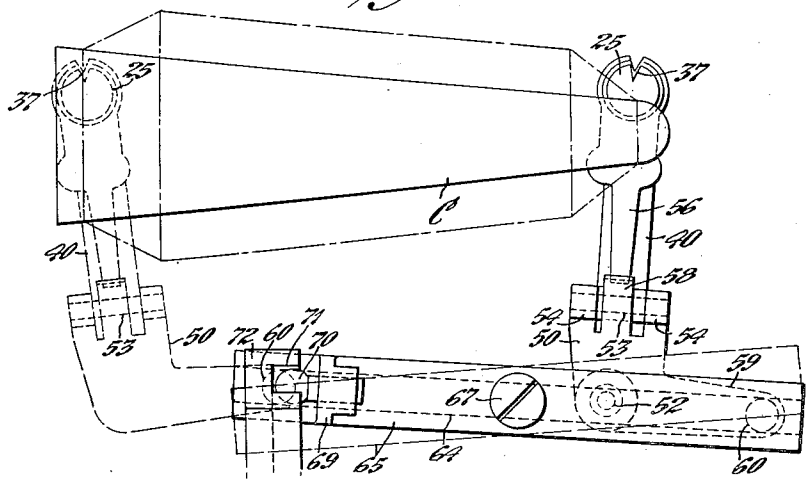


Fig. 6.

Inventors:
E. G. Hill
By H. A. Stern,
Watson, Cole, Grosvenor & Grindle
Attorneys.

April 18, 1939. E. G. HILL ET AL 2,154,847

ATTACHMENT FOR WINDING TAPER ENDED PACKAGES

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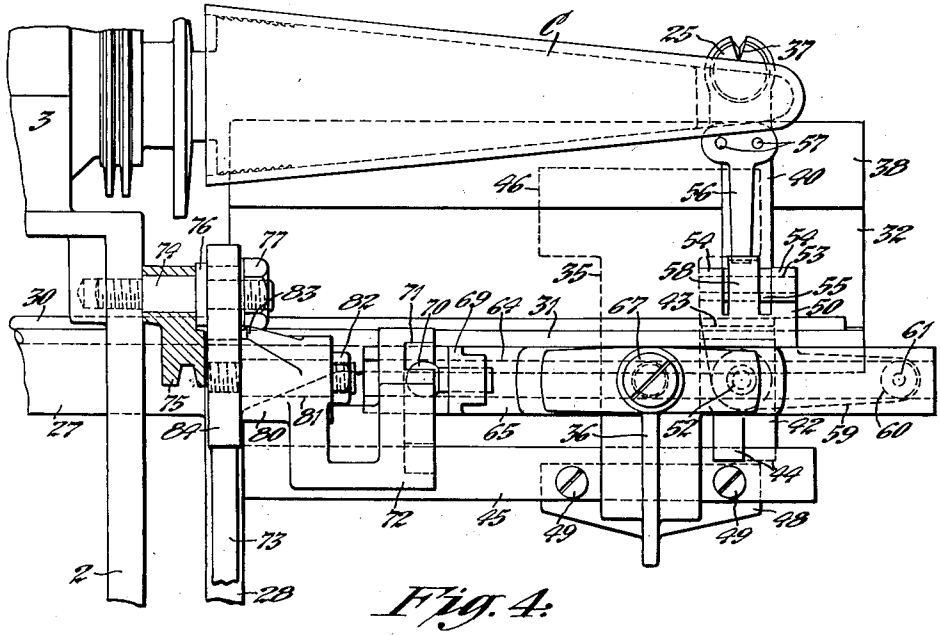


Fig. 4.

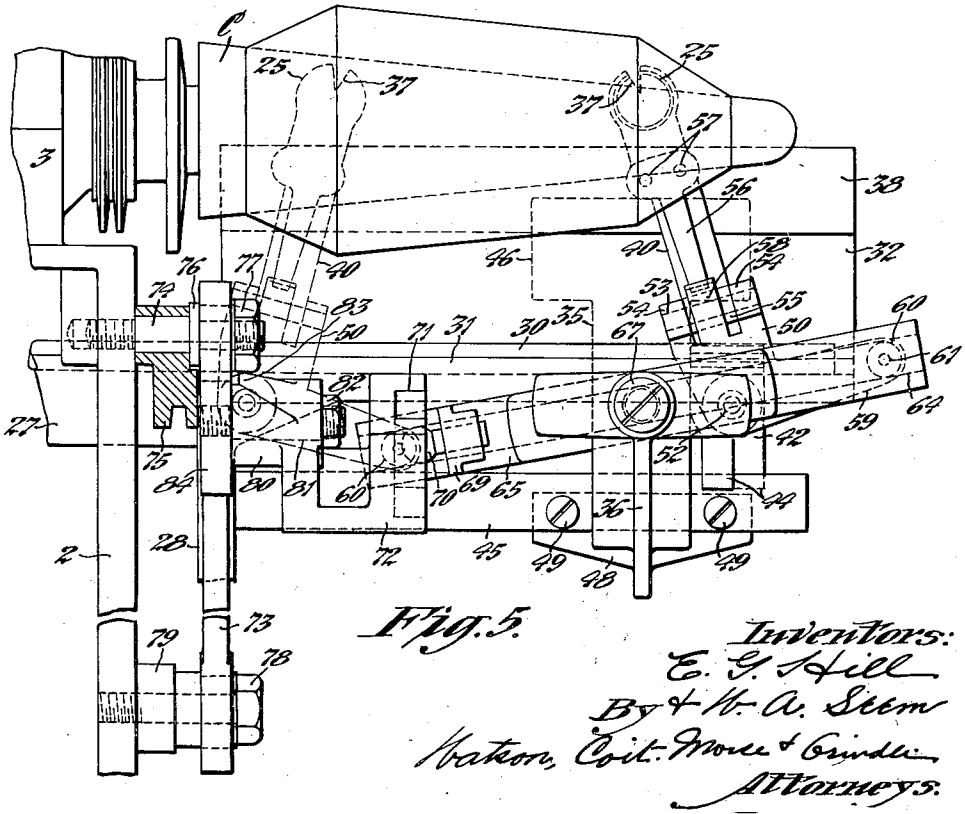


Fig. 5.

