April 5, 1949. R. H. LAWSON 2,466,600

WINDING MACHINE

Filed Dec. 28, 1944 2 Sheets-Sheet 1

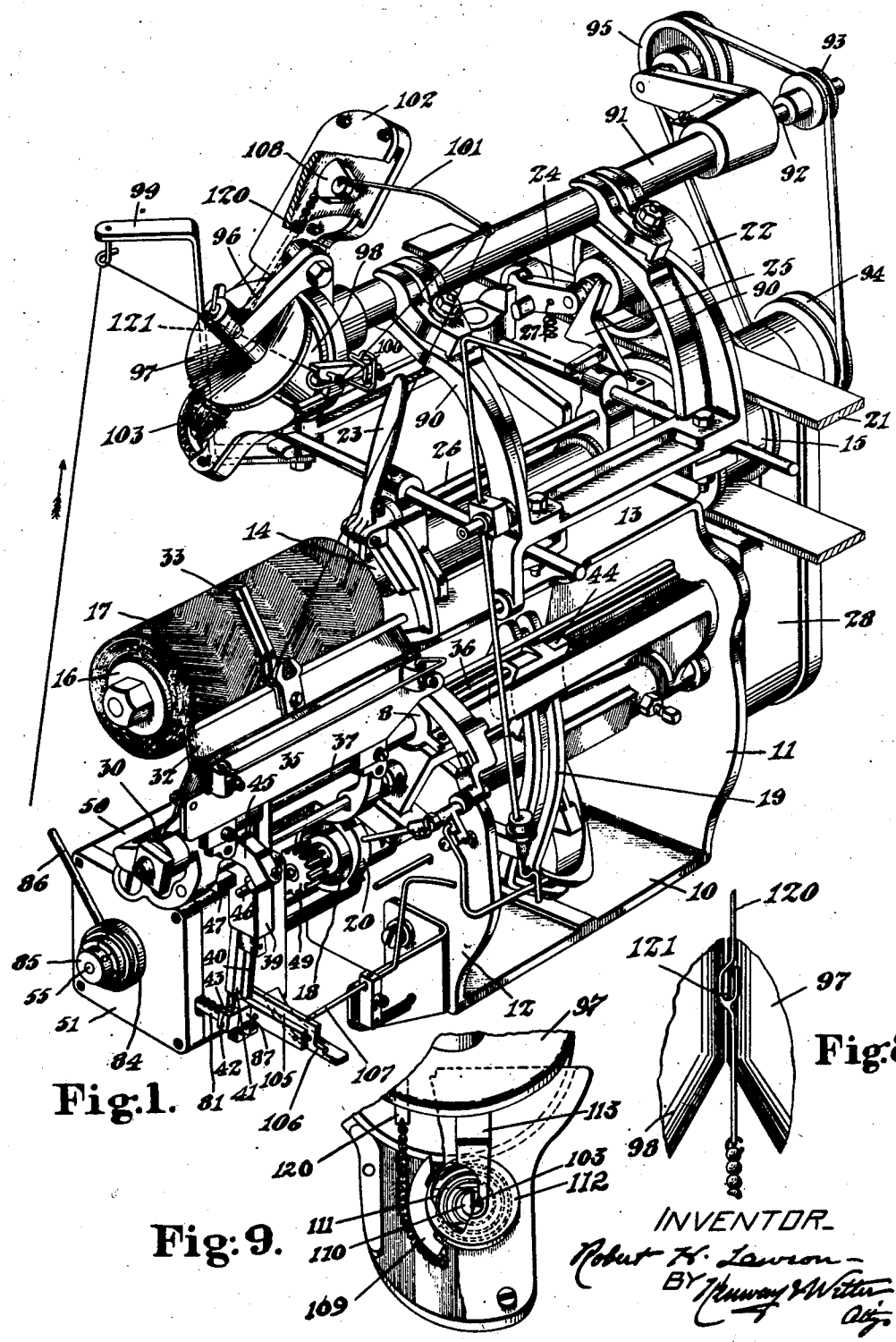


Fig. 1.

Fig. 8.

Fig. 9.

INVENTOR.
Robert H. Lawson
BY Kenway & Witter
Atty.

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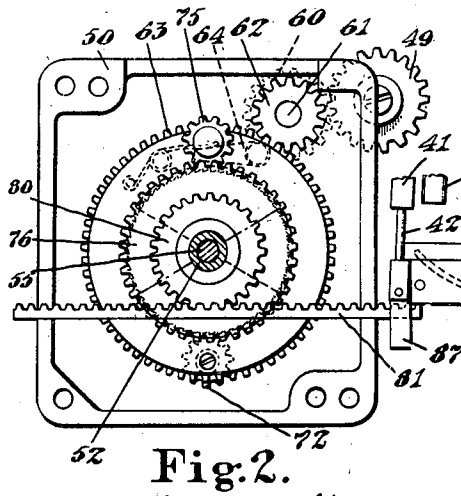


Fig.2.

