Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 1

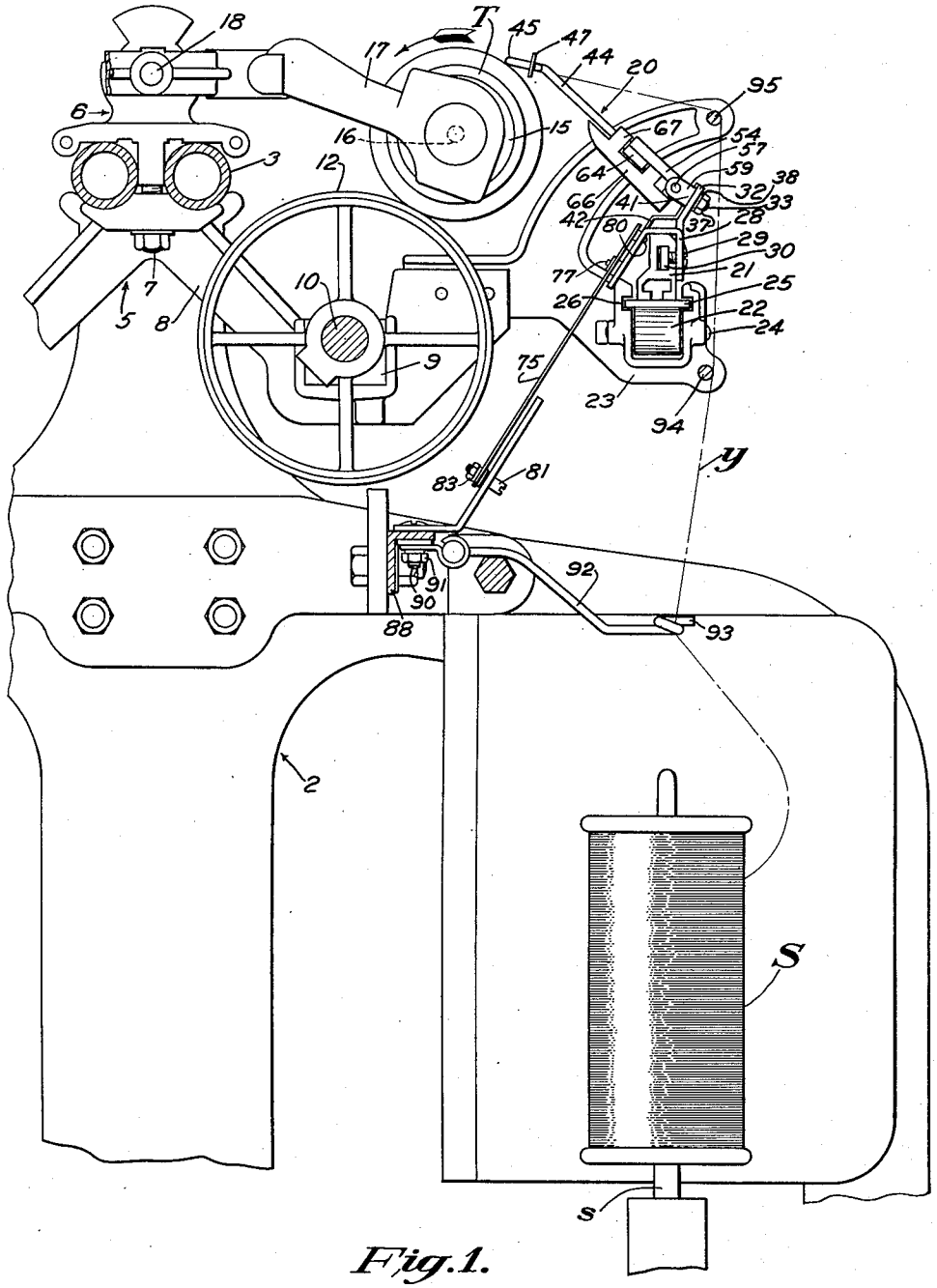


Fig. 1.

Inventor:
Norman E. Boily
By Watson, Cole, Grindle & Watson
Attorneys.

Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 2

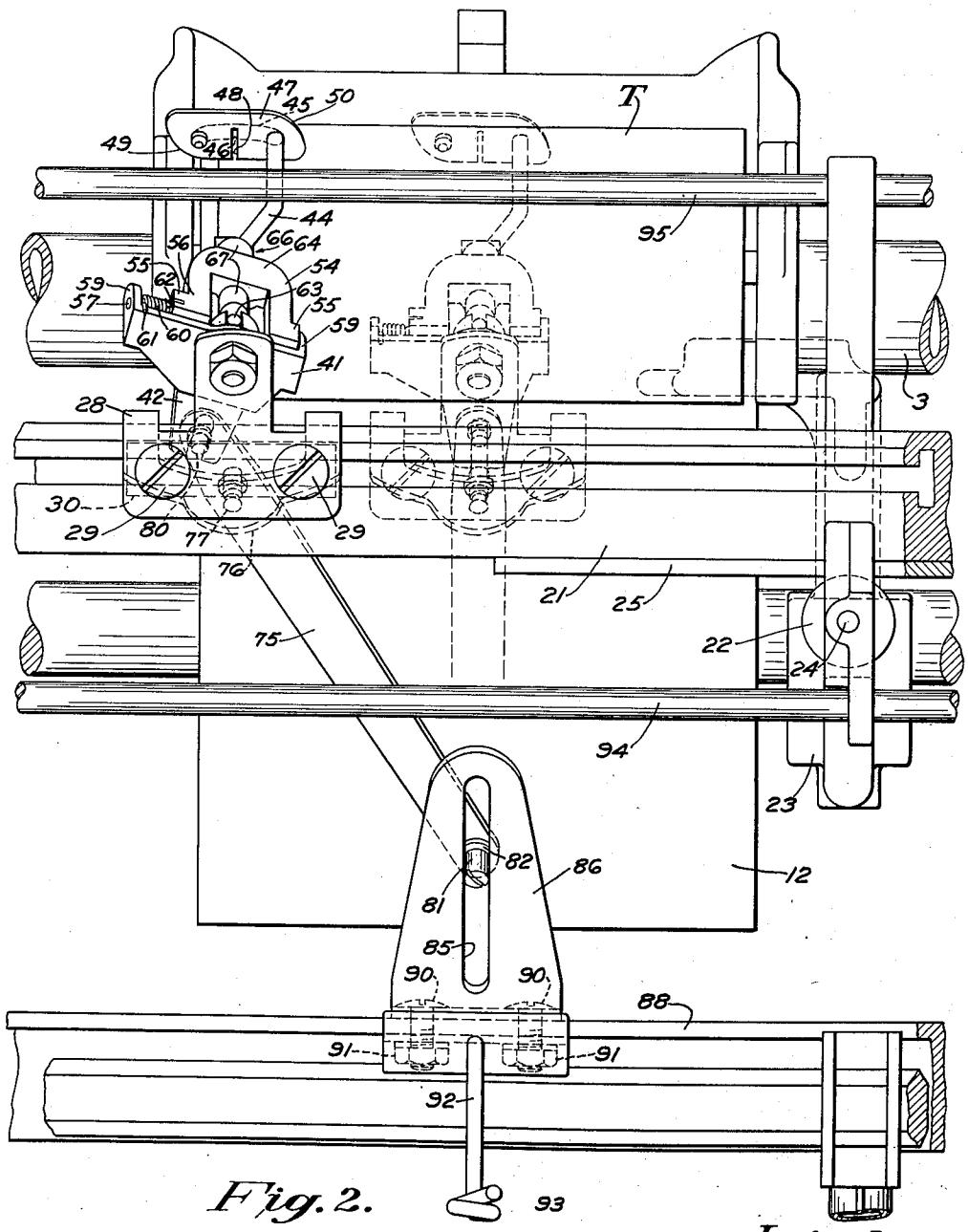


Fig. 2.