Inventors:
E. G. Hill
By H. A. Seem
Watson, Coit, Moore & Grindle
Attorneys.

April 18, 1939. E. G. HILL ET AL 2,154,847

ATTACHMENT FOR WINDING TAPER ENDED PACKAGES

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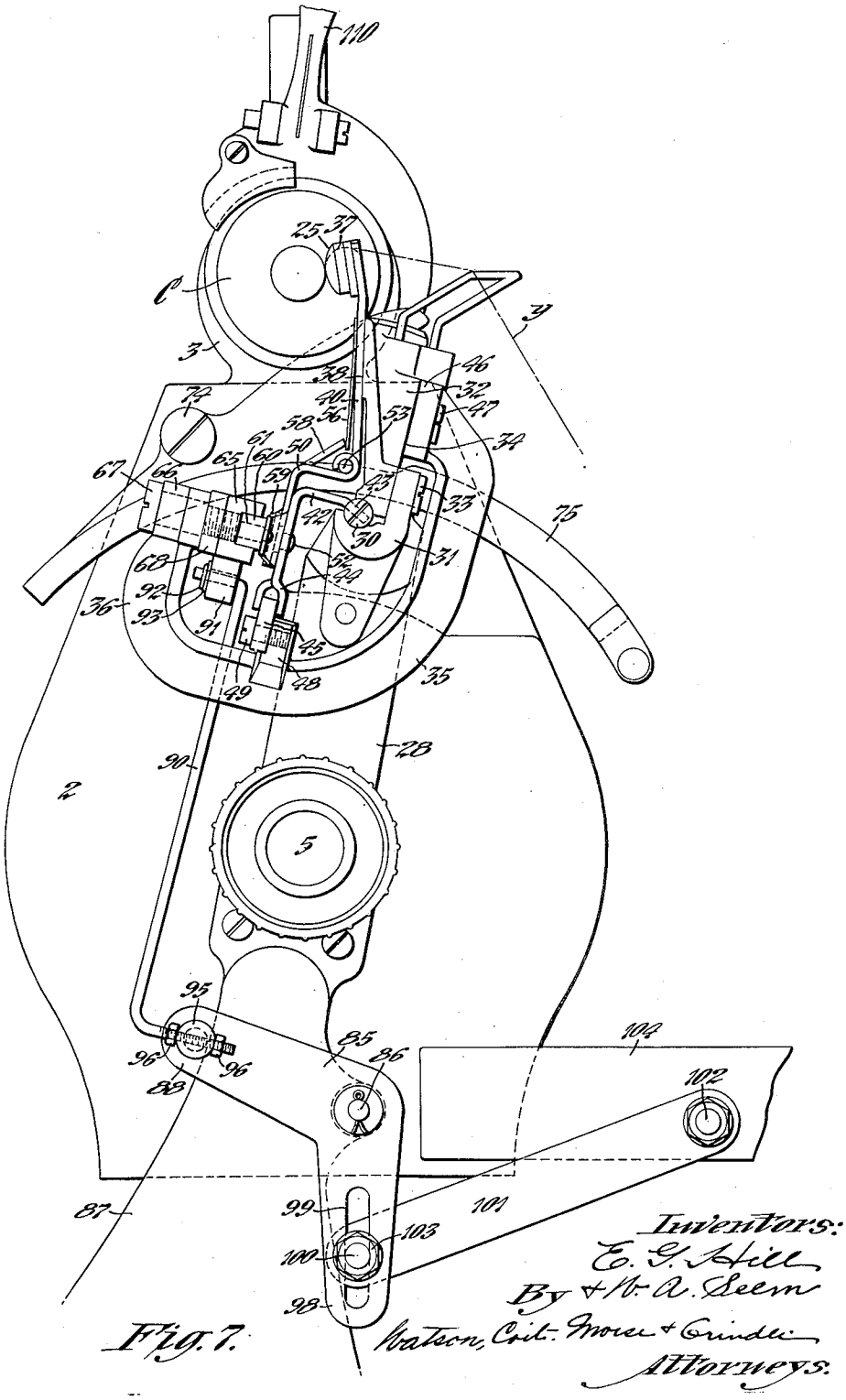


Fig. 7.

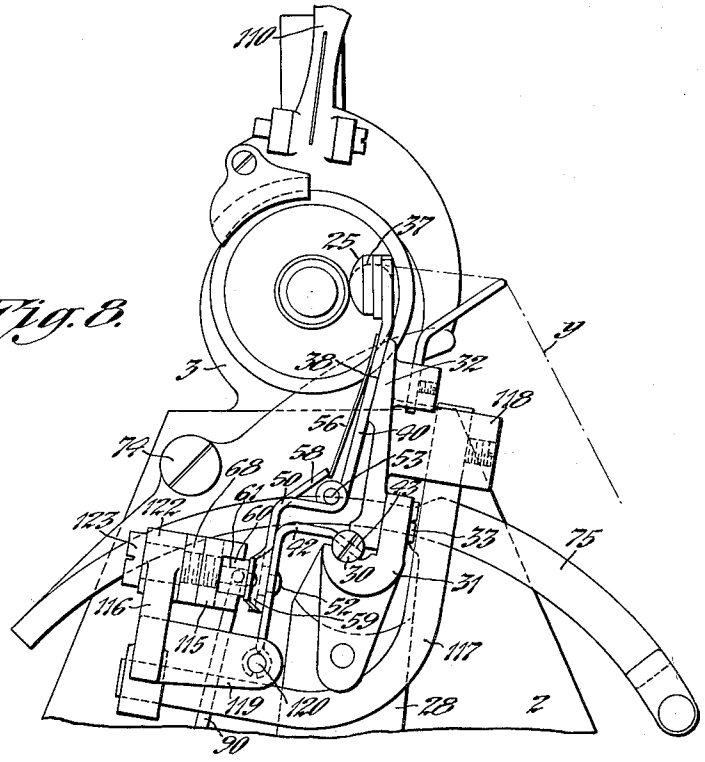
Inventors:
E. G. Hill
By H. A. Seem
Watson, Cole, Grover & Grindle
Attorneys.