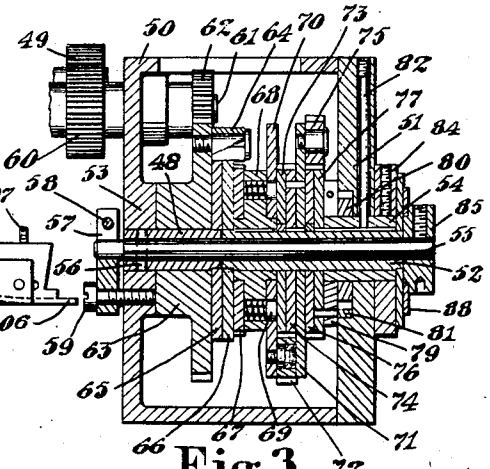


Fig.3.

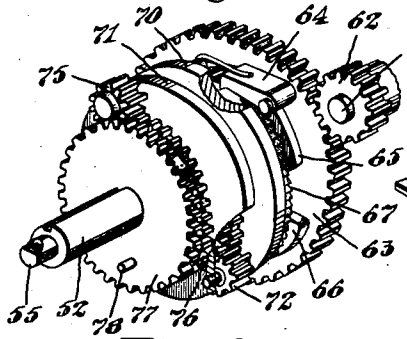


Fig.4.

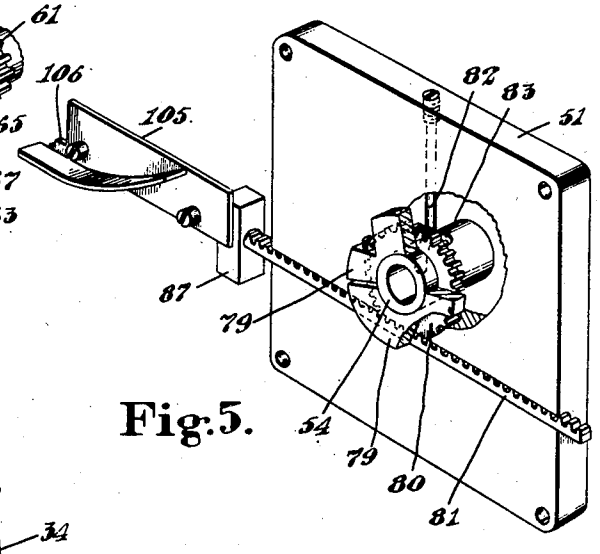


Fig.5.

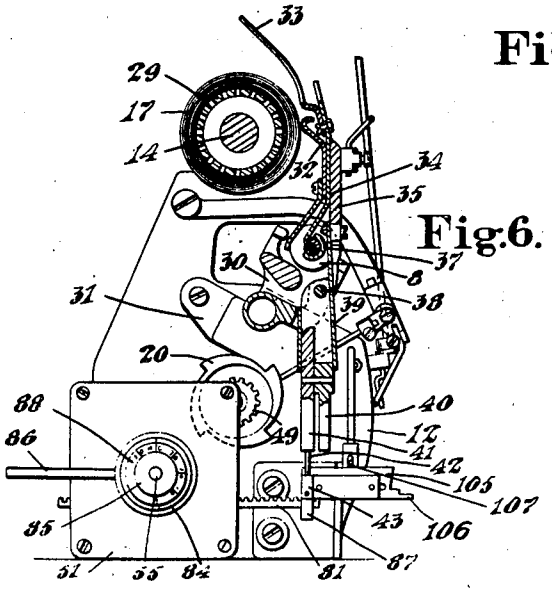


Fig.6.

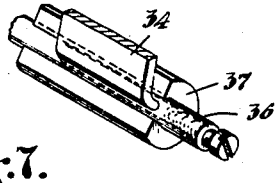


Fig.7.

INVENTOR.
Robert H. Lawson.
BY Kenway & Witter
Attys.

Patented Apr. 5, 1949

2,466,600

UNITED STATES PATENT OFFICE

2,466,600

WINDING MACHINE

Robert H. Lawson, Lakeport, N. H., assignor, by mesne assignments, to The Werdna Company, Bristol Highlands, R. I., a partnership

Application December 28, 1944, Serial No. 570,048

14 Claims. (Cl. 242—45)

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This invention relates to machines for winding yarn, thread or other filaments and consists in improvements whereby thread packages may be automatically wound at high speed with more exact control of density and accuracy in size, shape, contents, and in all other respects than has been possible heretofore. My invention also includes within its scope the novel process of winding filaments herein disclosed.

