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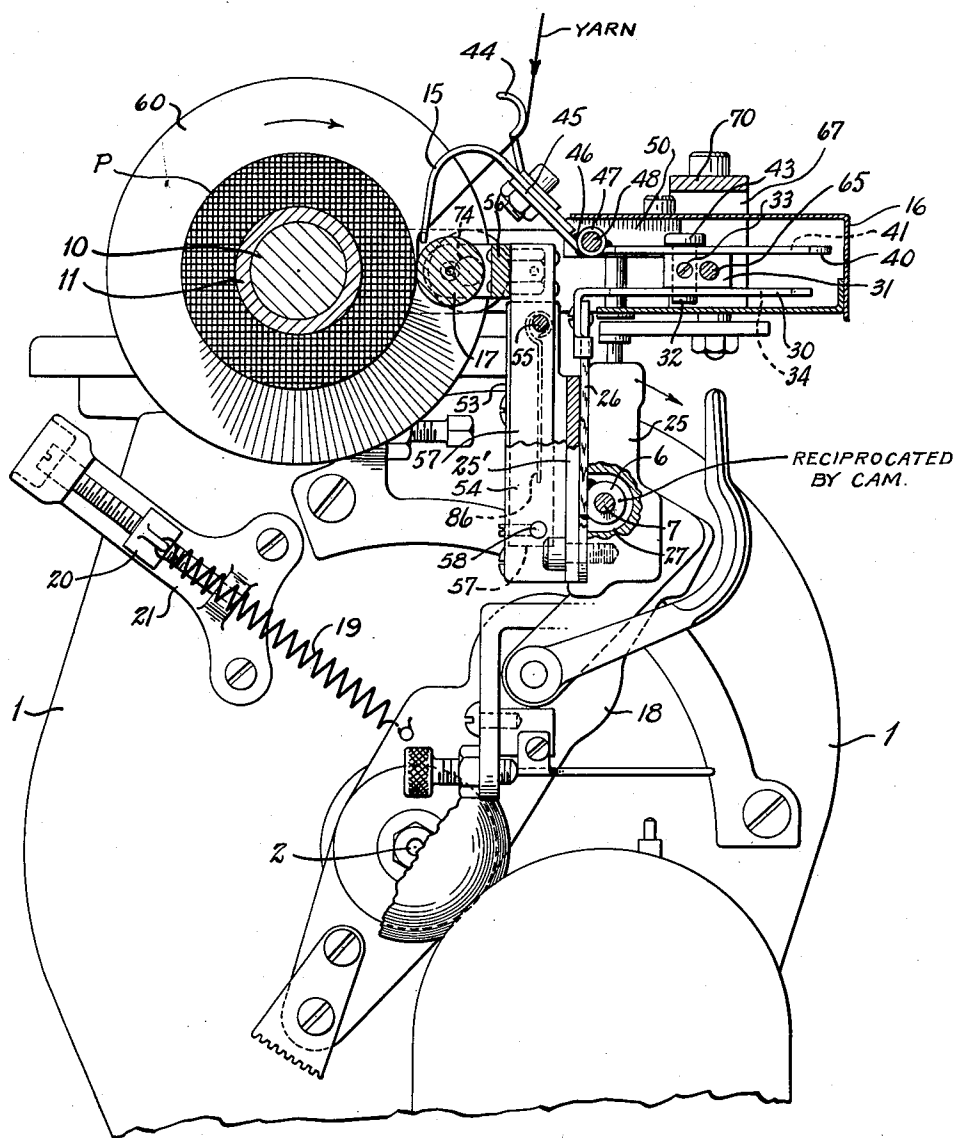