April 18, 1939. E. G. HILL ET AL 2,154,847

ATTACHMENT FOR WINDING TAPER ENDED PACKAGES

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Fig. 8.



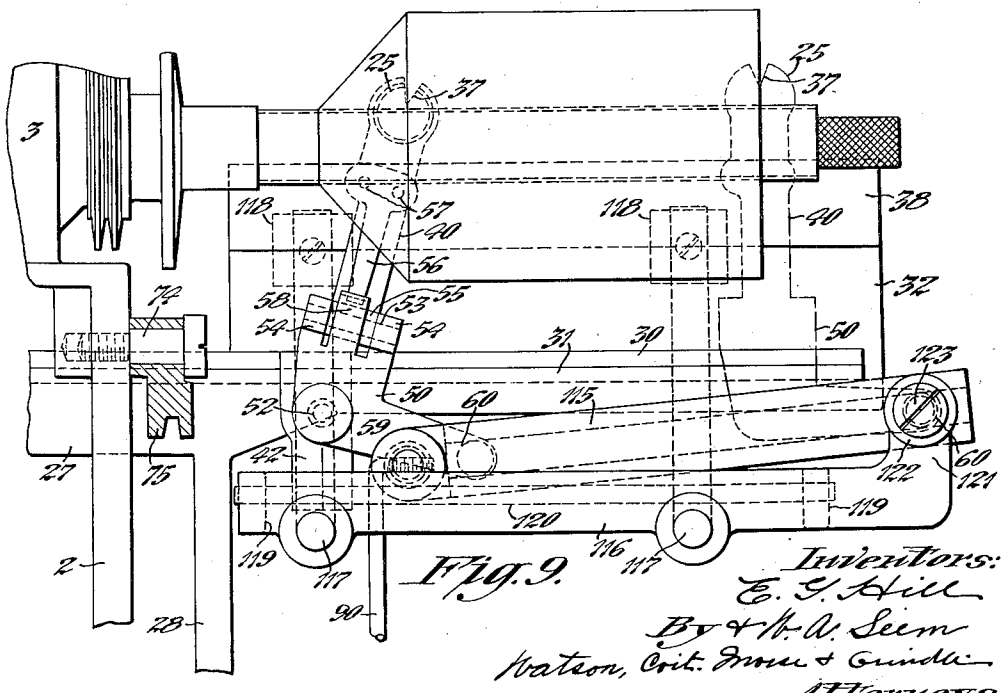


Fig. 9.

Inventors:
E. G. Hill
By H. A. Seem
Watson, Cole, Grindle & Grindle
Attorneys.

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UNITED STATES PATENT OFFICE

2,154,847

ATTACHMENT FOR WINDING TAPER ENDED PACKACES

Earl G. Hill, Forty Fort, and Warren A. Seem, Shavertown, Pa., assignors to Georgetown Silk Company, Wilkes-Barre, Pa., a corporation of New Jersey

Application July 12, 1934, Serial No. 734,824

19 Claims. (Cl. 242—43)

This invention relates to winding machines for winding packages of yarn, thread and other strand material, and particularly to a device or attachment for adapting the machine to form the packages with tapered or conical ends.

One object of the invention is to provide a device or attachment of the type indicated which may be applied to winding machines of standard design without material alteration in the construction or arrangement thereof.

Another object of the invention is to provide a device or attachment of the type indicated having means for progressively shortening the traverse of the thread-guide throughout the winding of the package to cause one or both ends of the layers of winding to be stepped back to shape the mass with a tapered or conical end or ends.

Another object of the invention is to provide a device or attachment of the type indicated having means for displacing the traversing thread-guide inwardly from its extremes of traverse throughout the continuous reciprocatory motion of the guide.

Another object of the invention is to provide a device or attachment of the type indicated having a thread-guide pivoted to rock on the traverse-bar or other element by which it is reciprocated and means for rocking said guide inwardly as it approaches the end of its traverse.

Further objects of the invention are set forth in the following specification which describes a preferred form of construction of the winding device or attachment and certain modifications therein as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a side elevation of a winding machine of well known type illustrating the present improved device or attachment as applied to use therewith;

Fig. 2 is an enlarged end view of the main portion of the machine shown in Fig. 1 with the parts illustrated in position at the start of the winding;

Fig. 3 is a similar end view of a portion of the machine showing the thread-guide control mechanism with the parts in position at a later stage in the winding;

Fig. 4 is a rearward view of the thread-guide control mechanism looking in the direction indicated by the arrow in Fig. 2 with the parts illustrated in position at the start of the winding;

Fig. 5 is a similar rearward view looking in the direction indicated by the arrow in Fig. 3 and illustrating the parts in position at a later stage in the winding;

Fig. 6 is a detailed view of the thread-guide control means or trackway;

Fig. 7 is an enlarged view, similar to Fig. 2, illustrating a modified form of the means for operating the control device for the thread-guide;

Fig. 8 is an end view of the machine corresponding to Fig. 7 and illustrating a modified arrangement of the control means to adapt the device to form the package with only one of its ends tapered; and

Fig. 9 is a rearward view of the control means for this modified form of construction.