In one aspect my invention consists in the broad combination of a back carrying a thread guide, with a rotary spindle for a thread or yarn package in which these two elements are moved relative to each other and positively at a predetermined rate of separation controlled or determined by the number of revolutions of the thread package, or separated at a substantially fixed ratio with respect to the rate of spindle revolution, thereby maintaining a uniform pressure or a definitely controlled and regulated pressure on the periphery of the package as it is built up in the winding operation.

Many attempts have been made heretofore to control the position and movement of the back by brake mechanism, counterweights or by gravity control, but none of these has been entirely successful in insuring a smooth and steady predetermined motion of the back and controlled predetermined pressure on the thread package without some irregularity due to vibration, inertia or friction. Accordingly, it has been practically impossible automatically to wind thread packages with unfailing precise uniformity and without variations in density, in length of yarn or in thread distribution. I have discovered that these difficulties may be eliminated by positively retracting the back in a movement controlled by the number of spindle or thread package rotations. In this way I am enabled to insure predetermined or uniform pressure of the back against the periphery of the thread package throughout the winding operation. This is the most important factor, but not the only factor, in controlling the density of the thread package, since the pressure of the back continually tends to rewind the package as it is built up on the spindle. Accordingly, if uniformity of density is desired in the package, the pressure of the back upon its periphery must be maintained uniformly, or if variations in density are desired the pressure of the back must be accurately controlled in exact accordance with the desired result.

In the preferred embodiment of my invention I provide mechanism for counting the number of spindle rotations and for retracting the back in accordance with the number of turns made by it. This involves a gear reduction movement in the order of approximately 1,000,000 to 1. Such mechanism constitutes another feature of the

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present invention, as will be described in detail hereinafter.

Other important features of the invention consist in provision for conveniently adjusting the ratio of back retraction movement to spindle or package rotation, in convenient means for resetting the mechanism for a new thread package, and in convenient means for permitting temporary separation of the back and thread package in case of emergency.

Another important feature of the invention consists in the combination of improved back operating mechanism as above discussed with a furnishing device which will insure that the thread or yarn shall reach the package with a uniform tension throughout the winding operation. The usual tension devices can only add to the tension of the thread coming from its source of supply. In winding machines heretofore used a slight tension from the source considerably increases the resultant tension on the thread as it is wound upon the package, and the change of rate of speed also affects the tension when the thread is built up in the rotating package. I have found, however, that by providing a furnishing device between the source of supply and the thread guide, all irregularities in tension are obviated and delivery of the yarn is insured at a uniform tension and unstretched or with a uniform stretch. This is especially important in the more elastic yarns such as nylon if the package is to be of a maximum size and the yarn to be in the best condition.

Important advantages of the present invention are:

(1) That the pressure against the thread package may be light and uniform, or heavy and uniform. Yarn has a tendency to full out on a package thereby requiring a considerable range of variation in the speed of the back carrying the thread guide. The brake mechanisms heretofore used in connection with the back, when once pushed away from the package, often acted with a jerky pressure that resulted in non-uniform density of package.

(2) That when the mechanism of the present invention is employed there is eliminated the tendency of the package to spring. In winding machines heretofore known this effect has been objectionable, especially with soft packages and as the size of the package increased.

(3) That greater accuracy of thread guide is assured by positively insuring the position of the back. The guide is moved in a constant cycle with more freedom from vibration than in any mechanism heretofore known, and therefore gives cleaner ends in the thread package, free from cross overs or overlaps.

(4) That the present invention permits all the winders in a room to be set alike so that a definite

number of spindle revolutions in each of the machines will lay the thread in uniform condition with uniform stretch or no stretch.

Another important feature of the invention consists in the combination of mechanism for positively controlling retraction of the back as the thread package increases in size in such a way that the pressure on the package being wound will be either uniform or practically nonexistent, together with means normally acting to pull the thread positively from a source of supply and deliver it to the thread guide always at a uniform tension.

This novel combination is essential in producing a package accurate in shape wound of thread with uniform tension, especially if uniform light tension is desired. The pressure of the thread guide on the package increases the tension of the thread as wound in the package. Accordingly, this pressure must be maintained at a predetermined degree; that is, it must either add nothing to the tension of the thread delivered to the package, or it must add a definite ascertainable amount. In the second place, it is essential that the thread should reach the thread guide always with a uniform and predetermined degree of tension. The first factor is insured by the novel mechanism herein shown for controlling the position and movement of the back, and the second factor is insured by the provision of a furnishing mechanism, such as shown, which operates normally to pull the thread from a source of supply and to pass it along with a predetermined ascertainable degree of tension. When these two conditions are fully realized the resulting thread package is superior in uniformity to packages heretofore produced since the thread is thus wound under uniform tension from start to finish. Packages wound under the control of only a furnisher or only a back are not completely uniform, for even if the thread leaves the furnisher under uniform tension down to the guide, lack of uniform pressure of the back against the package causes fluctuations in the amount of tension in the thread as it goes onto the package. On the other hand, even if the back is controlled to give a uniform pressure against the package, the lack of uniform tension in thread coming from the source of supply inevitably causes irregularities in the package. It is only by the cooperation of the two mechanisms in combination that complete uniformity of tension of the thread in the package can be achieved.