Fig. 1

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WINDING MACHINE

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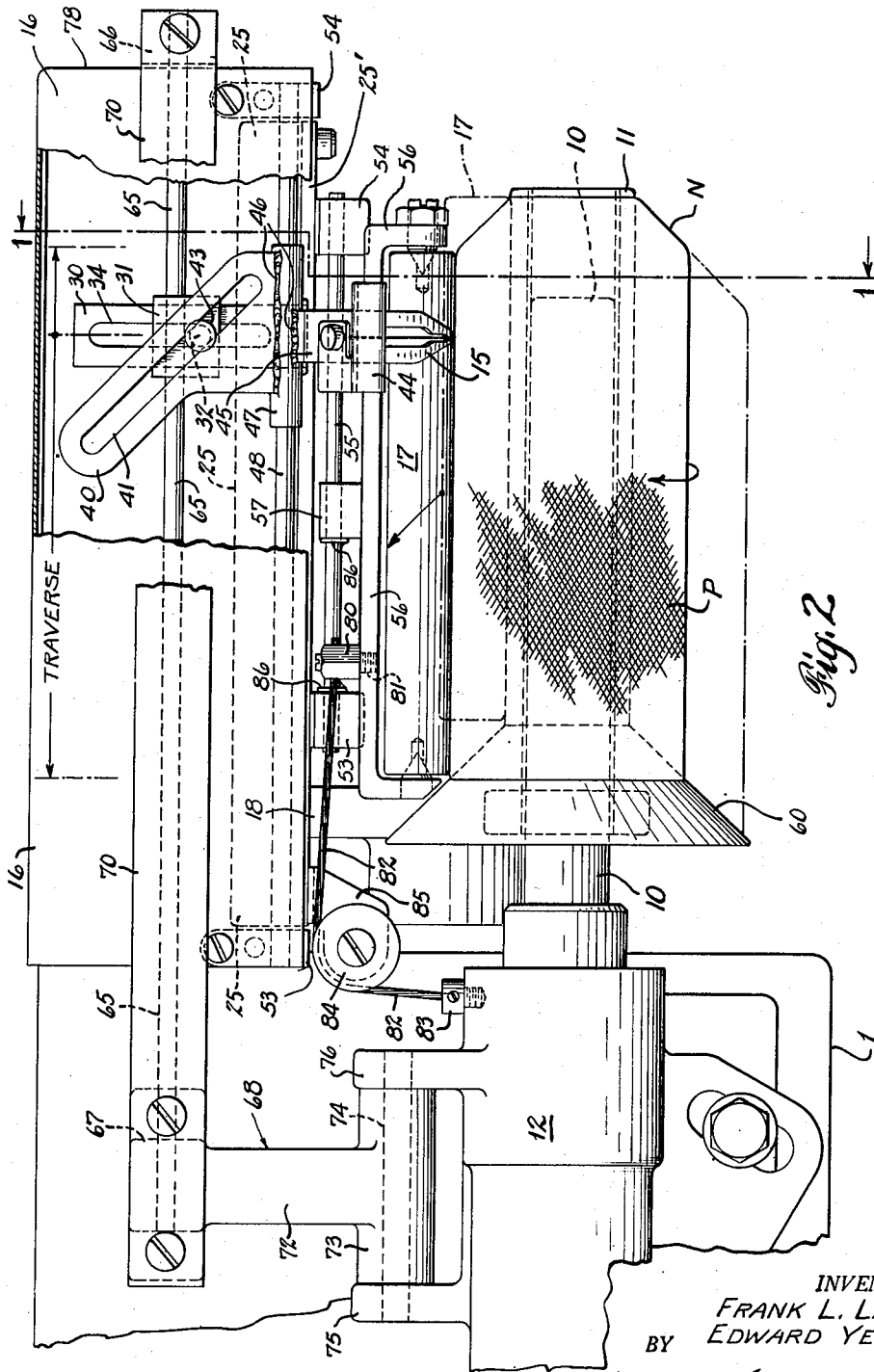