For convenience of description, the wound mass, whether of conical or cylindrical form, is hereinafter referred to as a "package"; the material being wound into the package, whatever its nature, is designated "yarn"; and the support or carrier for the package called a "tube." It is to be understood that these terms are to be interpreted severally in their generic sense as indicating any type of package, all kinds of strand material and any preferred shape of core or carrier on which the material is wound.

In the present drawings the invention is shown as applied to use with a standard type of winding machine known and sold under the trademark "Universal". It is to be understood, however, that the present device or attachment may be applied to use with other types of winding machines within the scope and purview of the present invention.

Referring to Fig. 1, the basic winding machine comprises a main frame 2 of box-like construction provided with opposite bearings 3 at the top which serve as the journals for a horizontal shaft 4, usually termed the "winding-spindle". Arranged below and parallel with the winding-spindle 4 is a cam-shaft 5 journalled in bearings 6 at the opposite sides of the frame 2. The spindle 4 constitutes the drive-shaft of the machine, being driven from a belt-pulley 8 adapted to be clutched to the shaft by means of a member 9 fast thereon. The clutch-member 9 carries a belt-pulley 10 which is connected by a belt 11 to a similar pulley 12 located therebelow. The pulley 12 is fast with and drives a shaft 13 journaled in a bearing 14 in a gear-casing 15 at the side of the main frame 2. At its inner end the shaft 13 carries a pinion 16 meshing with a gear 17 fast on the end of the cam-shaft 5.

The cam-shaft 5 carries a cam 20 fast therewith and constructed with a cylindrical rim formed with a helical groove 21 in its periphery.

The groove 21 is engaged by a roller or follower 22 on a slide or crosshead 23 which constitutes the means for reciprocating the thread-guide 25, to be later described. The crosshead 23 is slidable in a grooved guideway in a traverse-frame 26 constituted by a horizontal member 27 supported from legs 28 pivoted on bushings 29 which serve as the journals for the cam-shaft 5.

Connected at one end to the crosshead 23 is a traverse-rod 30 which slides in a suitable groove in the traverse-frame 26, see Fig. 2, with its outer end connected to impart reciprocatory motion to the thread-guide 25. Fastened to an outward extension 31 of the horizontal member 27 of the traverse-frame 26 is a plate or traverse-frame back 32 which is constituted to direct the course of the thread-guide 25 during its reciprocation. The construction and arrangement of the parts of the machine as thus far described are in accordance with the standard type of winding machine previously referred to. The only alteration necessary to the machine to adapt the present device or taper-end attachment for coöperation therewith is a slight change in the form of the guide-plate or traverse-frame back 32 which is fastened to the overhanging part 31 of the frame 26 by means of screws 33. As indicated in Figs. 1 and 2 the substitute traverse-frame back 32 is provided with a pad having a finished face 34 for the attachment of a sickle-shaped bracket 35 to be later described.

In machines of the present type the thread-guide 25 is usually constituted as a disk or "button", so-called, provided with a notch 37 through which the yarn or other strand feeds to the winding. The thread-guide button 25 is fitted to an opening at the top of a bifurcated arm 40 which is arranged to slide along the rearward face of the traverse-frame back 32. In some cases the traverse-frame back may be arranged with its bearing face 38 parallel with the axis of the winding-spindle, when the machine is fitted for winding packages of cylindrical form; while in other instances, the guiding face 38 may be inclined at an angle to the axis of the spindle when it is desired to wind conical packages. As herein illustrated the machine is shown adapted for winding packages of generally conical shape and for this purpose a tapered mandrel is provided on the overhanging extension of the spindle 4 for carrying and rotating a conical paper cop-tube indicated at C in the drawings.

The arm 40 carrying the thread-guide 25 is ordinarly attached directly to the outer end of the traverse-rod 30, but in the present form of construction a different mounting is provided for the thread-guide whereby to adapt it to rock on an axis crossing its line of travel. Referring particularly to Fig. 2, an elbow-shaped arm or mounting 42 is connected to the traverse-bar 30 at 43 with its right-angled portion extending downwardly and terminating in a fork or bifurcated portion 44. The sides of the fork 44 straddle a fixed guide-rail 45 constructed in the form of a relatively narrow bar of rectangular cross-section carried on the bracket 35, previously referred to.

The bracket 35 has a portion 46 fastened to the finished face 34 of the traverse-frame back 32 by means of screws 47, see Figs. 1 and 2. The depending sickle-shaped extension of the bracket 35 is of ribbed construction or T-shape in cross-section, reaching down beneath the overhanging portion of the traverse-frame 26 and then curving upwardly at the rear in an arm 36. Projecting across the top of the lower curved portion of the bracket 35 is an arm 48 to which the horizontal guide-rail 45 is fastened by screws 49.

The thread-guide arm which mounts the thread-guide 25 is of articulated construction comprising a main upright portion 40 hingedly joined to a lower elbow-shaped element 50. The element 50, in turn, is swiveled to the member 42, previously described as being connected to reciprocate with the traverse-bar 30, see Figs. 3, 4, 5 and 6. The element 50 is pivoted on a headed and shouldered stud 52 riveted through the depending portion of the member 42. The guide-arm 40 is hinged to the element 50 by means of a pivot-pin 53 held in curled over ears 54 on the member 50. As shown most clearly in Fig. 5, the lower portion of the arm 40 is curled around to form a bearing 55 for receiving the pivot-pin 53 extending between the ears 54 on the element 50. A relatively thin, flat spring 56 is riveted to the upper part of the arm 40 at 57 to adapt its lower end to bear against the end of a finger 58 bent back from the opening between the ears 54 on the member 50. The spring 57 tends to maintain the arm 40 bearing against the finished face 38 on the traverse-frame back 32.