These and other features of the invention and characteristics of the novel process will be best understood and appreciated from the following description of a preferred embodiment of the mechanism selected for purposes of illustration and shown in the accompanying drawings, in which:

Fig. 1 is a view in perspective of the complete machine,

Fig. 2 is a view in end elevation of the gear mechanism for positively retracting the back from the spindle or the package thereon,

Fig. 3 is a view of the same in longitudinal section,

Fig. 4 is a view in perspective of a portion of the gear mechanism,

Fig. 5 is a view in perspective of the cover plate of the gear mechanism and associated parts,

Fig. 6 is a view of the machine in end elevation, partly in section,

Fig. 7 is a fragmentary view in perspective of a detail of the thread guide mechanism, and

Figs. 8 and 9 are fragmentary views showing details of the furnishing mechanism.

The machine frame comprises a base 10 having upright side members 11 and 12 connected by a top member 13. The side members of the frame support journal boxes for the winding spindle 14 which is provided adjacent to its right-hand end, as seen in Fig. 1, with a flanged driving pulley 15. At its other end the spindle 14 projects beyond the left hand upright side member 12 of the frame and is provided with a flange 16 and collar (not shown) between which may be clamped a cop 29 on which the thread package 17 is to be wound. In Fig. 6 the cop 29 is shown as cylindrical in shape and perforated as used in package dyeing. The cop is held in position on the spindle 14 between the flange and collar by a nut threaded upon the free end of the spindle and engaging the flange 16.

In the side members 11 and 12 of the frame below the spindle 14 is also journaled a cam shaft 18 carrying a traverse cam 19. The cam shaft 18 is driven positively from the spindle 14 at reduced speed through gears contained in a gear box 28 which is fast to the right hand upright 11 of the frame. The spindle is driven by a flat belt 21 controlled by a belt tightening idler 22 mounted on a stud projecting transversely from an arm 24 pivotally supported by a bracket at the rear of the machine frame and normally pulled down into driving relation by a tension spring 27. The free end of the arm 24 is rounded and bears against a cam 25 connected through a horizontal rod 26 to an upstanding starting handle 23. When the machine is to be stopped, the handle is swung to the left, as seen in Fig. 1, and the idler raised permitting the belt 21 to leave the driven pulley 15. When the machine is to be set in operation, the handle 23 is moved to the right thus retracting the cam 25 and permitting the idler arm 24 to swing downwardly under the actuation of the spring 27 and the belt 21 is thus deflected into driving contact with the driven pulley 15.

The thread package is wound upon the cop on the spindle 14 from thread delivered through thread guiding and controlling means carried by a swinging back supported outside the upright member 12 of the frame opposite to the thread package.

The back comprises a frame 30 mounted to swing on bearings supplied by a yoke-shaped bracket 31 bolted to the upright side member 12 of the machine frame. The rocking frame 30 carries an upstanding plate 32 having a bead at its upper edge which bears against the thread package and provides a guideway for a forked thread guide 33 which is secured at its lower end to a flat vertical carriage 34 (Figs. 6 and 7). The front and outer portion of the guideway for the carriage 34 is provided by a vertical plate 35 which is attached to the rocking frame 30 in spaced relation to the beaded plate 32.

The carriage 34 is bent forwardly at its lower end to form a flange which is fastened in a slot in the outer end of a horizontal rod 36 fast at its inner end in a sliding block 44 carrying a downwardly extending cam roll which runs in the groove of the traverse cam 19. At its outer end the rod 36 is guided in a segmental block 37 mounted in cylindrical sleeve 8 which is part of the rocking frame 30. In the illustrated machine, but not necessarily, the rod 36 is arranged concentrically with the axis of the rocking frame 30 so that the traverse or longitudinal movement of

the thread guide is not interfered with by the rocking of the back.

The rocking frame 30 also carries a horizontal rod 38 (Fig. 6) to which is pivotally secured a downwardly extending link member comprising a hollow vertical leg 39 having a square tubular lower end. A pivoted connecting member 40 mounted on a downwardly extending bar 41 has an upper end portion which normally cooperates with the bar 41 to fill the space between opposite side walls of the lower end of the leg 39, as seen in Fig 6, thereby providing a rigid connection between the leg 39 and the bar 41. Upon tilting the member about its pivot, the upper end thereof is withdrawn from the leg 39 thereby providing a loose fit between the bar 41 and the leg 39. This unlocks the back to permit the same to be moved away from the package a slight distance, depending upon the extent of movement between the leg 39 and the bar 41 before the right side wall of the leg contacts the bar 41 and is stopped thereby.