Inventor:
Norman E. Boily
By Watson, Cole, Grindle & Watson
Attorneys.

Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 3

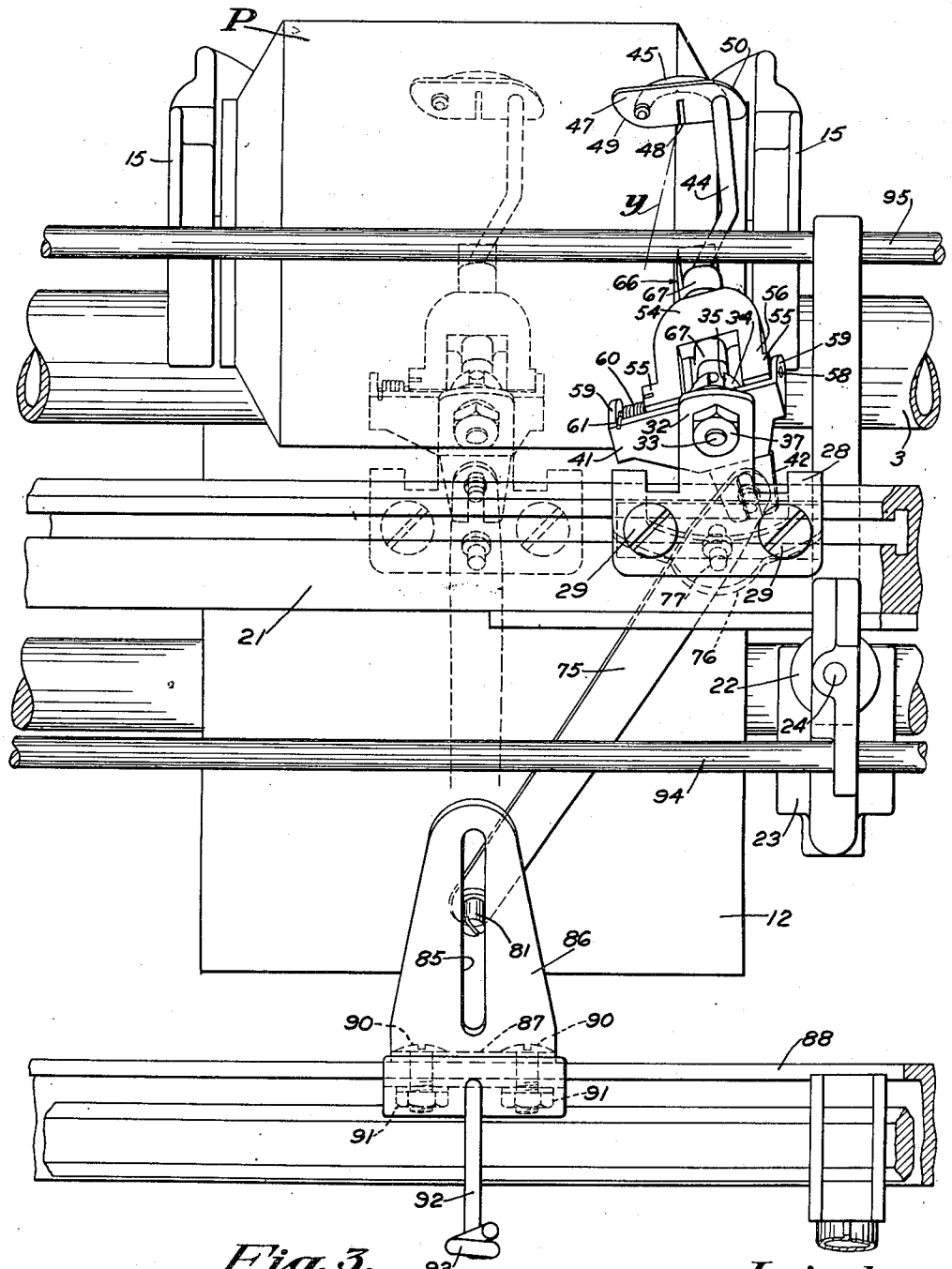


Fig. 3.

Inventor:
Norman E. Boily
By Watson, Cole, Grindle & Watson
Attorneys.

Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 4

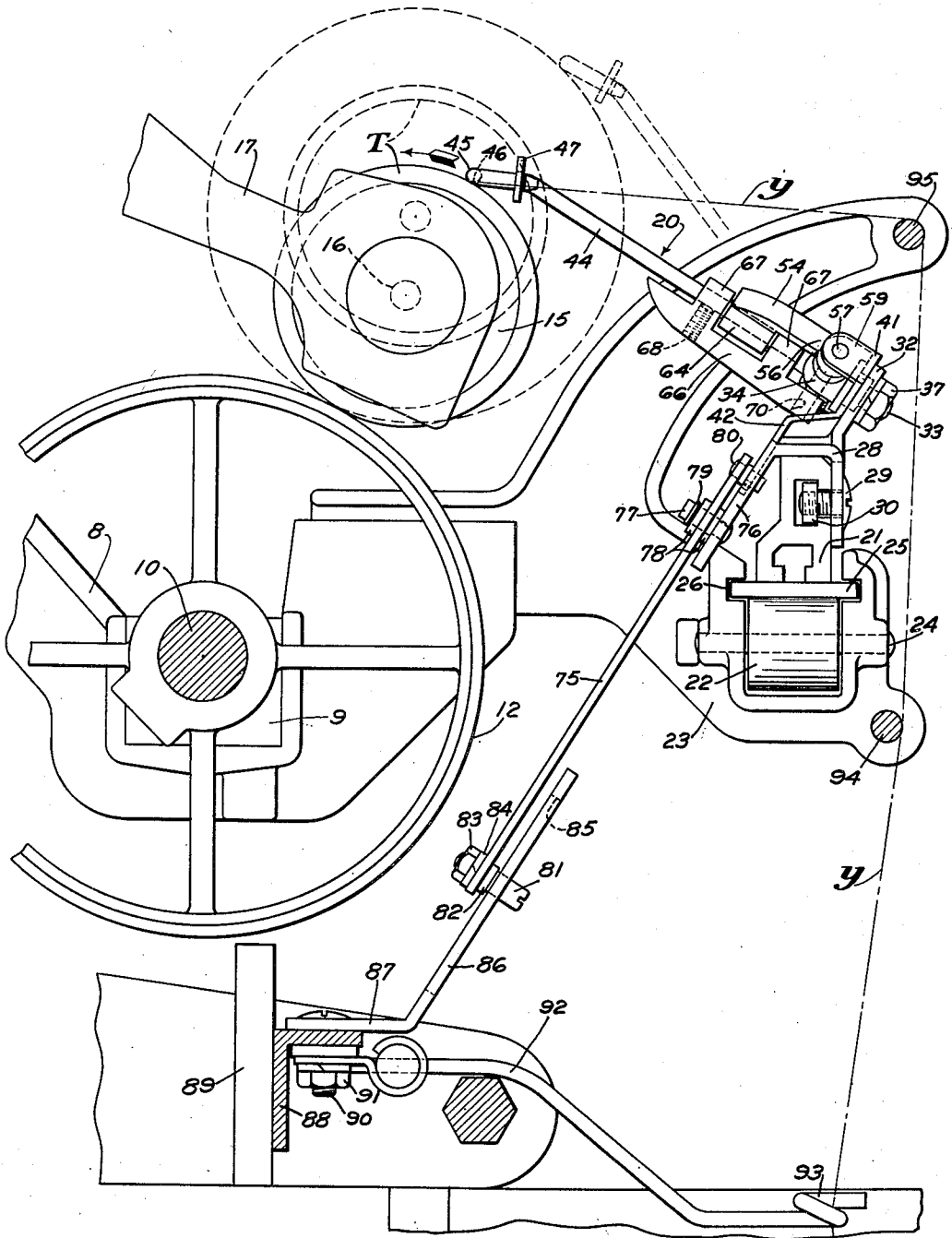


Fig. 4.