The thread-guide supporting element 50 is formed with an arm 59 extending laterally to the right as viewed in Figs. 4 and 5 and carrying a bowl or roller 60 journaled on a pin 61 secured in its outer end. The bowl or roller 60 is adapted to travel in the slot or guideway 64 of a track or guiding member 65 to cause the thread-guide to rock on the transverse pivot-stud 52 carried by the reciprocating member 42.

The track 65 is pivoted to a boss or hub 66 on the extremity of the rearward upstanding arm 36 of the bracket 35. A stud 67 screwed into a boss 68 on the back of the track 65 has its enlarged body portion journaled in the hub 66 on the bracket 35 whereby the track is mounted to rock in a substantially vertical plane. It will be observed by reference to Fig. 5 of the drawings that as the thread-guide mounting 42 is reciprocated with the traverse-bar 30 the element 50 to which the thread-guide arm 40 is hinged will be caused to rock about the pivot 52 as the roll 60 on its arm 59 rides up and down the incline of the track 65. The track 65 is located in horizontal position at the start of the winding as illustrated in Fig. 4 of the drawings whereby to cause the thread-guide to be reciprocated without any rocking or oscillating motion of the member 50 on the stud 52. It is noted, however, that the hinged connection of the arm 40 with the member 50 permits a rocking motion of the arm on the pivot 53 to adapt the thread-guide 25 to follow the taper of the cone-tube C. As the winding progresses, the track 65 is rocked or canted in the manner indicated in Fig. 5 to cause the guide-arm 40 to be rocked about the axis of the pivot-stud 52 to swing the guide 25 inwardly at each end of the traverse. In this way the traverse of the guide is progressively shortened to dispose the yarn in layers of gradually decreasing extent which effects the shaping of the package with a tapered or conical end or ends in the manner as later more fully explained.

The track or guide member 65 is swung or rocked to incline it to the normal path of reciprocation of the thread-guide 25 by and through the movement of the guide outwardly away from the axis of the winding-spindle. As the thread-guide 25 recedes from the winding-spindle the traverse-frame 26 is swung back on its pivot bear-

ings 29 concurrently with the increase in diameter of the winding. Conveniently, the means for rocking the track 65 may be operated from the movement of the traverse-frame 26. Such means may be of different forms, two embodiments thereof being shown in the present drawings.

As shown most clearly in Figs. 2, 3, 5 and 6 of the drawings, the guide member or track 65 is formed at one end with a rearwardly extending arm 69 carrying a spherically-headed stud 70 adapted to slide in an inclined guideway or groove 71 formed in a cam member 72 supported from the main frame 2 of the machine. The cam member 72 is adjustably mounted on an arm or bracket 73 fixedly attached to the side of the frame 2. The upper end of the arm 73 is secured to the frame 2 by means of a stud 74 which serves a further purpose in pivotally mounting the traverse-frame dog sector 75 constituting a part of the standard machine. The stud 74 has a flange 76 against which the upper end of the arm 73 is bound by a nut 77 screwed onto the end of the reduced portion of the stud. The lower end of the bracket 73 is secured to the frame 2 by means of a bolt 78 which also serves as the holding means for a member 79 constituting a stop acting to limit the swinging movement of the traverse-frame 26. Preferably, the bracket 73 is formed at the ends with slots for the stud 74 and bolt 78 to provide for its vertical adjustment in initially setting the cam member 72 at the proper height.

The cam member 72 is of U-shape or bifurcated form as viewed from the rear, see Fig. 5, with one of its legs provided with a hub 80 through which projects a stud 81 screwed into the arm 73. A nut 82 on the outer threaded end of the stud 81 secures the cam member 72 in place while adapting it to be adjusted angularly about the stud 81 to regulate the inclination of the cam-groove 71. A finger or pointer 83 on the upper end of the cam member 72 has a mark adapted to register with numbered graduations on an arcuate plate 84 forming part of the arm 73. The angular position of the cam member 72 may be altered to cause it to effect a greater or less extent of inclination of the track 65 in accordance with the amount of oscillating motion to be imparted to the thread-guide 25 to obtain the desired formation of the package; that is with a greater or lesser degree of taper at its end or ends.

Fig. 7 of the drawings illustrates a modified form of construction of the means for canting or tilting the guide member or track 65. In this latter form of construction a bell-crank lever 85 is pivoted on a stud or pin 86 carried by the lower weighted arm 87 of the traverse-frame 26. One arm 88 of the bell-crank 85 is connected by a link 90 to an ear 91 on the underside of the track 65; the link being conveniently formed of wire with its end bent at right-angles and inserted through a hole in the ear 91. A cotter-pin 92 and washer 93 at the end of the angular part of the link 90 hold the latter in place and the lower end of the link is also bent at right-angles and inserted through a hole in a stud 95 swiveled to the end of the arm 88 of the bell-crank 85 with nuts 96 for securing it in place.

The opposite arm 98 of the bell-crank 85 is slotted at 99 to receive a stud 100 at the end of a link 101 which is attached at its opposite end to a stud 102 fast in some rigid part of the machine, for example, the bracket 104 which supports the tension-device 105, see Fig. 1 of the drawings. It is to be noted that the link 101 is pivotally connected to the arm 98 of the bell-crank 85 by the stud 100 and, likewise, the opposite end of the link 101 is pivoted on the fixed stud 102 to provide freedom of movement between these parts as the traverse frame 26 swings on its pivot 5. The connection of the link 101 with the arm 98 may be adjusted by loosening the nut 103 and sliding the stud 100 in the slot 99, whereby to regulate the extent of motion communicated to the bell-crank lever 85 under the movement of the traverse-frame 26 during the growth in the package; it being noted that as the thread-guide 25 swings away from the axis of the winding-spindle the movement of the traverse-frame will rock the bell-crank lever 85 to cause the link 90 to tilt the rearward end of the track 65 downwardly. The method of operation of the complete machine with the attachment constructed as first described is as next explained.