The bar 41 is bored to receive at its lower end a rod 42 fastened in turn at its lower end in a block 43 which is pivotally connected to a block 87 fast to the end of a horizontally moving rack 81, to be presently described.

It will be apparent that as the rack 81 is moved inwardly, or toward the left in Fig. 1, the back is retracted about the axis of the rod 36 through the connecting mechanism above described. The locking member 40 supplies means for quickly breaking the connection in case it should be desired to move the back independently of its geared operating mechanism.

The rocking frame 30 is provided near its outer end with a forwardly and downwardly projecting arm 45 carrying an adjustable stop screw 46, arranged to contact with a stationary abutment 47 on the bracket 31 to limit the extreme outward position of the back.

The block 87 carries also a portion of an automatic stopping mechanism comprising a vertical plate 105 having a shoulder 106 at its outer end, and normally supporting at its upper edge a horizontal trip rod 107. The plate 105 is moved inwardly by the rack as the back is retracted. When it reaches a position permitting the rod 107 to drop off upon the shoulder 106, corresponding to full package size, the machine is brought to rest by automatic stopping mechanism operated by a step cam 20 on the cam shaft 18. This mechanism will not be described herein since it forms no part of the present invention but is well known in winding machines.

The gear mechanism for controlling the position of the back will now be described. This is operated by a pinion 49 secured to the outer end of the cam shaft 18, the latter, as already noted, being driven from the spindle through reducing gears. The mechanism is enclosed in a rectangular casing 50 secured to the machine frame beyond the end of the shaft 18 and having a removable cover plate 51 closing its outer side. A two part hollow shaft 48—52 is journaled in this casing, the left hand part 48 in a boss 53 projecting inwardly from the inner wall of the casing 50 and the right hand part 52 in a sleeve or bushing 54 rotatably mounted in the cover plate 51. Within the hollow shaft 48—52 is journaled a solid shaft 55 connected at its left hand end, as shown in Fig. 3, by a pin 56 to the hollow shaft section 48 and extending outwardly through the inner wall of the casing 50 where it is provided with a friction arm 57 adjustable in its holding action by means of a clamping screw 58 and held against rotation by a screw 59 which passes through the arm 57 and is threaded into the inner wall of the casing. It will be understood that the concentric shafts 52 and 55 are thus normally held at rest but may be turned a limited amount against the friction of the arm 57, the amount of friction being regulated by the screw 58.

The pinion 49 on the end of the cam shaft is arranged to mesh with a pinion 60 fast on the outer end of a short shaft 61 journaled in the upper portion of the inner wall of the casing and carrying at its inner end a pinion 62 (Figs. 2 and 3). This drives a large gear 63 journaled to rotate upon the hollow shaft section 48 within the casing and located next to the boss 53 on its inner wall. The gear 63 carries a wide pawl 64, best shown in Fig. 4, and this pawl is controlled in its action by a stationary disk shield 66 and an adjustable disk shield 65. The adjustable shield 65 is fast upon the hollow shaft section 48 and may be given a rotary adjustment thereby as will presently be explained. Adjacent to the two shields is a toothed ratchet disk 67 and a small portion of its circumference is exposed to the action of the pawl 64 in the gap or recess of the two shields 65 and 66. With the shield 65 set as shown in Fig. 4, the pawl 64 may engage and advance the ratchet disk 67 for a distance of 4 or 5 teeth before the pawl is thrown out of operation, but the adjustable shield 65 may be set so that the operation of the pawl 64 may include anywhere from 1 to 50 or more teeth of the ratchet disk, corresponding to the rate of movement which it is desired to impart to the back for the work in hand.

The ratchet disk 67 is fast upon the hub of a disk 68 arranged to turn freely upon the hollow shaft section 52. The hub is symmetrically shouldered and at its other end, that is, its right hand end as seen in Fig. 3, is fastened a disk 70 that carries near its circumference a small pinion 72. This pinion 72 meshes simultaneously with two narrow gears 73 and 74 mounted on the hollow shaft section 52 and differing from each other in pitch by a single tooth. The gear 73 is keyed to the hollow shaft section 52 and is therefore normally stationary, while the gear 74 is free to turn and will accordingly be advanced one tooth with respect to the gear 73 for each complete revolution of the disk 70 carrying the small pinion 72. For example, the gear 73 may have 50 teeth and the gear 74 may have 49 teeth, with the result that the gear 74 will be rotated on the shaft section 52 once with respect to the gear 73 for each 50 revolutions of the pinion-carrying disk 70. The disks 68 and 70 are chambered to contain a series of small symmetrically arranged spring plungers 69 which are effective to act as brakes on the ratchet disk 67 to prevent overrunning thereof.