Fig. 2

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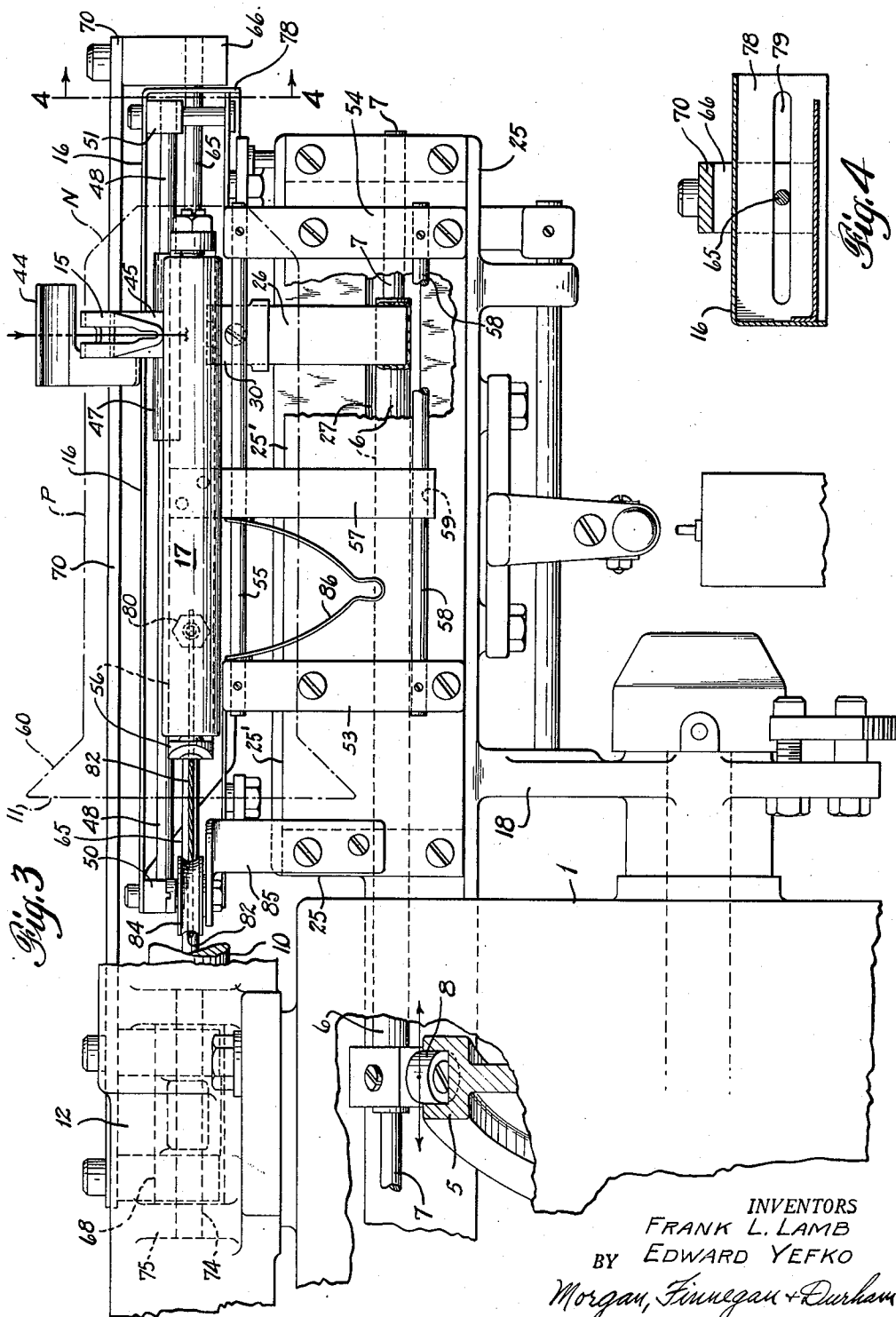
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4 Sheets-Sheet 4