Referring to Figs. 1 and 2 of the drawings, this latter view shows the cam 72 adjusted to the furthest extreme of its angularity to effect a maximum shortening of the layers of yarn during the winding of the package, it being noted that the index pointer 83 is set at the last graduation mark "4". At the start of the winding the transverse-frame 26 is adjusted to the position shown in Fig. 2 with the thread-guide 25 resting against the surface of the cop-tube C on which the winding is to be performed; the tube having been placed on the winding-mandrel and secured thereto by suitable means as usually provided. With the traverse-frame 26 in this position the spherical-headed stud 70 is positioned adjacent the upper end of the groove 71 in the cam 72, whereof the guiding track 65 will assume a horizontal position as illustrated in Fig. 4 of the drawings.

The yarn or other material is supplied from a suitable source, not herein shown but usually placed below, the strand *y* being led up through the tension-device 105, passed through the notch 37 in the thread-guide 25 and its end secured to the cop-tube C. The machine is started to operate by rocking the starting lever 110, shown in Fig. 1, and as the winding-spindle 4 is rotated the yarn will be wound onto the cop-tube C while being traversed back and forth longitudinally thereof by the guide 25 which is reciprocated from the cam 20.

As the winding proceeds the increase in diameter of the package causes the thread-guide 25 to recede from the axis of the winding-spindle with the traverse-frame 26 swinging on its bearings 29. During the continuous reciprocation of the traverse-bar 30, actuated from the cam 20, the member 42 slides along the rail 45 and the thread-guide mounting comprising the arm 40 and pivoted member 50 are reciprocated therewith with the roller 60 sliding in the groove or guideway 64 of the track 65. With the track 65 in horizontal position at the start of the winding the roll 60 travels in a course parallel with the path of the traverse-rod 30 and consequently no oscillating movement will be imparted to the guide mounting or member 50 carrying the arm 40. Therefore, the thread-guide 25 will be traversed to its maximum extent as determined by the throw of the cam 20; or throughout substantially the whole length of the cone-tube C or other support on which the winding is performed.

However, as the yarn is built up on the cop-tube C and the guide 25 recedes from the axis thereof the swinging movement of the traverse-

frame 26 will cause the spherical-headed stud 70 on the arm 69 of the track 65 to slide down the inclination of the groove 71 in the cam 72. Under this action the track 65 is rocked or canted away from the horizontal as indicated in Fig. 5 of the drawings to an extent commensurate with the growth in the winding. The track 65 is thus gradually rocked on its pivot 67 so that as the thread-guide carrying member 50 is reciprocated the inclination of the track will cause the roller 60 to continuously rock the member 50 on its pivot 52. Under this action the thread-guide arm 40 is rocked inwardly away from its extremes of traverse at each end of the throw with a progressively increasing extent of motion, thereby causing a gradual shortening of the layers of winding throughout the building of the package. This progressive shortening of the traverse of the thread-guide 25 results in building the package with gradually shortened courses to form it with tapered or conical ends as indicated in Fig. 5 of the drawings.

In the embodiment of the invention as illustrated in Fig. 7, the operation of the machine is substantially the same, that is as regards the tilting or canting of the track 65 during the reciprocation of the thread-guide 25 to effect a progressive shortening of its traverse. In this case, however, the displacement of the track 65 is effected by the action of the bell-crank lever 85 which is rocked by and with the movement of the traverse-frame 26. As the traverse-frame 26 rocks on its pivot its lower weighted arm 87 swings to the left, as viewed in Fig. 7, carrying the bell-crank 85 bodily with it. As the bell-crank 85 is moved in this manner the link 101 connected thereto causes it to be rocked in a contraclockwise direction to draw the link 90 downwardly to tilt the track 65 in the same manner as previously explained in connection with the first described construction.

Fig. 6 illustrates an alternative arrangement of the track 65 which may be adopted when it is desired to increase the length of the package to be wound. With the track initially set with its rearward or inner end canted upwardly the thread-guide arm 40 will be rocked outwardly at each end of its traverse and thereby the extent of traverse of the guide 25 will be increased over the normal throw of the cam 20.

In some instances it may be desired to wind a package with only one of its ends tapered and for this purpose the present device or attachment may be organized as shown in Figs. 8 and 9 of the present drawings. In this embodiment of the invention the thread-guide and its connections are of the same form and arrangement as previously described but the traverse-control track 115 is mounted in a different manner. In place of the bracket 35, previously described as the mounting for the track 65, the present form of track 115 is swiveled on an arm or bracket 116 supported at the ends of two elbow-shaped arms 117 held in bosses 118 on the traverse-frame back 32. The bracket 116 has a pair of arms 119 for supporting a cylindrical rod 120 which takes the place of the rail 45 shown in Fig. 2, the reciprocating member 42 having its lower end shaped to straddle the sides of the rod to slide thereon. At one end of the bracket 116 is an upstanding finger or projection 121 formed with a bearing hub 122, through which projects a shouldered stud 123 screwed into a boss on the back of the track 115. With this arrangement the pivot for the track 115 is located at the outer end thereof while its inner end is connected to the link 90 shown in Fig. 7 of the drawings as connected to the bell-crank lever 85. It will thus be apparent that the rocking movement of the bell-crank lever will cause the track 115 to be tilted downwardly at its inner end during the growth in the winding while its outer end remains fixed.