The gear 74 is pinned to a second pinion-carrying disk 71 having near its periphery a small pinion 75. The pinion 75 is arranged to mesh with two narrow gears 76 and 77 of equal diameter, the gear 76 being keyed to the hollow shaft section 52 and the gear 77 being freely rotatable thereon. The gears 76 and 77 vary from each other in pitch by a single tooth and therefore provide another gear reduction which may again be 50 to 1.

The slowly rotating gear 77 is fastened by a pin 78 to a friction collar or disk 79, best shown in Fig. 5, which is frictionally mounted on the inner end of the sleeve 54. This sleeve also carries a

pinion 80 which is fixed thereon and is arranged to revolve in a recess formed in the inner face of the cover plate 51 and meshes with the rack 81 mentioned before which is guided for rectilinear movement in a horizontal slot extending from side to side of the cover plate 51. At its outer end the rack is connected to the block 87 through which it acts to move the back toward and from the spindle as will be presently explained.

Rotation of the sleeve 54 is limited by a circumferential slot 83 therein extending about half way around the sleeve and into which projects the end of a stop pin 82 threaded into a vertical bore in the cover plate. Partial rotation of the sleeve may be effected manually through the medium of a collar 84 fast to the outer end of the sleeve and provided with a socket for a handle 86 as shown in Fig. 1. When the handle 86 is turned in counter-clockwise direction to its extreme left hand position (Fig. 6) permitted by the slot 83, the sleeve 54 is rotated in the friction disk 79, turning the pinion 80 meshing with the rack 81 and swinging the back inwardly to its initial position adjacent to the cop on the spindle 14, all without interrupting the operating connection between the back and the reducing gear. As the mechanism above described is operated by the reducing gear, the pinion 80 is turned in the opposite direction (clockwise as seen in Fig. 2) and the back positively retracted from the cop.

Pinned to the outer end of the solid shaft 55 is a small concentric collar 85 also having a socket for a removable handle by which this shaft may be turned to adjust the disk shield 65. Beneath the collar 85 is a disk 88 graduated from 1 to 50 to indicate the number of ratchet teeth on the ratchet disk 67 which are exposed to action of the pawl 64 corresponding to the setting of the collar 85.

Assuming, for example, that the gear reduction between the spindle 14 and the cam shaft 18 is 1 to 5, the reduction between the pinion 62 and the gear 63 is 1 to 5; between the ratchet and the ratchet wheel is 1 to 15, the gears 73 and 74 is 1 to 50, and the gears 76 and 77 is 1 to 50, we have a total reduction of 937,500 to 1 between the spindle revolution and the revolution of the pinion 80 which drives the rack 81. In other words, for each 937,500 revolutions of the spindle, in which 937,500 turns of yarn are laid in the package, the back is retracted a distance corresponding to one turn of the pinion 80.

The thread or yarn to be wound is delivered to the thread guide 33 of the back from a source of supply through the medium of a furnishing device which has the function of positively drawing the yarn from the source of supply at the variable rate required by the thread package in its growth and then passing the strand along after imposing a uniform tension upon it. Such a furnishing device is disclosed in detail in my prior Patent No. 2,273,052, dated February 17, 1942, to which reference may be had for details of structure.

As shown in Fig. 1 the furnishing device is mounted upon a pair of brackets 90 which project upwardly from the upper member of the machine frame and carrying at their upper ends a horizontal tubular support 91. In this support is journaled a shaft 92 having a driving pulley 93 at its outer end. The shaft is driven by a belt from a driving pulley 94 at the outer end of the spindle shaft 14, tension being maintained on the belt by an idler roll 95 mounted in a bracket fast to the tubular support 91.

Another bracket 96 is fast to the left hand end of the support 91 and in this is journaled a shaft carrying a cone 97 arranged to rotate freely in inverted position about a downwardly inclined axis. The cone 97 contacts with a similar cone 98 fast to the left end of the shaft 92. The axes of the two cones intersect and their surfaces are provided with rubber coatings which grip and advance the yarn between them. The yarn or thread passes from the source of supply to an eye carried by an upstanding bracket 99 which guides the thread to a movable thread guide, and thence to the area of contact between the two cones 97 and 98. The path of the thread between these cones, that is to say, its distance from the apex, is determined by the movable thread guide having an eye 121 (Fig. 8) which is supported on the entry side of the cones. This thread guide is connected to a thread arm 101 movably mounted in a casing 102 also supported by the bracket 96. From the cones the thread passes outwardly to a fixed eye 100 (Fig. 1), then upwardly to an eye in the outer end of the governing arm 101 and thence it passes directly to the thread guide 33 on the back.