Inventor:
Norman E. Boily
By Watson, Cole, Grindle
& Watson
Attorneys

Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 5

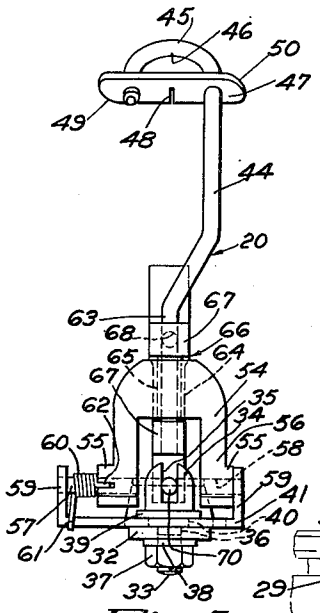


Fig. 5.

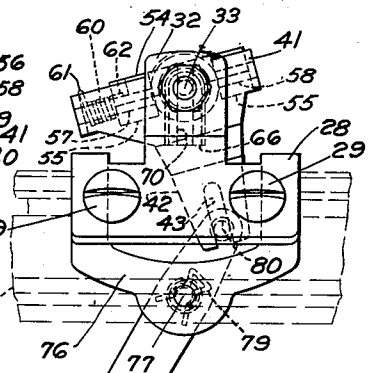


Fig. 7.

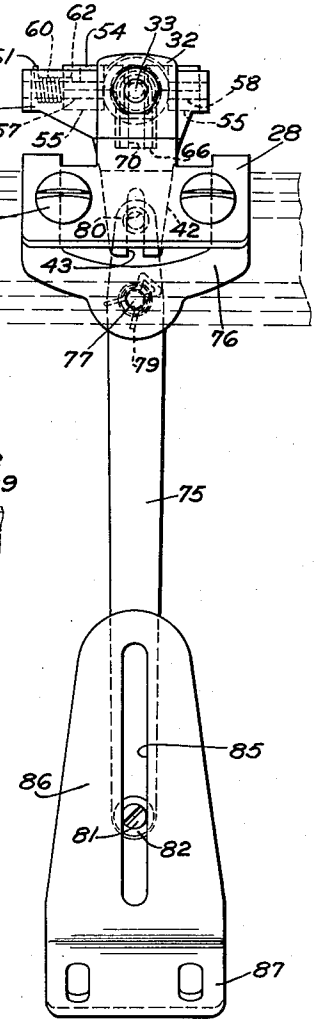


Fig. 6.

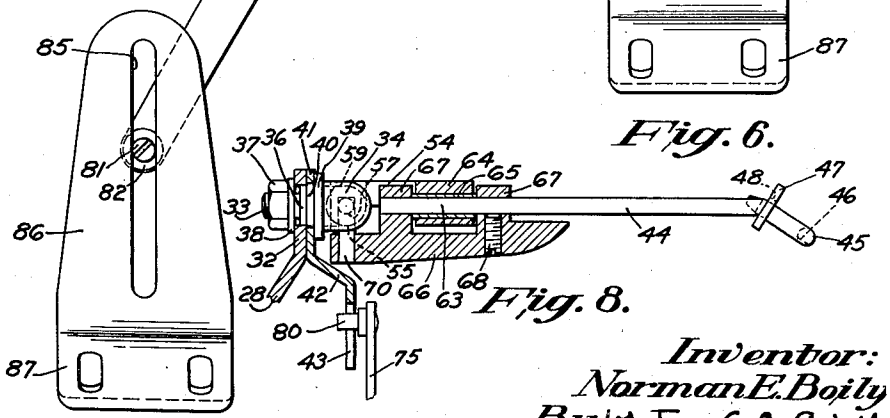


Fig. 8.

Inventor:
Norman E. Boily
By Watson, Cole, Grindle & Watson
Attorneys.

Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 6

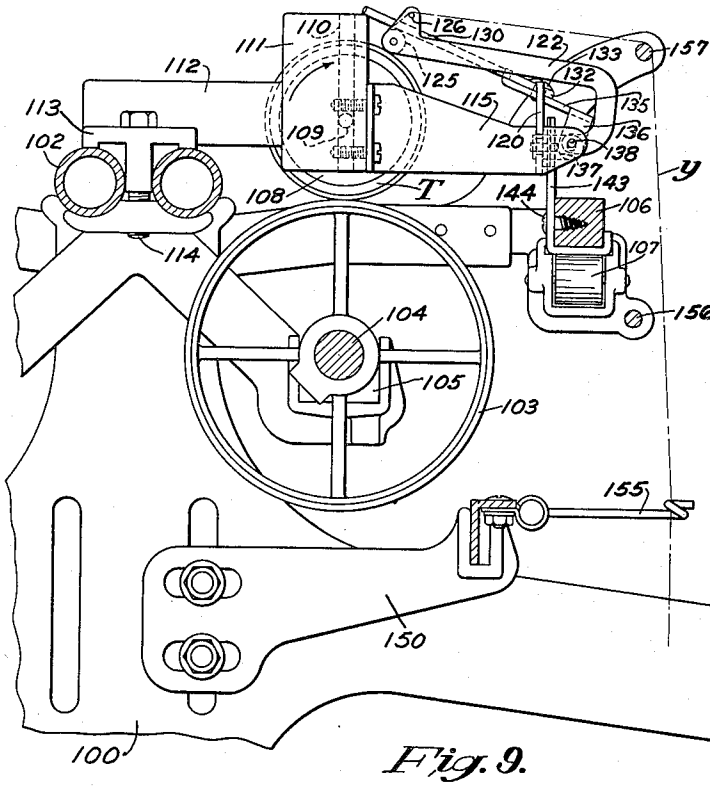


Fig. 9.

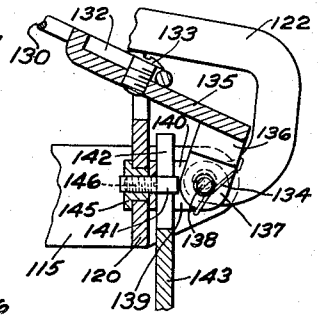


Fig. 11.

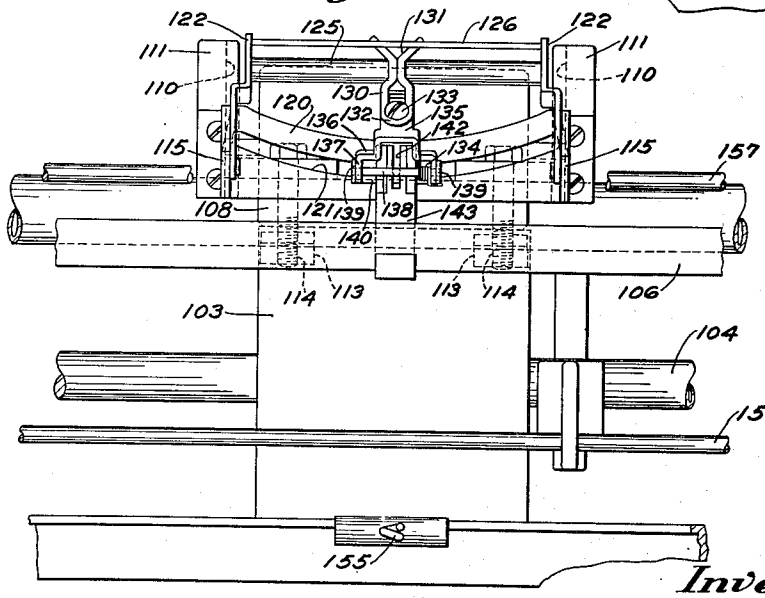


Fig. 10.

Inventor:
Norman E. Boily
By Watson, Cole, Grindle & Watson
Attorneys.