It is to be further noted that the pivot for the track 115 is located at a point corresponding with the outer extreme of movement of the roller 60 on the arm 59 of the reciprocating member 50 which mounts the thread-guide arm 40. Consequently, as the track 115 is canted downwardly at its inner end it acts on the thread-guide to shorten its stroke only at the rearward end of the traverse, that is, as it moves toward the frame of the machine. When the thread-guide 25 moves toward the outer end of its traverse the roller 60 will ride up the incline of its track to restore the guide to upright position as indicated by the dash lines in Fig. 9, this terminal point of the traverse remaining constant throughout the whole winding. In other words, as the package increases in diameter the traverse of the thread-guide 25 will be shortened at one end only as the roller 60 rides down the incline of the track 115 to rock the arm 40 in the manner indicated in Fig. 9. The package produced by this method of winding is sometimes wound on a wooden tube or holder with a head or flange abutting the flat end of the yarn mass. This character of spool or package is unwound by drawing the yarn off over its tapered end, thus avoiding any tendency of the strand to snarl or entangle and maintaining a more uniform tension of delivery.

It will be observed from the foregoing that the present invention provides a particularly simple yet efficient mechanism which may be employed as an attachment for winding machines to control the formation of the packages wound thereon. The device may be arranged to wind a package with practically any degree of taper at its opposite ends or may be constituted to form the package with one end flat and the other tapered, all within the purview of the invention.

Other modifications may also be made in the construction and arrangement of the parts of the device without departing from the spirit or scope of the invention. Therefore, without limiting ourselves in this respect, we claim:

1. In combination, means for rotating a package, a guide for traversing yarn on the package, a reciprocating element, an arm rockably mounted on said element and carrying the guide, a track mounted on a pivot, means on the guide-supporting arm engaging the track, means for supporting the thread-guide to adapt it to move bodily away from the axis of the package during the growth in the winding, stationary means held in fixed relation to said guide-supporting means, and means engaging said stationary means and actuated therefrom to tilt the track on its pivot to cause it to rock the guide-carrying arm to progressively shorten the traverse of the yarn throughout the winding.

2. In combination, means for rotating a package, a swinging traverse-frame, an element reciprocable on said traverse-frame, an arm pivoted to said reciprocating element to swing on an axis crossing the path of movement of the reciprocating element, a thread-guide carried by said arm, a track rockably supported on the traverse-frame, means on the arm travelable on the track during the reciprocation of the ele-

ment, a stationary cam held fixed with respect to the traverse-frame, and means carried by the track and engaging the cam to rock the track by the movement of the traverse-frame as the guide recedes from the axis of the package during the growth in diameter thereof.

3. In a winding machine, the combination of a winding-spindle for rotating a package, a traverse-frame rockable toward and away from said winding-spindle, an element reciprocable on said traverse-frame, an arm pivoted to said reciprocating element, a guide for the yarn carried by said arm, a track rockably mounted on the traverse-frame, means on the guide-supporting arm travelable on the track, a normally stationary cam adjustable about a fixed axis, and means carried by the track and engaging the cam during the movement of the traverse-frame as the guide recedes from the winding-spindle to cant the track to cause the guide-carrying arm to be rocked about its pivot with an increasing extent of motion throughout the building of the package.

4. In combination, means for rotating a package, a guide for traversing yarn on the package, a reciprocating element mounted to move away from the axis of the package during the growth in the winding, an arm pivoted to said element and carrying the guide, a rockable track movable with the guide during the movement of the latter away from the axis of the package, means on the guide-carrying arm engaging the track to rock the arm, a stationary guideway, and means carried by the track and slidable on the guideway to rock the track as it moves with the thread-guide during the growth in the winding to cause the track to rock the guide-carrying arm to progressively shorten the extent of the traverse of the guide throughout the winding of the package.

5. In combination, a winding-spindle, a thread-guide reciprocable longitudinally of the winding-spindle, means to reciprocate the guide, means to mount the guide to adapt it to rock inwardly from the ends of its normal traverse, means for supporting the guide to adapt it to move bodily away from the winding-spindle, a track rockably mounted on the guide-supporting means, means on the guide engaging the track, an inclined guideway held stationary with respect to the guide-supporting means, and a follower carried by the track and slidable on the stationary guideway to rock the track to cause it to shift the thread-guide inwardly from the ends of its normal traverse to gradually shorten the layers of winding to form the package with a tapered end.

6. In combination, a rotatable winding-spindle, a thread-guide, means for reciprocating the thread-guide longitudinally of the spindle, means for mounting the thread-guide to adapt it to be shifted inwardly from its extremes of normal traverse, a support for the guide movable to adapt it to recede from the axis of the winding-spindle during the growth in the winding, a track pivoted to said support, an arm connected with the guide, a follower on said arm slidable on the track to rock the arm to shorten the traverse of the guide, a stationary inclined guideway fixed with respect to the movable support for the guide, and means carried by the track and engaging the guideway to rock the track during its movement with respect thereto to vary the traverse of the thread-guide during the winding of a package on the winding-spindle.

7. In combination, a rotatable winding-spindle, a movable traverse-frame, a member reciprocable on said traverse-frame, means to reciprocate said member with a constant length of throw, an arm pivoted to said reciprocating member, a thread-guide carried by said arm, a track pivoted to the traverse-frame, means on the guide-carrying arm slidable on the track, a stationary member fixed with respect to the movable traverse-frame and having an inclined guideway, and means carried by the track and slidable on the guideway to rock the track during the movement of the traverse-frame as the guide recedes from the winding-spindle with the growth in the winding.

8. In a winding machine, the combination of a frame, a winding-spindle journaled in said frame and adapted to rotate a package, a traverse-frame pivoted on the main frame to swing toward and away from the winding-spindle, a member reciprocable on the traverse-frame, means for reciprocating said member, an arm pivoted to said reciprocating member, a thread-guide carried by said arm, a track rockably mounted on the traverse-frame, means on the guide-carrying arm slidable on the track during the movement of the reciprocating member, an inclined guideway held stationary on the main frame, and means carried by the track and engaging the guideway to rock the track during the movement of the traverse-frame as the guide recedes from the winding-spindle.