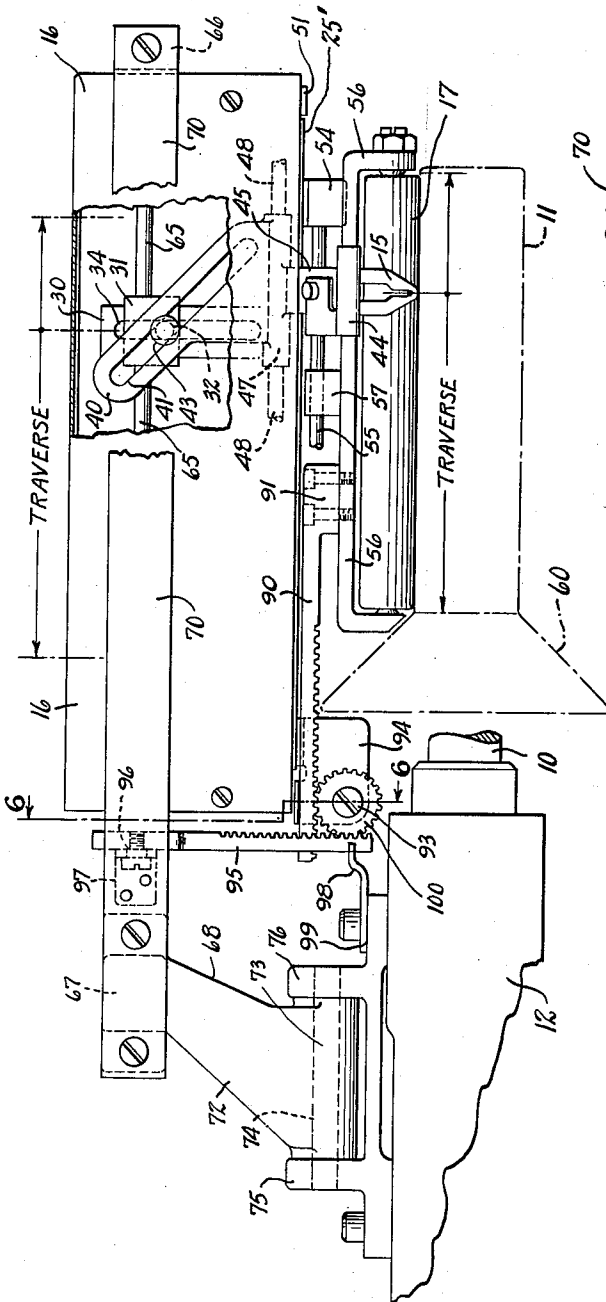


Fig. 5

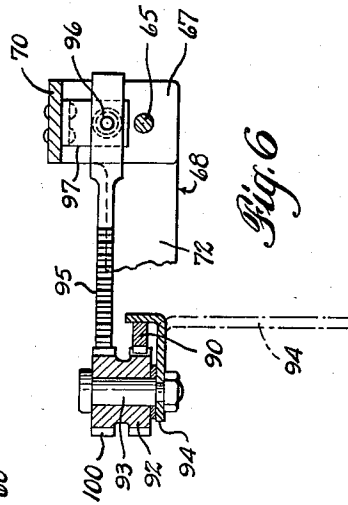


Fig. 6

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WINDING MACHINE

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16 Claims. (Cl. 242—43)

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The invention relates to winding machines and more especially to new and improved mechanisms for controlling the traverse in winding a package on a spool having a tapered base.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Fig. 1 is a vertical end section with parts broken away of a winding mechanism embodying the invention taken on line 1—1 of Fig. 2;

Fig. 2 is a top plan view of said mechanism with parts broken away;

Fig. 3 is a side elevation of said mechanism viewed from the left in Fig. 1 with parts broken away;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a partially diagrammatic reduced plan view, similar to Fig. 2, showing a modification of the pressure roll moving means; and

Fig. 6 is a vertical section on line 6—6 of Fig. 5.

The invention provides an improved form of mechanism for winding a package of yarn, thread or the like on the so-called "king spool," that is, a spool having an enlarged conical or tapered base. The ends of packages formed on such spools are required to conform to the contour of the spool base, each successive yarn layer being spaced axially rearwardly on the spool, so that the bottom of the package is conically hollow and the top or front end is conically pointed. To form such package the length of the yarn traverse is constant throughout winding of the package but is continuously shifted axially rearwardly as the diameter of the package builds up, the rate of such shifting being equal to the slope of an element of the inclined base of the spool.

The winding of king spools has been accomplished in different ways by various prior mechanisms. In one such machine the shifting of the traverse is accomplished by guide means held in contact with the tapered spool base as the package builds up; in others the spool or its supporting spindle or a part thereof is moved

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axially while the position of the yarn traverse remains fixed. In the latter forms, axial movement of the spool or spindle may be effected by cam means connected with the drive of the spindle or by the pull of the yarn or by various other means.

The present invention avoids the complexity and disadvantages of previous systems and provides a new and simplified construction for shifting the traverse as the package is built up. The control means of the invention is free from any contact with the spool or its associated parts; the spool and its supporting spindle and drive have only a simple rotary movement, and the pull of the yarn is not utilized or depended upon.

One object of the invention is to provide means for shifting the yarn traverse on a winding king spool package, said means being wholly carried by the swinging frame and acting directly on the reciprocating yarn guide adjacent the point where the yarn is laid on the package. By suitable guide means so carried and associated with the swinging frame and traverse mechanism, the traverse can be shifted to follow the spool base exactly without any contact between said means and the spool, its support or drive.

Another object of the invention is to provide an improved construction and mounting for the pressure roll and to impart a novel movement and function thereto. In such mechanisms it is common to provide a roller called the pressure roll which bears against the surface of the package at all times and imparts movement due to the increasing package diameter to swing the traverse frame away from the spool axis. Such roll also imparts a smoothing or ironing effect to the package. According to the present invention, an axial movement is imparted to said roll so that it will automatically move toward the spool base as the package builds up. Thus the roll can be made the exact length of the traverse and will not overlap either end of the package but will maintain contact with the entire length thereof at all times.