Dec. 22, 1953 N. E. BOILY 2,663,508

YARN-WINDING DEVICE

Filed May 2, 1949 7 Sheets-Sheet 7

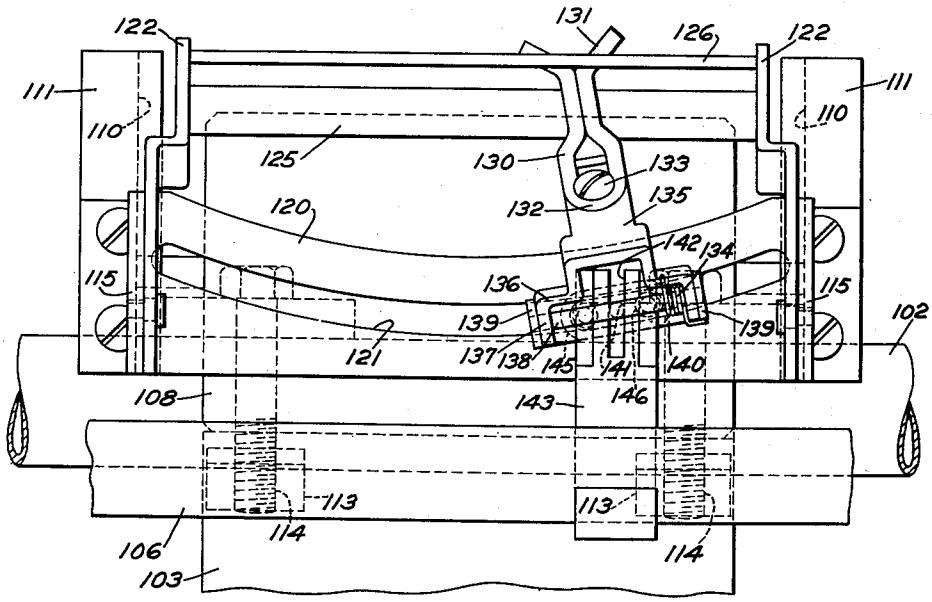


Fig. 12.

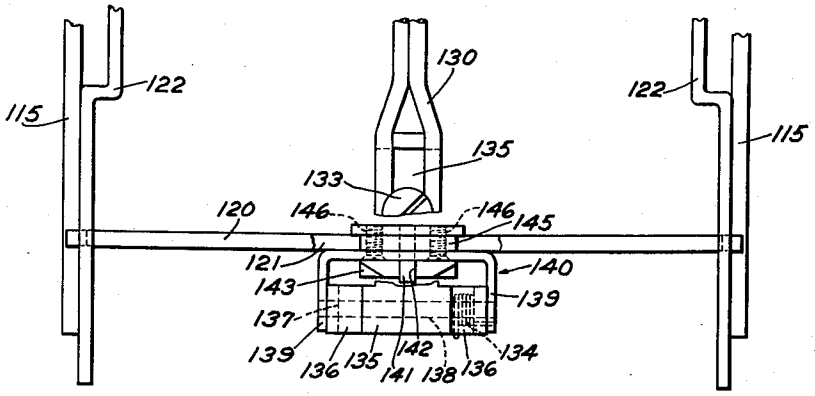


Fig. 13.

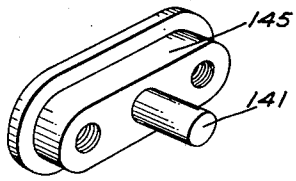


Fig. 14.

Inventor:
Norman E. Boily
By Wanton, Cole, Grindle & Watson
Attorneys.

Patented Dec. 22, 1953

2,663,508

UNITED STATES PATENT OFFICE

2,663,508

YARN-WINDING DEVICE

Norman E. Boily, Central Falls, R. I., assignor to Universal Winding Company, Boston, Mass., a corporation of Massachusetts

Application May 2, 1949, Serial No. 90,943

13 Claims. (Cl. 242—43)

1

This invention relates to winding machines for producing packages of yarn, thread, and other strand materials, and more particularly to a device or attachment for twister-frames and similar machines to adapt them for winding headless packages with tapered or conical ends.

In the following specification and claims the term "yarn" is used in a general sense to indicate any kind of attenuated material and the work "package" is intended to apply to any mass of such material whatever its dimensions.

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

Another object is to provide a device or attachment of the type indicated having means for progressively shortening the traverse of the wound material throughout the building of the package to cause the ends of the layers of winding to be stepped back whereby to shape the mass with tapered or conical ends.

Another object is to provide a device or attachment of the type indicated having means for progressively displacing the traversing yarn-guide inwardly from its extremes of traverse throughout its continuous reciprocatory motion to gradually shorten the layers of winding.

Another object is to provide a device or attachment of the type indicated in which the yarn-guide is pivoted to swing away from the axis of the winding package as the mass of yarn is built up and means operated by the receding movement of the guide to cause it to be displaced progressively inward as it approaches the ends of its traverse to gradually shorten the length of the layers of winding.

Another object is to provide a device or attachment of the type indicated which is of simple construction with its parts proof against wear and deterioration and durable over extended periods of use.

Another object is to provide a device of the type indicated which may be applied as an attachment to twister-frames by simply fastening its elements to standard parts of the machine without requiring machining or other operations.

Further objects of the invention are set forth in the following specification which describes a preferred form of construction of the device or attachment and one modified form thereof as illustrated by the accompanying drawings.

In the drawings:

Fig. 1 is a side elevation of a conventional type

2

of twister-frame illustrating the present improved device or attachment as applied to use thereon;

Fig. 2 is an enlarged front elevation of the essential parts of the twister-frame showing the present device or attachment applied thereto and illustrating the traversing yarn-guide at one end of its traverse at the start of winding with its central position shown by dotted lines;

Fig. 3 is a similar view showing the traversing yarn-guide at the opposite end of its traverse with the package illustrated as having been wound to substantially its full diameter;

Fig. 4 is a side view showing the parts of the attachment in the position illustrated in Fig. 2 at the start of winding a package;

Fig. 5 is a detailed view of the traversing yarn-guide showing the relation of its parts and its mounting;

Fig. 6 is a view of the mounting for the traversing yarn-guide and the connections for oscillating or rocking it during its traverse with the guide shown in its mid-position of traverse;

Fig. 7 is a similar view showing the same elements with the guide in a position at the right-hand end of its traverse;

Fig. 8 is a part-sectional view showing the universal joint between the yarn-traversing guide and its mounting;

Fig. 9 is a side view of a modified form of the device;

Fig. 10 is a front view of the same;

Fig. 11 is an enlarged part-sectional detail view of the guide-mounting;

Fig. 12 is a front view of the modified form of the invention illustrated in Fig. 10 showing the parts in enlarged scale with the yarn-guide in a different position;

Fig. 13 is an enlarged plan view of the cam-track showing the shoe which slides therein and illustrating its connection with the mounting for the yarn-guide; and

Fig. 14 is a greatly enlarged perspective view of the cam-shoe.

The present improved winding device or taper-end attachment is herein illustrated as applied to a conventional type of up-twister, so-called, in which yarn is taken from a spool or other supply located therebelow and wound into a self-sustaining package without end heads or flanges. Self-sustaining packages of this type are well known in the art, being produced by winding the strand material in helical turns about a central core, usually in the form of a paper tube, with the ends of the wound mass built up in substantial flat formation without

the use of end heads or flanges. Certain textile materials wound in this manner, for example, synthetic yarns such as rayon and nylon, have a more or less glossy surface which tends to cause the wound coils to slip and slide, particularly at the ends of the package if the latter is not sustained by spool-heads or flanges. It has therefore become the preferred practice to build the package with tapered or conical ends instead of flat, perpendicular ends as more generally used in the winding art. It is therefore the purpose of the present invention to provide a device or attachment which may be applied to use on spinning and twisting frames for producing a package of this preferred type; that is, having tapered instead of square ends so that the tendency for the strands to slip and slide down across its ends is obviated. In this preferred type of taper-ended, headless package the windings are more stable and the yarn coils are not subject to sloughing off at the ends of the package to form overruns or "stitches" liable to interfere with the unwinding of the yarn from the package in delivering it for transfer processes.