9. In combination in a winding machine, a frame, a winding-spindle journaled in said frame, a traverse-frame pivoted to the main frame to adapt it to swing with respect to the winding-spindle, a reciprocating member carried by the traverse-frame, a thread-guide arm pivoted to said member to adapt it to rock in the direction of its reciprocation, a track pivoted to the traverse-frame, means on the guide-arm travelable on the track to rock the arm during its reciprocating motion, a member fixed to the main frame and having an inclined guideway held stationary with respect to the movable traverse-frame, and a follower on the track slidable on the guideway to rock the track during the movement of the traverse-frame as the guide-arm recedes from the axis of the winding-spindle whereby to cause said guide-arm to be oscillated to progressively shorten the extent of traverse of the yarn guided thereby.

10. In combination, a rotatable winding-spindle, a traverse-frame pivoted to swing away from the winding spindle, a member reciprocable on said traverse-frame, means to reciprocate said member with a constant length of throw, a thread- guide pivoted to said reciprocable member, a track pivoted to the traverse-frame, means on the thread-guide slidable on the track, a member having an inclined guiding slot, and means engaging said slot to tilt the track on its pivot by and with the movement of the traverse-frame whereby to cause the track to rock the thread-guide to vary its extent of traverse during the winding of the package.

11. In a winding machine, the combination of a frame, a winding-spindle journaled in said frame, a second frame pivoted to the main frame to adapt it to swing away from the winding-spindle, a thread-guide reciprocable on the second frame and adapted to oscillate substantially in the direction of its reciprocation, a track pivoted to the second frame, a follower on the thread-guide slidable on the track, an element fixed to the main frame, and means operatively connected to the track and slidable on said fixed element

as the second frame moves away from the winding-spindle with the growth in the winding to shift the position of the track to cause it to oscillate the thread-guide to vary the length of traverse of the yarn wound on the winding spindle.

12. In combination, a rotating winding-spindle for suporting a yarn package, a reciprocating element mounted to move away from the axis of the package during the growth in the winding, a thread-guide pivoted to said reciprocating element to adapt it to oscillate substantially in the direction of its reciprocation, a pivoted track movable with the guide during the movement of the latter away from the axis of the package, means on the guide travelable on the track, a stationary member, and means operatively connected to the track and slidable on the stationary member to tilt the track as the thread-guide moves away from the axis of the package whereby to cause the track to oscillate the thread-guide to progressively vary the extent of traverse of the yarn during the winding of the package.

13. In combination, a main frame, a winding-spindle journaled in said frame, a traverse-frame pivoted on the main frame to adapt it to swing with respect to the winding-spindle, a member reciprocable on the traverse-frame, a thread-guide pivoted to said member to adapt it to rock substantially in the direction of its reciprocation, a track pivotally mounted on the traverse-frame, a follower on the guide engaging the track, stationary means on the main frame, and means operatively connected to the track and slidable on the stationary means to alter the position of the track as the traverse-frame swings away from the winding-spindle whereby to cause the track to oscillate the thread-guide to vary the extent of its traverse during the winding of a package on the winding-spindle.

14. In combination, a main frame, a winding-spindle journaled in said frame, a traverse-frame pivoted on the main frame to adapt it to swing away from the winding-spindle, a member reciprocable on the traverse-frame, means to reciprocate said member, a thread-guide mounted on said member to adapt it to be oscillated substantially in the direction of its reciprocation, a track pivoted on the traverse-frame, a follower connected to the thread-guide and engaging the track, and means operative during movement of the traverse-frame away from the winding-spindle to tilt the track to cause it to oscillate the thread-guide to vary the extent of its traverse during the winding of a package on the winding-spindle.

15. In combination, a main frame, a winding-spindle journaled in said frame, a traverse-frame pivoted on the main frame to adapt it to swing away from the winding-spindle, a thread guide reciprocable on the traverse-frame and arranged to oscillate substantially in the direction of its reciprocation, a track pivoted on the traverse-frame, a follower connected to the thread guide and engaging the track, and means operative during movement of the traverse-frame away from the winding-spindle to tilt the track to cause it to oscillate the guide to vary the extent of its traverse, said means including a member connected to the track, and a part rigid with said main frame.

16. In a cop winding machine, the combination with a positively rotated cop holder, a swinging frame, a thread guide mounted on said frame to recede from said holder as the cop builds up, means for traversing said thread guide on said frame, and means for progressively decreasing the effective stroke of said thread guide as the cop increases in diameter, said means comprising a cam member and a member cooperating therewith, one of said members being carried by said swinging frame and the other member being fixed relative to said frame, and means for adjusting the position of said fixed member.

17. In combination, a main frame, a winding-spindle journalled in said frame, a traverse-frame pivoted on the main frame to adapt it to swing away from the winding spindle, a thread guide reciprocable on the traverse frame and arranged to oscillate substantially in the direction of its reciprocation, a track pivoted on the traverse frame, a follower connected to the thread guide and engaging the track, cam means operative during movement of the traverse frame away from the winding spindle for tilting the track to cause it to oscillate the guide to vary the extent of its traverse, said cam means including a member fixed to the main frame of the machine, and a member carried by the swinging frame and operatively connected to the track.

18. In a cop winding machine, the combination with a positively rotated cop holder, a swinging frame, a traverse bar mounted on said frame, a thread guiding member pivotally supported by said traverse bar, whereby said thread guiding member may recede from said holder as the cop builds up, means operated by the receding movement of said thread guiding member for automatically shifting the angular position of said member to progressively shorten its effective stroke at each end of the stroke as the cop increases in diameter.

19. In a cop winding machine, the combination with a positively rotated cop holder, a swinging frame, a traverse bar mounted on said frame, a thread guiding member pivotally supported by said traverse bar, whereby said thread guiding member may recede from said holder as the cop builds up, and means operated by the receding movement of said thread guiding member for automatically shifting the angular position of said member to progressively shorten its effective stroke at one end only of the stroke as the cop increases in diameter.

EARL G. HILL.
WARREN A. SEEM.