As herein shown the thread arm 101 projects outwardly from a sector 108 pivotally mounted in the upper part of the casing 102 of the furnishing device. A similar sector 109 is mounted in the lower part of the casing as best shown in Fig. 9. Short chains are wrapped about both sectors and are connected by a light bar 120 in which is formed the thread guide eye 121. The lower sector 109 has a stud 110 to which is connected a torsion spring 111 tending at all times to swing the sector 109 in a counter-clockwise direction thereby moving the eye 121 toward the apex of the strand-feeding cones and tending to lift the thread arm 101. The other end of the spring 111 is connected to a circular cover 112 frictionally held beneath an arm 113 attached to the casing 102 and rotatable for adjusting the tension of the spring 111. A clamping screw 103 is provided for holding the cover 112 in any desired position of adjustment. In general the action of the spring 111 balances the weight of the thread passing through the eye of the thread arm 101, the tension of the spring lightly resisting downward swing of the thread arm.

When the thread package is first started and the thread is being wound at a relatively slow linear rate, the thread arm 101 occupies an initial elevated position and through its connections leading the thread in a path close to the apices of the two cones. With the thread so guided the furnishing device draws from the supply at a relatively but positive slow rate. On the other hand, as the diameter of the thread package increases, and the thread is wound at an increasing linear rate, the thread arm 101 is swung downwardly and through its connections the thread is guided in a path disposed nearer and nearer to the base of the cones 97 and 98 so that the thread is drawn at an increasingly faster rate from the thread supply.

It will be seen, therefore, that the furnishing device positively draws the thread from the source of supply, eliminating any irregularities of tension incident thereto, and then positively advances the thread so that it issues from between the cones 97 and 98 without initial tension.

While I have illustrated my invention as embodied in a winding machine in which the spindle for the thread or yarn package is rotated about a fixed axis, it will be understood that my in-

vention may be applied with equal advantage to winding machines of other types, for example, the well-known Foster Winding Machine or the Universal Winding Machine in which the thread package rests on a revolving roller and is turned thereby. In applying my invention to a machine of that type the relative separation would be effected by positive movement of the spindle and the roller would be the full equivalent of a back. In the accompanying claims, therefore, I use the term "back" in a broad sense to include any guide or roller or contact member that serves the function of a back in engaging the yarn or thread as it is built upon a spindle into the form of a package.

It will be noted further that while the reducing gear mechanism for positively moving the back is herein shown as driven from the spindle shaft, and while I prefer to drive it in this manner, it would be within the scope of my invention to drive it by a separate constant speed electric motor rotating at a substantially fixed ratio with respect to spindle rotation.

Thread or yarn is delivered from a source of supply through the furnishing device to the thread guide **33** always at uniform tension and always at the rate of speed required by the rotating thread package. The back is set in its initial position adjacent to the cop **29** on the winding spindle by clockwise rotation of the collar **84**. The rate of movement of the back is adjusted to the denier of the yarn by setting the collar **85** to expose the proper number of ratchet teeth between the disk shields **65** and **66**. When the machine is set in operation, the pinion **80** is driven positively at a fixed ratio with respect to the turns of the spindle, for example, 1 to 937,500. The movement of the back during the winding operation is thus controlled in a positive manner for obtaining a yarn package of uniform and predetermined density. Where the winding operation proceeds in the normal manner it is clear that yarn of the desired denier is being wound to provide a package of predetermined shape and density, and examination of the individual packages may thus be eliminated with a considerable economy in the cost of handling the yarn. When the package has been completed and removed from the spindle, the back may be restored to its initial position by rotation of the collar **84**, or if it is desired for any purpose to move the back independently of its operating mechanism the driving connection may be temporarily interrupted by rocking the locking member **40**.

Another advantage I have observed in operating the mechanism herein described is that it tends always to correct the shape of the thread package. For example, if the package has become out of round or otherwise distorted by accident or mischance, my new combination of positively acting furnishing device together with mechanism for positively controlling retracting movement of the back as the thread package increases in size will immediately begin to restore the package to its perfect circular cross section uniformly throughout its length.

The co-pending application of Charles D. Jencks discloses another construction which may be successfully used in the said combination for controlling the retracting movement of the back.

This application is a continuation-in-part of my co-pending application Ser. No. 504,752, filed October 2, 1943, now abandoned.

Having thus disclosed my invention and described in detail one illustrative example of it,

I claim as new and desire to secure by Letters Patent:

1. A winding machine having, in combination, a rotary spindle for a thread package, a back carrying a longitudinally movable thread guide and being itself mounted for movement toward and from the spindle, mechanism for positively retracting the back at a rate governed by the rotation of a thread package with said spindle, and means for positively pulling thread from a source of supply and supplying it to the thread guide at a uniform tension.