Referring to the present drawings, Fig. 1 illustrates the general construction of an uptwister comprising upright frame-members 2 and longitudinally-extending supports for the mechanism of the machine. The machine is herein shown as of the double type with twisting and winding mechanisms on each side of the frame, but since all of the several winding devices or attachments are of the same form of construction only one is shown in connection with the essential parts of the machine. A pair of tubular rods or pipes 3 extend horizontally longitudinally of the frame of the machine for supporting brackets 5 of inverted V-shape with clamps 6 for fastening them thereto by means of bolts 7 as shown in Fig. 1.

The inclined arms 8 of the several brackets 5 spaced along the length of the machine support bearing-boxes 9 for a horizontal drive-shaft 10 carrying a series of rotary driving drums 12. The driving drums 12 are driven continuously to rotate the packages being wound by frictional contact with their peripheries. The packages are usually wound on paper tubes T mounted on cylindrical holders or mandrels 15 provided with end gudgeons 16 which are journaled in bearings in the sides of a pair of hingedly-mounted arms 17. The arms 17 are adapted to pivot about a rod 18 supported in a bearing in the upper clamping part 6 of the brackets 5. As the yarn is deposited on the tube T to build the cylindrical package the arms 17 swing upwardly with the growth in diameter of the wound mass.

The yarn-guide 20 for each winding unit is connected to a traverse-bar 21 reciprocated longitudinally of the machine for traversing a plurality of the guides for the multiple packages at each side of the frame of the machine. The traverse-bar 21 may be of any usual construction and as herein shown it is supported for reciprocation by a plurality of rollers 22 journaled in socketed brackets 23 bolted to the V-shaped bracket 5, see Fig. 4. The rollers 22 are journaled on pins 24 riveted through the sides of the sockets at the ends of the brackets 23. The traverse-bar 21 may be of metal of generally rectangular shape in cross-section and provided with a flange 25 at its base supported on the rollers 22 with the ends of the flange received in recesses 26 at the sides of the socket to prevent the bar from rising up from the rollers.

Each yarn-guide 20 is carried by a saddle-like mounting 28 straddling the traverse-bar 21 and bolted thereto. As shown in Fig. 4 the traverse-bar 21 is of hollow construction and a pair of bolts 29 extend through one side of the saddle 28 with a plate 30 on their threaded ends held in the hollow of the bar to fixedly attach the saddle thereto, see Figs. 2 and 4. The saddle 28 is formed with an upwardly-projecting inclined arm or extension 32 for mounting the yarn-guide 20 which is connected thereto by an arrangement of universal joints as next described.

Fast in the arm 32 is a stud 33 having a bifurcated head 34 on its inner end formed with a central slot 35, see Fig. 5. The shank of the stud 33 is formed with a flat-sided portion 36 fitted to a rectangular slot in the arm 32 to prevent the stud from turning in the arm of the mounting or saddle 28, see sectional view, Fig. 8. A nut 37 screwed onto the threaded end of the stud 33 against a lock-washer 38 rigidly secures the stud to the mounting 28. Between a flange 39 integral with the stud 33 and its flat-sided portion 36 is a cylindrical bearing portion 40 that serves as a pivot bearing for a yoke-member 41 which carries the yarn-guide 20. The yoke-member 41 has a downwardly-extending elbow-shaped arm 42 terminating in a bifurcated portion formed with a relatively narrow slot 43 which provides a connection for rocking or oscillating the yoke 41 on its pivot bearing 40 by means to be later described. The yarn-guide proper consists of a bent wire arm 44 terminating in a loop 45 provided with a relatively narrow groove 46 in its curved portion through which the yarn-strand feeds in delivering to the winding package. Mounted on the looped end 45 of the wire arm 44 is a flat blade-like member 47 which functions as a self-threading device for picking up the yarn from the surface of the package to direct it into the groove 46 at the end of the guide. The pick-up blade-member 47 is held on the looped end 45 of the arm 44 by portions of the wire engaging through holes at its opposite ends, see Fig. 5, and the blade is formed with a central slot 48 in which the yarn is caught to direct it to the slot 46 in the looped end of the wire. It is to be noted that the blade 47 is of peculiar contour at its ends, the under edge of the blade at one end being inclined upwardly in a relatively long arcuate portion or curve 49; while the opposite end has a reverse curve 50 leading downwardly from the upper edge of the blade. These two curved or inclined edges of the blade provide for a plow-like action to adapt the blade to ride either over or under the yarn in accordance with the direction of traverse of the yarn-guide 20, to pick up the yarn in the slot 48 and direct it to the groove 46 in a manner and for the purpose as later more particularly explained.

The wire arm 44 of the yarn-guide 20 is supported by a bifurcated fork-member 54 which is pivoted to rock on the yoke 41 in a direction at right-angles to the direction of oscillation of said yoke. The fork 54 is provided with hubs 55 at the ends of its legs 56 which are bored to receive transverse-pins 57 and 58 projecting into bearings in ears 59 at the sides of the yoke 41. A helical spring 60 coiled around the pivot-pin 57 with one end 61 held against the edge of the cross-member of the yoke 41 has its opposite end 62 engaging a slot in the end of the bearing hub 55, thus tending to swing the fork 54 in a direction to cause the looped end 45 of the yarn-guide 20 to

bear against the surface of the package being wound.

The wire arm 44 of the yarn-guide 20 is connected to the fork 54 with its offset end 63 inserted through a hub-like bearing 64 at the closed end of the fork, see Fig. 8. Preferably, the bore of the bearing 64 is lined with a bushing 65 of wear-resisting or self-lubricating material to reduce friction during relative oscillation of the fork 54 about the end of the wire. To prevent the yarn-guide 20 from rocking with the fork 54 and maintain its curved end 45 normally flat against the surface of the package, a holding member or stabilizer 66 is provided. The wire arm 44 of the yarn-guide 20 is held fast in a pair of bearings 67 on the stabilizer 66 straddling the bearing 64 on the fork 54, the rod being held from turning in the stabilizer bearing by a set-screw 68, see Fig. 8. The stabilizer 66 underlies the rod 44 with one end projecting in under the slotted head 34 of the fixed stud 33 and a pin 70 projecting upwardly therefrom engages through the slot 35 in the head. Through these connections the yarn-guide 20 is prevented from rocking or oscillating laterally during the oscillation of the yoke 41.

It has been stated that the yoke 41 is provided with a depending arm 42 formed with a slot 43 for connection with the means for oscillating the yoke. One preferred oscillating means for this purpose may consist in a rockable lever 75 pivoted to the saddle 28 which is fastened to the reciprocating traverse-bar 21. The saddle 28 is formed with a skeleton arm 76 projecting downwardly at an angle from the top of the traverse-bar 21 and terminating in an ear in which is fastened a pivot-stud 77, see Figs. 4 and 7. The pivot-stud 77 may be riveted through the end on the arm 76 to project through a hole adjacent the upper end of the lever 75 with washers 78 at either side of the lever to provide for its freedom of oscillation about the stud. The outer washer 78 may be held on the end of the pivot-stud 77 by means of a hairpin-shaped wire 79 having its legs engaging in a groove in the end of the stud. Riveted through the upper end of the lever 75 is a shouldered stud or pin 80 disposed with its end projecting through the slot 43 in the depending arm 42 of the yoke 41. Fast in the lower end of the lever 75 is a larger pivot-stud 81 held with its shouldered portion 82 clamped against the side of the lever by means of a nut 83 and lock-washer 84 as shown in Fig. 4. The stud 81 is adapted to slide in a vertical slot 85 in a fixed member 86 fastened to the main frame of the machine, see Figs. 3 and 4. Referring to Figs. 3 and 4, the member 86 is of plate-like form extending angularly in parallel relation to the lever 75 with its horizontal foot 87 fastened to an angle-iron 88 supported on a horizontal cross-member 89 of the frame of the machine. The member 86 may be fastened to the upper flange of the angle-iron 88 by means of bolts 90 and nuts 91 shown in Figs. 3 and 4. A wire arm 92 may likewise be fastened to the angle-iron 88 by the bolts 90 to extend outwardly from the frame of the machine with its end terminating in a pigtail-guide 93 for the yarn y as it feeds upwardly to the winding mechanism.