In accordance with the illustrative embodiment of the present invention, means are provided for positively rotating the core or spool at a relatively high speed while it is supported on a driven spindle, and this spindle is preferably located near the top of the machine frame where it is easily accessible. Geared to the spindle and driven therewith are cam means for reciprocating a traverse member at a relatively constant velocity, and this member is supported on a pivotally or swingably mounted frame so that it may move

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from the package as the package builds up through the winding of yarn on the core.

A yarn guide is reciprocally carried by the pivoted or swinging frame and is moved back and forth at a relatively constant distance close to the surface of the package or even against the surface of the package, the distance being maintained in the illustrative embodiment by means of a pressure roll or other member mounted on the frame, bearing against the surface of the package and supported between the package and the yarn guide.

The yarn guide is given a reciprocation of constant amplitude parallel to the axis of the package, but by guide means interconnecting the yarn guide and the swinging frame, including a slot or cammed surface having the same inclination as the tapered or conical base of the king spool, the traverse is shifted axially of the package so that its termini constantly shift toward the base of the spool as the package builds up. This interconnection between the inclined guideway and the means for reciprocating the yarn guide is related to the swinging position of the guideway or frame by means of an interconnecting member which does not swing but maintains a substantially constant radial distance from the axis of the package.

The pressure roll is also mounted so that it can move axially of the package and such movement is imparted to it as the package builds up so that the roller is moved toward the base of the spool in amounts proportional to the swinging movement of the frame or guideway.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory but are not restrictive of the invention.

Referring now in detail to the present preferred embodiment of the invention, illustrated by way of example in the accompanying drawings, the improved winding mechanism of the present invention is shown as applied to a standard winding machine generally known in the trade as the "Foster Precise Winder." The mechanism of the invention is supported in the usual manner at the top of a main frame 1 which carries a cam shaft 2 driven by suitable drive means not shown. Conventional traverse cam 5 on the cam shaft imparts reciprocating traverse motion to sleeve 6, slidably mounted on rod 7, through the roller stud 8. A spindle 10 for supporting and rotating a king spool 11 is driven by suitable conventional drive means through spindle bearing 12.

The apparatus embodying the novel features of the invention, generally shown in the upper right hand portion of Fig. 1, comprises a traversing yarn guide 15 which is adapted to reciprocate parallel to the spindle 10 and to rock transversely away therefrom as the package P of yarn builds up on said spindle. Said yarn guide and its associated parts, constituting the swinging frame or guideway, comprise a housing 16 for most of said parts, and a pressure roll 17 which bears against the periphery of the package and thus acts as an interponent to move the frame away from the spindle as the package builds up. The frame is adapted to rock as a unit about the axis of the main shaft 2 so as to respond to the enlarging girth of the package. For this purpose the frame is supported by arm 18 pivoted about the cam shaft 2. Tension spring 19 is fixed at one end to arm 18 and at the other end to an adjustable block 20 on bracket 21 fixed to the main frame 1. The spring urges the frame and

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roller 17 toward the package and permits yielding rocking away from the spindle as the package builds up.

Referring to the construction of the guideway, a block 25 is formed at the upper end of arm 18 to rock therewith, the inner or left hand face (Fig. 1) of said block being planed away for slidable contact with upstanding plate 26. The lower portion of said plate is welded to traverse sleeve 6 and the block 25 is cylindrically cut away at 27 to receive rod 7 and sleeve 6. Thus the reciprocating motion of sleeve 6 is imparted to the upright plate 26.

The upper portion of plate 26 is bolted to a flanged plate 30 which extends horizontally outwardly and lies within the housing 16. Said plate 30, which is relatively narrow, slidably supports on its upper surface a block 31 which is bored to receive an upstanding stud or pin 32 which is rigidly fixed to the block by set screw 33. The lower end of said pin 32 is designed to extend through a fore-and-aft slot 34 in plate 30 so as to be freely slidable with respect thereto. A second plate 40 lies on top of block 31 and is slotted at 41, said plate and slot lying at an angle of about 45°, as shown, (that is, the angle of the king spool base) with respect to the slot 34. The upper end of pin 32 lies above the top of plate 40 and is headed at 43 to have a top diameter substantially greater than that of the slot 41.