2. A winding machine having, in combination, a rotary spindle for a thread package, a back carrying a movable guide, furnishing mechanism for positively drawing thread from a source of supply and delivering it at substantially uniform tension to the package being wound, and gear mechanism for positively moving the back away from the spindle as the package increases in size, said furnishing mechanism and said gear mechanism both being driven from the said rotary spindle.

3. A winding machine having, in combination, a rotary spindle for a thread package, a back carrying a longitudinally movable guide and being itself mounted for movement toward and from the spindle, mechanism driven by the spindle for positively retracting the back at a rate proportional to the number of revolutions of the spindle, and means movable by the operator to different positions for adjusting the rate of such retracting movement.

4. A winding machine having, in combination, a rotary spindle, a back movable toward and from the spindle, and mechanism for positively retracting the back including a rotary pawl carrier, a ratchet disk driven thereby, relatively adjustable shields for determining the number of ratchet teeth moved by the pawl, and operative connections between the ratchet disk and the back.

5. A winding machine having, in combination, a rotary spindle, a back movable toward and from the spindle, and mechanism for positively retracting the back including a rotary pawl carrier, a ratchet disk driven thereby, relatively adjustable shields for determining the number of ratchet teeth moved by the pawl, a rotary disk having a pinion thereon driven by said ratchet disk, a pair of gears differing from each other by one tooth driven by said pinion, and operative connections actuated by the relative movement of the two gears.

6. A process of packaging yarn or the like, which includes the steps of positively pulling yarn from a source of supply at a rate proportional to the winding speed, subsequently uniformly tensioning the yarn, and then delivering the tensioned yarn to a rotary package under pressure of a member continuously touching the package and positively retracted at a speed determined by the growth of the package size, thereby allowing the thread package to grow at will under uniform pressure and with substantially uniform tension of thread therein.

7. In a winding machine having a rotary spindle and a back arranged to engage a thread package as the latter is wound thereon, mechanism including a pawl and ratchet, for positively retracting the back from the spindle, a normal stationary shaft carrying a shield controlling the action of the pawl, gears mounted on said shaft and connected to the ratchet, and means for manually turning the said shaft to adjust the

shield for controlling extent of pawl operation on the ratchet.

8. In a winding machine having a rotary spindle and a back arranged to engage a thread package as the latter is wound thereon, mechanism including a frictionally driven rotatable sleeve for positively retracting the back from the spindle, a driven pinion mounted on said sleeve, a rack driven by the pinion and connected to said back, and manually operated means for reversely turning the sleeve and moving the rack to return the said back to its initial position after a thread package has been completed.

9. In a winding machine having a rotary spindle and a back arranged to engage a thread package as the latter is wound thereon, mechanism for positively retracting the back from the spindle, including a reducing gear assembly driven at fixed ratio with respect to the spindle and having connections to the back, and a disengageable latch element in said connections whereby the back may be temporarily released for quick movement away from the spindle.

10. A winding machine having a rotary spindle, a back mounted in the machine to engage a thread package wound on the spindle, and means for positively moving the back away from the spindle including a normally stationary shaft, a reducing gear assembly mounted concentrically upon said shaft and driven at a fixed ratio with respect to the spindle, and operative connections between said gear assembly and the back.

11. A winding machine including in combination, a rotary spindle for a thread package, a back carrying a thread guide constructed and arranged to cooperate with said spindle to wind a package thereon, mechanism for relatively moving apart said spindle and back including means for effecting said relative movement at a rate controlled in relation to the growth of the size of the package, and means for pulling thread from a source of supply and supplying it to the thread guide at a substantially uniform tension, whereby a package of substantially uniform density wound at a substantially uniform tension is adapted to be provided.

12. A winding machine having, in combination, a rotary spindle for a thread package, a back carrying a longitudinally movable thread guide, said back being mounted for movement toward and from the spindle, mechanism for positively controlling retracting movement of the back as the thread package increases in size, and means acting normally positively to pull thread from a source of supply and to deliver it to the thread guide at a uniform tension, thereby allowing the thread package to grow at will under uniform pressure and with substantially uniform tension of thread in the package.

13. A winding machine having, in combination, a rotary spindle for a thread package, a back carrying a longitudinally movable thread guide, said back being mounted for movement toward and from the spindle, mechanism for positively controlling the retracting movement of the back as the thread package increases in size, and means driven by said spindle and acting normally positively to pull thread from a source of supply and to deliver it to the thread guide at uniform light tension.

14. In a winding machine having a rotary spindle and a back arranged to engage a thread package as the latter is wound thereon, mechanism for positively retracting the back from the spindle and having connections to the back, and a disengageable latch element in said connections whereby the back may be temporarily released for quick movement away from the spindle.

ROBERT H. LAWSON.

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