Above the pigtail-guide 93 a pair of horizontal rods 94 and 95 are supported by the bracket 23 in position to further guide the yarn y to direct it at right-angles at the top in a length leading through the slot 48 in the blade 47 and the groove 46 in the looped end 45 of the yarn-guide 20. As

shown in Fig. 1, the yarn y usually delivers from a spool S held on a spindle s which may be mounted on some fixed part of the frame, not herein shown in detail. It will be understood that the several yarn-guides 20 at either side of the twister-frame are traversed longitudinally of their respective package-holding spindles or mandrels 15 by the reciprocation of the traverse-bar 21. Any suitable means such as a cam or the like may be employed for reciprocating the traverse-bar 21, these parts of the mechanism of the machine not being shown or described herein as they are of usual construction well understood by those versed in the art. The construction and arrangement of the winding mechanism of one preferred embodiment of the invention having been described in detail the method of operation of the complete apparatus is explained as follows:

To prepare the machine for winding, a supply spool S, Fig. 1, is placed on the spindle s and a length of yarn y drawn upwardly therefrom is threaded through the pigtail-guide 93, carried across the rods 94 and 95, thence drawn inwardly and its end attached to the tube T on the mandrel or package-holder 15. With the self-threading yarn-guide shown in Figs. 2 and 3 it is unnecessary to place the yarn in the guide, this being accomplished automatically in the manner next explained. To start the winding the arms 17 supporting the mandrel 15 are swung downwardly to place the periphery of the cop-tube T in contact with the circumference of the driving drum 12, whereupon the mandrel and the tube T carried thereby will be driven rotatively in the direction indicated by the arrow in Fig. 1. It has been stated that the yarn-guide 20 is traversed longitudinally of the package-core or tube T by the reciprocation of the traverse-bar 21 with the yarn y taken up by the rotation of the tube driven by its contact with the driving drum 12. Referring to Figs. 2 and 3, should the yarn be attached to the tube T at a point at the left of the yarn-guide 20, immediately the guide starts to traverse toward the left-hand end of the tube the blade 47 will ride over the yarn, due to the inclined under edge of the blade, whereof to cause the yarn to enter the slot 48 and be directed into the groove 46 in the looped end 45 of the wire 44; thus resulting in the guide picking up the yarn to traverse it back and forth on the tube. On the other hand, if by chance the yarn should be attached to the tube T at the right of the guide 20 a different operation is required; that is, the threading blade 47 must pass under the yarn from below as the guide moves to the right so that at its next stroke to the left it will engage the yarn in the slot 48 in the manner as just previously explained. The reason for this is that the arm 44 of the yarn-guide 20 as it moves to the right would prevent the yarn from passing under the blade 47 and into the slot 48. Consequently, the blade 47 must first be caused to pass under the yarn to prevent it from being obstructed by the arm 44 and after the blade has passed beyond the yarn the next traverse of the guide toward the left will cause the blade to ride over the yarn to pick it up in the slot 48 and direct it into the groove 46. In this way the yarn is automatically threaded into the yarn-guide 20 in whatever position it may be related thereto when attached to the tube T. In other circumstances, if the yarn breaks at any point during winding and is pieced-up on the surface of the package either at the left or right of the

guide 20 the same threading operation will be accomplished automatically.

During the reciprocation of the traverse-bar 21 the saddle or mounting 28 thereon and the yarn-guide 20 carried by the yoke 41 are traversed back and forth longitudinally of the axis of the package-holder or mandrel 15. Referring to Fig. 2, as the traverse-bar 21 carries the yarn-guide 20 to the left from mid position (illustrated by dotted lines in this view) the yoke 41 on which the guide is pivoted will be rocked or oscillated into the position shown by full lines in Fig. 2. This rocking action of the yoke 41 and the guide 20 is effected by the oscillation of the lever 75 about its pivot 77 on the mounting 28. As the mounting 28 moves toward the left the pin 80 at the upper end of the lever 75 is swung towards the left and through its engagement with the slot 43 in the depending arm 42 of the yoke 41 it will rock the yoke in the opposite direction; the lower end of the lever 75 being held to rock about the pivot-stud 81 which is free to slide up and down in the vertical slot 85 of the stationary or fixed plate-member 86. A similar rocking action or oscillation of the yoke 41 and yarn-guide 20 takes place as the traverse-bar 21 is reciprocated in the opposite direction or from left to right, the rocking of the yoke then being in the reverse direction as indicated in Fig. 3 of the drawings. Throughout the winding of a package this oscillation of the yoke 41 and the fork 54 carrying the guide 20 is continued, first in one direction and then in the opposite direction as the yarn is traversed to deposit it in helical coils surrounding the tube T. The yarn is thus distributed in layers of predetermined extent at the start of winding, the length of its traverse being in accordance with the proportion of the parts last described. To change the length of traverse of the yarn for producing packages of different sizes, levers of different lengths may be substituted for the lever 75.

It has been stated that the object of the present invention is to provide a machine for winding headless packages with tapered or conical ends to render them more stable and prevent the coils of winding from sliding over or sloughing off over the ends of the packages. To effect this tapering of the ends of the package it is required that the layers of winding be progressively shortened from start to finish of the package and this action is accomplished with the present device or attachment in the manner as next explained. Referring to Figs. 1 and 4, as the layers of yarn are built up on the tube T the package-holder or mandrel 15 will be caused to rise away from the drum 12 with the supporting arms 17 for the mandrel swinging upwardly about the pivot 18. Also as the package grows in diameter the yarn-guide 20 will be caused to swing away from the axis of the package as it pivots about the pins 57 and 58 by means of which the fork 54 is connected to the oscillating yoke 41. At the same time, the coiled spring 60 on the pin 57 acts to resist this outward swinging motion of the yarn-guide 20 whereby to maintain its looped end 45 bearing constantly on the surface of the winding. If not restrained, the yarn-guide including the blade 47 and the looped end 45 of the wire arm 44 normally would be rocked with the oscillation of the yoke 41, but to prevent such action the stabilizer 66, see Figs. 5 and 8, comes into play to maintain the end of the guide and the lower edge of the blade 47 substantially parallel with the surface of the winding. It has been explained that the arm 44 of the yarn-guide 20 is mounted free to rotate in the bearing 64 of the fork 54 and through the connection of the stabilizer 66 with the bifurcated head 34 of the stud 33 fast in the mounting 28 the guide 20 is prevented from being rocked with the oscillation of the yoke 41. Stated another way, through the engagement of the pin 70 on the stabilizer 66 with the slot 35 in the head 34 of the stud 33 the guide-arm 44 is prevented from turning with the bearing 64 on the fork 54 and consequently the guiding portion of the arm and the blade 48 are maintained level with the proper contact against the surface of the tube T and the layers of winding being deposited thereon.

The progressive shortening of the length of layers in the package takes place due to the recession of the yarn-guide 20 outwardly away from the axis of the package being wound as it pivots about the axis of the pins 57 and 58. That is, as the yarn builds up on the tube T and the guide 20 swings outwardly its amplitude of traverse will be shortened since the end of the guide-arm 44 where the yarn is directed onto the package by the groove 46 will move in a plane at right-angles to the axis on which the fork 54 pivots. Stated more simply, the delivering end 45 of the yarn-guide 20 will be displaced in a direction toward the longitudinal center of the package being wound or, in other words, it will be swung inwardly from the ends of the tube T to gradually reduce the extent of its traverse and thereby progressively shorten the layers of winding so that the package will be built up with tapering ends as illustrated in Fig. 3 of the drawings. Fig. 3 of the drawings illustrates the yarn-guide 20 at the right-hand end of its traverse at the completion of the package and in this view the pick-up blade 47 appears to be tilted or canted from its position shown by dotted lines in this view. The reason for this apparent tilting of the guide is that it is being viewed at an angle and actually the lower edge of the blade 47 will still be parallel with the surface of the package.