Yarn guide 15, as shown, is conventional in form, being curved and bifurcated to receive the yarn which, if fed from above as shown in Fig. 1, may pass around guide hook 44 fixed to and extending upwardly from the outwardly and downwardly extending shank 45 of the guide 15. Said shank 45 is welded at 46 to a sleeve 47, which, in turn, is welded to the inner end of slotted plate 40. Thus the reciprocating motion of the transverse sleeve 6 is imparted to plate 30, by means of pin 32, to the upper slotted guide plate 40, the yarn guide 15 and of their associated parts. As shown in Figs. 1 and 2, yarn guide 15 and its associated parts are supported for sliding traversing movement on rod 48, embraced by sleeve 47. Said rod 48 extends along the inner upper portion of the housing 16 and is supported at its ends by blocks 50 and 51.

The embodied means for supporting the pressure roll 17 to rock with the frame or guideway comprises a pair of vertically disposed blocks 53 and 54 fixed to a cover plate 25' which is secured to the inner face of block 25 and spaced therefrom sufficiently to provide sliding space for the traversing plate 26. A rod 55 is mounted at either end in said blocks 53 and 54 so as to lie parallel to the axis of the spindle. The pressure roll 17 itself is rotatably journaled at its ends on center pin bearings adjustably mounted in the arms of a yoke 56, the central portion of which is slidably mounted on rod 55 by means of bored block 57. A second rod 58 is mounted parallel to rod 55 at a lower level, its ends being supported in the lower parts of blocks 53 and 54 and the lower end of block 57 being bored at 59 to slide thereon. Thus the roller in yoke 56 has a limiting sliding action parallel to the axis of the spindle. Means for controllably governing the extent of said action in connection with the formation of the package will be later described.

In accordance with the invention means are provided, through the interaction of the slotted plates 30 and 40, to shift the traverse of the yarn guide in conformity with the angle of the base of the king spool as the package builds up. As

shown, the spool 11 is cylindrical throughout the major portion of its length but the enlarged base 60 thereof is frusto-conical, being inclined outwardly and rearwardly at an angle of about 45° as shown in Fig. 2. The problem presented by winding the package P on such spool is effecting a rearward lateral shifting of the traverse as the package builds up so that the yarn base of the package will conform exactly to the slope of the spool base 60, while the nose N of the package adopts an equivalent slope.

For this purpose means are provided for holding the traversing block 31 and pin 32 from rocking with the guideway, while permitting full reciprocating traverse movement thereof. For this purpose the block 31 is bored to slide on rod 65 which lies within the guideway housing, but does not participate in the swinging movement thereof. Rod 65 is supported at its front end in block 66 and at its opposite or rear end in the stem 67 of a supporting yoke 68. Block 66 and the upper ends of yoke 68 are fixed to depend from a transverse horizontal bar 70 which overlies and is spaced from the top of the guideway housing 16.

The rod 65 is mounted to be held at a substantially fixed radial distance from the axis of spindle 10, but is permitted a slight rising and falling motion to accommodate its position to the vertical component of the swinging movement of the guideway assembly on arm 18. For this purpose bar 70 and yoke 68 are hung from the free end of a rocking T-shaped bracket arm 72, cross-head 73 of which is bored to rock about shaft 74, the ends of which are supported in lugs 75 and 76 fixed to and extending from the spindle bearing 12. Said shaft 74, of course, is parallel to the spindle axis and to rod 65. In order to permit the guideway to swing relatively to rod 65 and also permit said rod to drop as the guideway swings away and down, the closed end 78 of the guideway housing 16 is slotted at 79 as shown in Fig. 4.

In view of the mechanism described above it will be clear that a shifting of the termini of the traverse of the yarn guide 15 is effected although the length of said traverse is maintained constant. Said shift is effected by the interrelation between pin 32 and the slots 34 and 41 in plates 30 and 40. In operation, as the guideway is forced to swing outwardly (in the direction of the arrow in Fig. 1) by contact of roll 17 with the surface of package P, pin 32 remains relatively stationary with respect to such swinging movement. The slot 34 in plate 30 permits said plate to slide outwardly with respect to the pin while imparting the reciprocating traverse movement thereto. The upper portion of the pin bears against the inclined faces of slot 41 and thus as the guideway rocks outwardly, the pin gradually forces plate 40 to the left in Fig. 2, that is, toward the base of spool 11. Inasmuch as the angle of slot 41 to the spindle axis is the same as that of the spool base, the result is that yarn guide 15, fixed to plate 40, will be similarly affected and thus the traverse will be shifted as required. The termini of the traverse for an intermediate thickness of package are indicated in Fig. 2, while the position of the termini in the beginning of the winding operation are indicated in Fig. 5.