It will be understood from the above explanation that the packages P represented in Fig. 3 will thus be formed of superimposed layers with the first layers of maximum length and succeeding layers progressively shortened from start to finish of the winding.

Figs. 9 to 14 of the present drawings illustrate a modified form of construction of the invention which in some respects is simpler than that first described. As shown in Figs. 9 and 10, the winding mechanism is adapted to be applied to a conventional type of up-twister, spinning frame or like machine having a main framework including uprights 100 with horizontally-extending tubular cross-rods 102 at the top. The driving drum 103 is mounted on a horizontal shaft 104 journaled in bearing boxes 105, as in the previously-described machine, and a longitudinally-extending traverse-bar 106 is likewise supported on rollers 107 for reciprocation in a horizontal path on the frame. The winding mandrels 108 for supporting the cores or tubes T on which the packages are wound are mounted somewhat differently from the arrangement first described, the gudgeons 109 at the ends of each mandrel 108 being slidable in vertical grooves 110 formed on the inside of upright members 111 supported by horizontal arms 112. The arms 112 project forwardly from clamps 113 fastened to the tubular rods 102 by bolts 114. Through this arrangement each package-holder or mandrel 108 is

adapted to rise away from its driving drum 103 as the yarn is built up on the tube T.

Bolted to the front of the frame-members 111 are horizontal arms 115 which project forwardly therefrom for supporting certain parts of the winding mechanism as next described. Extending laterally between the arms 115 and rigidly-supported thereby at its ends is a plate 120 formed with an arcuate cam-slot 121 constituted as a track for rocking the mounting for the yarn-guide as later more particularly described. The arms 115 have pivoted thereto at their outer ends a pair of elbow-shaped members 122 reaching inwardly therefrom and supporting a roller-bail 125 adapted to bear against the surface of the layers of yarn wound on the tube T. Also extending between the members 122 is a guide-rod 126 spaced above the roller-bail 125, these elements forming a straight track for the yarn-guide 130 which is reciprocated longitudinally of the package above the bail. The yarn-guide 130 is in the form of a bifurcated wire arm terminating in a V-shaped crotch 131 through which the yarn feeds and having a loop 132 at its opposite end with a screw 133 inserted therethrough for fastening it to a forked mounting 135.

The mounting 135 may be of sheet-metal in bifurcated form with offset legs 136 terminating in ears 137, see Figs. 11 and 12. The ears 137 are perforated to receive a transverse pin 138 for pivotally mounting the guide 130 to swing about the axis of the pin as its guiding end recedes from the axis of the package during its growth in diameter. A spring 134 coiled about the pin 138 tends to rock the guide toward the package to maintain the roller-bail 125 bearing thereagainst. The pivot-pin 138 has its ends mounted in the forwardly-projecting arms 139 of a rockable mounting or yoke 140 which is pivotally connected to the transverse-bar 106 for oscillation by the cam-plate 120. Referring to Figs. 11 and 12, the connection between the yoke 140 and the reciprocating traverse-bar 106 consists in a pin or stud 141 projecting from the yoke through a vertical slot 142 in a vertical plate 143 fastened to the traverse-bar 106 by a screw 144. The pin 141 also projects rearwardly from the yoke 140 through a shoe 145 slidable in the slot 121 of the cam-plate 120. A reduced portion of the shoe 145 engages in the slot 121 of the cam-plate 120 and is flanged at its end to abut the back of the plate. The shoe 145 is fastened to the yoke 140 by means of screws 146 inserted through the back of the yoke and threaded into the shoe, see Fig. 13.

Mounted on an arm 150 bolted to the frame-member 100 is a pigtail-guide 155 through which the yarn y feeds upwardly from its supply spool, not shown, to draw across the rod 157 and thence lead across the wire guide-rod 126 and down through the crotch 131 at the end of the yarn-guide 130 to feed around the bail 125 to the winding package.

The method of operation of this last-described construction of the device is as follows: As the traverse-bar 106 is reciprocated longitudinally of the machine the plate 143 rigidly attached thereto is connected to reciprocate the yoke 140 through means of the stud 141 engaging through the slot 142 in the plate. The shoe 145 on the yoke 140 is thus caused to slide back and forth in the slot 121 of the cam-plate 120 with a rocking motion imparted thereto which oscillates the yoke 140, first in one direction and then in the opposite direction as the yarn-guide 130 approaches the ends of its traverse. The oscillation of the yoke 140 is transmitted to the yarn-guide 130 to rock its guiding end toward the longitudinal center of the package as the guide moves away from this center at the ends of its stroke in either direction; similarly to the action of the oscillating thread-guide of the first-described construction. Also, as in the method of operation of the first-described embodiment, the yarn-guide 130 is swung about the pivot-pin 138 by the receding movement of the roller-bail 125 from the axis of the package as the winding increases in diameter. Consequently, as the yarn-guide 130 swings upwardly on its mounting or yoke 140 it is caused to toe-in toward the longitudinal center of the package as it approaches each end of its traverse. This canting or toeing-in action of the yarn-guide 130 increases as it swings upwardly with its swinging motion being in a plane inclined to the axis of the package due to the oscillation of the guide at its mounting on the yoke 140. In this way, the amplitude of traverse of the guide is progressively reduced as the package builds up on its core T whereof the layers of winding are gradually shortened to form the package with tapered ends. It will therefore be understood that in either form of construction of the invention the traverse of the yarn-guide is progressively reduced in extent so that taper-ended packages may be wound one after another; it being only necessary to thread the yarn into the guide and place it in position adjacent the surface of the cop-tube T to start the winding operation.

It will be observed from the foregoing specification that the present invention provides a novel form of construction of a winding device which operates in a new way to produce the desired result of winding packages with tapered ends. While the invention is illustrated herein in a preferred embodiment with one modified form of construction, it is to be understood that further changes may be made in the structure and arrangement of the parts of the device without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In combination with a driving drum, means for mounting a package for contact with the driving drum to adapt it to be rotated thereby with its axis receding from said drum during the growth of the package, a reciprocating traverse-bar, a member pivotally mounted on said bar to rock in a plane substantially parallel to its path of reciprocation, a yarn-guide pivoted to the rockable member to adapt it to swing about an axis disposed substantially perpendicular to the axis of said rockable member, means for rocking said member during the reciprocation of the traverse-bar to cause the yarn-guide be displaced inwardly from the ends of its normal traverse as it swings about its own pivot, and means to prevent the yarn-guide from turning relative to the surface of the package during the rocking of said member.

2. In a device for winding taper-ended packages, the combination with means for supporting and rotating a package and a traverse-bar reciprocable longitudinally of the package, of a yarn-guide for distributing yarn on the package comprising an arm with a guiding groove at its end, an oscillating member connected to the traverse-bar and pivoted to rock on an axis crossing the plane of movement of the traverse-bar, a mounting for the yarn-guide arm pivoted to the

oscillating member to swing about an axis at right-angles to its axis of oscillation, means for mounting the yarn-guide arm for relative turning motion in the mounting, stabilizing means for preventing the yarn-guide arm from turning in its mounting during the rocking motion of the oscillating member, and means for oscillating said member whereby the swinging movement of the yarn-guide arm thereon during the growth in diameter of the pacgage will cause it to move in a plane inclined to its path of movement at the ends of its traverse to progressively displace the slotted end of the guide inwardly from the ends of its normal traverse during the progress of the winding to form the package with tapered ends.

3. In a winding device embodying means for supporting and rotating a package and a longitudinally-reciprocating traverse-bar, the combination therewith of an oscillating member reciprocated by said traverse-bar, a yarn-guide for distributing the yarn on the package, means for mounting the yarn-guide on the oscillating member to swing about an axis disposed at right-angles to its axis of oscillation, and a lever pivoted to the traverse-bar with one end connected to the oscillating member and its opposite end pivotally held to cause it to rock the oscillating member during its reciprocation, said yarn-guide being adapted to swing about its pivot in a plane inclined to its direction of reciprocation during the oscillation of said member whereby to displace it inwardly from the ends of its normal traverse to deposit the yarn in layers of gradually reduced extent to build the package with tapered ends.

4. A winding mechanism comprising means for mounting and rotating a package-core to wind yarn thereon, a traverse-bar reciprocable longitudinally of the axis of said package-core, a member connected to said traverse-bar for reciprocation thereby, a mounting pivoted to said member to adapt it to oscillate about an axis at right-angles to the plane of reciprocation of the traverse-bar, a yarn-guide pivoted on said mounting to swing about an axis at right-angles to its axis of oscillation, a lever pivoted to the traverse-bar and provided with means at one end for pivotally connecting it to the mounting, a fixed member having a slot, and a pivot-stud in the opposite end of the lever slidable in said slot for connecting it to the fixed member to cause the lever to rock the mounting during the reciprocation of the traverse-bar.

5. In a winding mechanism, means for supporting and rotating a package, a reciprocating member, a rockable member pivoted to said reciprocating member to rock about an axis perpendicular to its direction of reciprocation, a member pivoted to the rockable member to swing about an axis at right-angles to the axis of said rockable member, a yarn-guide supported by said swingable member to adapt it to recede from the axis of the package being wound, and a lever connected to the rockable member to oscillate it and displace the yarn-guide inwardly from the ends of its normal traverse to effect a progressive reduction in its amplitude of traverse as the package increases in diameter.

6. In a winding device, means for supporting and rotating a package, a reciprocating member, a member pivoted to said reciprocating member to rock about an axis substantially perpendicular to the direction of its reciprocation, a guide-supporting member pivoted to said rockable member to swing about an axis at right-angles to the axis of said rockable member, a yarn-guide supported by said last-named member to adapt it to turn therein to maintain the end of the guide bearing flat against the surface of the package, means for retaining the guide in said flat position during the rocking motion of the rockable member, and means to rock said rockable member as the guide swings on its pivot during the growth in diameter of the package to cause said guide to move in a plane inclined to the axis of the package to gradually reduce its amplitude of traversing motion and progressively shorten the layers of winding to build the package with tapered ends.

7. In a winding device, the combination with means for supporting and rotating a package, of a reciprocating member, means to reciprocate said member longitudinally of the axis of the package, a rockable member pivoted to the reciprocating member on an axis disposed transversely of the direction of its reciprocation, a member pivoted to said rockable member on an axis crossing the axis of said rockable member, an arm extended from said pivoted member and provided with yarn-guiding means at its end adapted to distribute the yarn on the package, a lever pivoted to the reciprocating member with one end connected to rock the rockable member, and means for retaining the opposite end of said lever to adapt the motion of the reciprocating member to oscillate the lever and rock the rockable member.

8. In a winding device, the combination with means for supporting and rotating a package, of a reciprocating member, a yoke pivoted to said reciprocating member to adapt it to rock about an axis extending transversely of the direction of reciprocation of said member, a fork pivoted to said yoke to swing about an axis extending at right-angles to the axis of said yoke, an arm connected to said fork and extending therefrom with yarn-guiding means at its end, a lever pivoted to the reciprocating member and having a pivot at its end engaging a slot in the yoke, a stationary slotted member, and a stud at the opposite end of the lever engaging the slot in the stationary member.

9. In a winding device, in combination with means for supporting and rotating a package and a reciprocating member, an arm pivoted to said member to adapt its end to swing toward and away from the axis of the package, means at the end of said arm for guiding the yarn to traverse it longitudinally of the package, and a threading element adjacent the guiding end of the arm, said threading element having a central slot on its under side to adapt the yarn to enter thereinto and formed with an upwardly-directed edge at one end to adapt it to ride over the yarn to cause it to be received in the slot, said threading element having a reversely-directed edge at its opposite end to adapt it to ride under the yarn to pass therebeyond so that during the reverse reciprocation of the guide the opposite end of said element will ride over the yarn and engage it in the slot in said element.

10. In a winding device, the combination with means for supporting and rotating a package of a traverse-member, a yarn-guide hinged to said traverse-member and projecting towards the package with a guiding groove at its end, and a pick-up threading element for the yarn constituted as a blade having a slot entering from its lower edge in alinement with the groove in

the guide, one end of the blade being formed with its lower edge sloping upwardly to adapt it to ride over the yarn to cause the latter to enter the slot in the blade and be directed into the groove in the guide, the opposite end of said blade being formed with its upper edge sloping downwardly to adapt this end of the blade to plow under the yarn to pass thereby when the guide is traversing in one direction so that the blade will ride over the yarn as the guide traverses in the opposite direction to catch the yarn and direct it into the groove in the guide in the manner as first explained.

11. In a winding machine, in combination with means for supporting and rotating a package and a traverse-bar reciprocable longitudinally of the package, a yarn-guide comprising an arm hinged to the traverse-bar and projecting therefrom toward the package, said guide formed with a groove at its end for receiving and guiding the yarn to traverse it on the package, and a self-threading pick-up means adjacent the guiding end of the arm comprising a blade projecting laterally therefrom and formed with a central slot alined with the groove in the guide, said blade having its lower edge inclined upwardly at one end and its upper edge inclined downwardly at its opposite end whereof when the yarn-guide is reciprocated in one direction along the periphery of the package the pick-up blade will ride over the yarn to receive it in its slot and direct it into the guiding groove, and when the guide is moved in the opposite direction the blade will plow under the yarn to pass therebeyond so that it may be picked up by the slot in the blade at the next reverse traverse of the yarn-guide.

12. In a mechanism for use with a winding device embodying means for rotating a package and a reciprocating traverse-member, the combination comprising an oscillating member adapted to be reciprocated by said traverse-member, a yarn-guide for distributing yarn on the package, means for pivotally mounting the yarn-guide on the oscillating member to swing about an axis normal to its axis of oscillation, and a lever adapted to be pivoted to the traverse-member with one of its ends connected to the oscillating member and its opposite end pivotally held to cause it to rock the oscillating member during its reciprocation, said yarn-guide being adapted to swing about its pivot in a plane inclined to its direction of reciprocation during the oscillation of said member whereby to displace it inwardly from the ends of its normal traverse to deposit the yarn in layers of gradually reduced extent to build the package with tapered ends.

13. In a mechanism for use with a winding machine having means for rotating a package and a reciprocating member, the combination comprising a yoke adapted to be pivoted on said reciprocating member to rock about an axis extending transversely of the direction of the reciprocation of said member, a fork pivoted to said yoke to swing about an axis extending at right-angles to the axis of said yoke, an arm connected to said fork and extending therefrom with yarn-guiding means at its end, a lever adapted to be pivoted to the reciprocating member and having a pivot at its end engaging a slot in the yoke, a slotted member adapted to be fixedly mounted, and a stud at the opposite end of the lever engaging the slot in said slotted member.

NORMAN E. BOILY.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,063,235	Adsit	June 3, 1913
1,900,480	Bartholomew	Mar. 7, 1933
2,178,263	McKean	Oct. 31, 1939
2,200,388	Finlayson	May 14, 1940
2,206,582	Shipman	July 2, 1940
2,249,384	Hitchcock	July 15, 1941
2,395,522	Thomas	Feb. 26, 1946
2,475,895	Hill	July 12, 1949

FOREIGN PATENTS

Number	Country	Date
43,973	Germany	July 26, 1888
46,975	Germany	May 10, 1889