While, as shown and described, the inclined slot is located in the upper plate 40 which is fixed to the yarn guide 15, the relationship of the two slotted plates 30 and 40 may be reversed. That

is, the lower plate 30 may contain the inclined slot, while the upper plate 40, to which the yarn guide is fixed, may be provided with a radial slot like 34. In such case the slot in the lower plate would be inclined at the same angle as slot 41 with respect to the axis of the spindle but would lie in the opposite sense or direction—that is instead of running from left to right reading from the top to bottom in Fig. 2, said slot would run from right to left. Such reverse inclination and opposite arrangement of the slotted plates has been built and is effective in practice and the inter-relation and action of the parts, as previously described, are otherwise the same.

Referring now to the embodied means for imparting axial movement to the pressure roll 17, in accordance with the invention, a block 80 is bored to slide on rod 55 and is fixed to the rear of yoke 56 as by screw 81. A cable 82 has one end fixed to block 80 and its other end fixed at 83 to the spindle bearing 12. A pulley 84 is mounted on the rocking guideway by bracket 85 fixed to the face of block 25 and the cable runs on said pulley. Thus as the guideway rocks outwardly in the direction shown in Fig. 1, the cable tends to pull the block 80 to the left in Fig. 2, that is toward the base of the spool, and with it the pressure roll 17. The roll is normally urged toward the nose end of the spool by U-shaped expansion spring 86, one end of which bears against fixed block 53 and the other end against sliding block 57. Thus when the roll lies against the bare spool, the length of the roll lies on the cylindrical length of the spool but as the guideway rocks away from the spool the pressure roll is drawn toward the base of the spool at such a rate that it will be in contact with the end and outer edge of the spool base when the package is fully wound. In other words, the pressure roll is equal in length to the traverse and shifts axially of the spindle in the same direction and to the same amount. This provides an even application of pressure specifically to that part of the package which is being wound as the winding takes place.

A modified construction for effecting the same axial movement of pressure roll 17 is shown in Fig. 5. In this construction the motion is effected by a rack and gear mechanism. A rack 90 is connected at one end to the yoke 56 by bolted bracket 91, and the teeth of the rack engage the lower pinion 92 on gear shaft 93 which is rotatably supported by bracket 94 on the face of block 25. A second rack 95 lies at right angles to rack 90 and its outer end is pivotally connected at 96 to a bracket 97 suspended from bar 70. The other end of rack 95 is loosely supported in the prongs of fork 98 which is fixed to the spindle base at 99. The teeth of rack 95 engage upper pinion 100 of the gear. Thus as the guideway rocks outwardly the turning of the pinion 100 on rack 95 also turns pinion 92 to draw rack 90 and the pressure roll 17 toward the spindle base as and for the purposes previously described.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What we claim is:

1. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a yarn guide for laying yarn on the spindle, a guide member

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carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second guide member connected to said yarn guide, a member connecting said two guide members and reciprocated therewith but held a fixed distance from the spindle axis, one of said guide members interacting with said connecting member to shift the termini of the yarn guide traverse as the package builds up.

2. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a spool on the spindle having an inclined base, a yarn guide for laying yarn on the spindle, a guide member carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second guide member connected to said yarn guide, a member connecting said two guide members and reciprocated therewith but held a fixed distance from the spindle axis, and means carried by one of said guide members and acted on by said connecting member to shift the termini of the yarn guide traverse as the package builds up in amounts proportional to the inclination of the spool base.

3. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a spool on the spindle having an inclined base, a yarn guide for laying yarn on the spindle, a guide member carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second guide member connected to said yarn guide, a member connecting said two guide members and reciprocated therewith but held a fixed distance from the spindle axis, one of said guide members having a surface inclined to the axis of the spindle at the same angle as the spool base, and acted on by said connecting member to shift the ends of the yarn guide traverse as the package builds up.

4. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a yarn guide for laying yarn on the spindle, a slotted guide member carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second guide member connected to said yarn guide, a member connecting said two guide members and reciprocated therewith but held a fixed distance from the spindle axis, one of said guide members having a slot inclined to the axis of the spindle and acted on by said connecting member to shift the termini of the yarn guide traverse as the package builds up.

5. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a yarn guide for laying yarn on the spindle, a slotted guide member carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second slotted guide member connected to said yarn guide, a member engaging the slots in said two guide members and reciprocated therewith but held a fixed distance from the spindle axis, the slot in one of said guide members being inclined to the axis of the spindle and acted on by said connecting member to shift the termini of the yarn guide traverse as the package builds up.

6. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a yarn guide for

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laying yarn on the spindle, a slotted guide member carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second slotted guide member connected to said yarn guide, a member engaging the slots in said guide members and reciprocated therewith but held a fixed distance from the spindle axis, the slot in the second said guide members being inclined to the axis of the spindle and acted on by said connecting member to shift the termini of the yarn guide traverse as the package builds up.

7. In a winding machine in combination a guideway mounted to swing away from a package spindle as the package builds up, a yarn guide for laying yarn on the spindle, a slotted guide member carried by the swinging guideway and reciprocated in a traverse of constant length parallel to the axis of the spindle, a second guide member fixed to said yarn guide, a pin engaging the slots in said two guide members and reciprocated therewith but held a fixed distance from the spindle axis, one of said slots being inclined to the axis of the spindle and acted on by said pin to shift the termini of the yarn guide traverse as the package builds up, said pin having a limited rocking movement about the spindle axis to accommodate itself to the swinging of the guideway.

8. In a winding mechanism of the type having a guideway mounted to swing away from a package spindle as the package builds up, in combination, a yarn delivery guide subjected to traverse reciprocation while held out of contact with the surface of the package, a pressure roll bearing against the surface of the package, said roll having continuous contact over a substantial part of the length of the package, and means for moving the pressure roll axially of the package.

9. The mechanism of claim 8 wherein the yarn guide and the pressure roll are shifted in the same direction and substantially to the same extent.

10. The mechanism of claim 8 where the pressure roll is shifted a distance proportional to the thickness of the package.

11. The mechanism of claim 8 having means for moving the pressure roll toward the base of the package as the package builds up.

12. In a winding mechanism of the type having a guideway mounted to swing away from a package spindle as the package builds up, in combination, a yarn delivery guide subjected to traverse reciprocation of constant amplitude parallel to the axis of the spindle, a spool on the spindle having a tapered base, means for shifting the termini of the yarn guide traverse toward the base of the spool as the package builds up, a non-reciprocative pressure roll having contact with an axial element of the package surface, and means for moving the pressure roll toward the base of the spool at the same time.

13. In a winding mechanism of the type having a guideway mounted to swing away from a package spindle as the package builds up, in combination, means for laying yarn in a traverse along the spindle, a pressure roll bearing on the surface of the package and imparting the swinging movement to the guideway, and means for shifting said roll axially of the spindle as the package builds up, the length of said roll being substantially equal to the length of the traverse.

14. In a winding mechanism of the type having a guideway mounted to swing away from a package spindle as the package builds up, in com-

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bination, means for laying yarn in a traverse along the spindle, a pressure roll bearing on the surface of the package and imparting the swinging movement to the guideway, and means for shifting said roll axially of the spindle as the package builds up, said means including a member connected to the roll and actuated by the relative movement between the spindle mounting and the swinging guideway, and other means for shifting the traverse of the yarn.

15. In a winding mechanism of the type having a guideway mounted to swing away from a package spindle as the package builds up, in combination, means for laying yarn in a traverse along the spindle, a pressure roll bearing on the surface of the package and actuating the swinging movement of the guideway, the length of the roll being substantially equal to that of the traverse, and means for shifting said roll axially of the spindle as the package builds up, said means including a cable actuated by the relative movement between the swinging guideway and a fixed part of the machine.

16. In a winding mechanism of the type hav-

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ing a guideway mounted to swing away from a package spindle as the package builds up, in combination, means for laying yarn in a traverse along the spindle, a pressure roll bearing on the surface of the package and actuating the swinging movement of the guideway, the length of the roll being substantially equal to that of the traverse, and means for shifting said roll axially of the spindle as the package builds up, said means including gearing actuated by the relative movement between the swinging guideway and a fixed part of the machine.

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