

July 3, 1945.

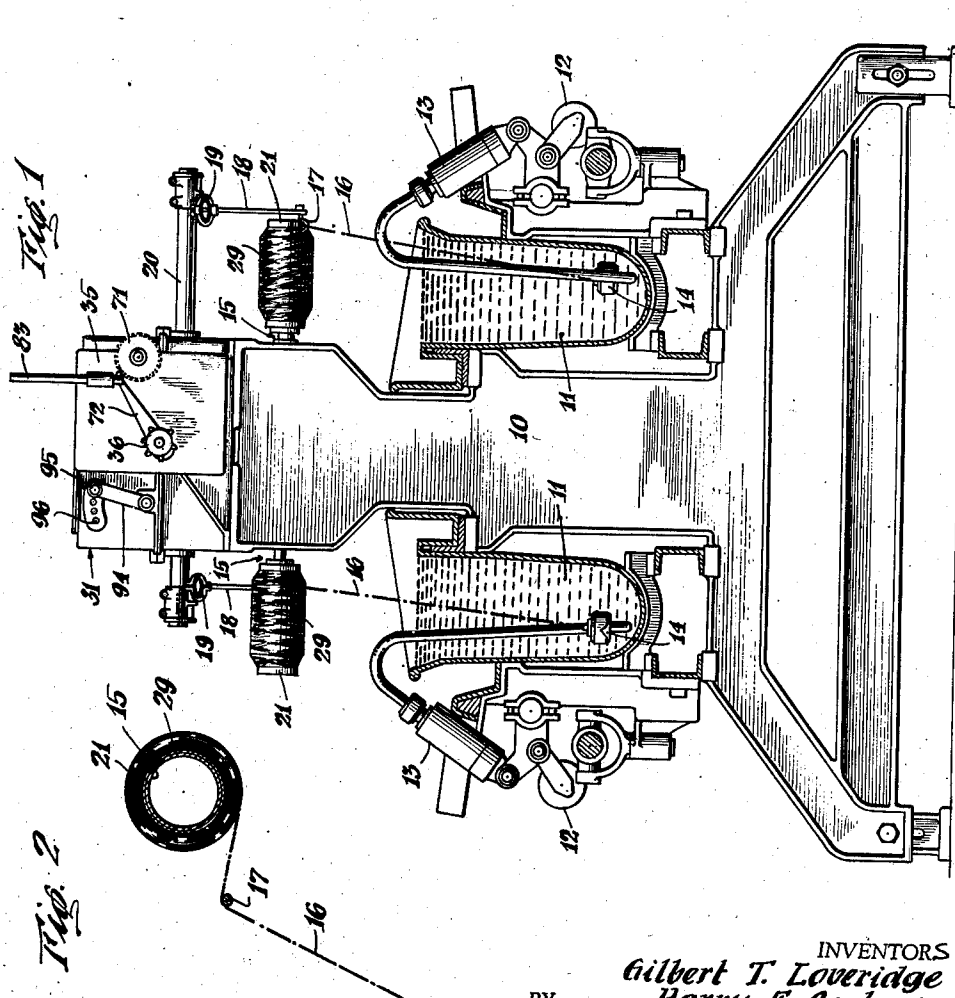
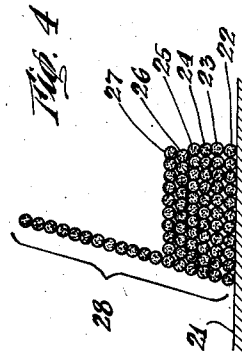
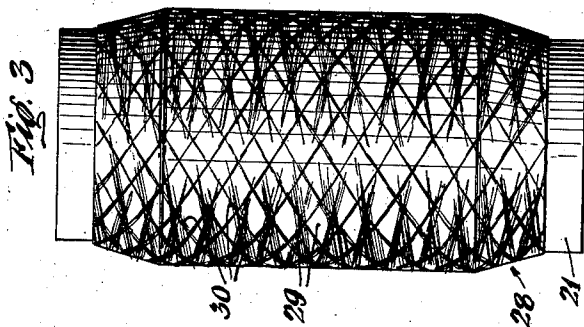
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2,379,813

RAYON BOBBIN SPINNING MACHINE AND METHOD OF OPERATION

Filed July 8, 1941

5 Sheets-Sheet 1



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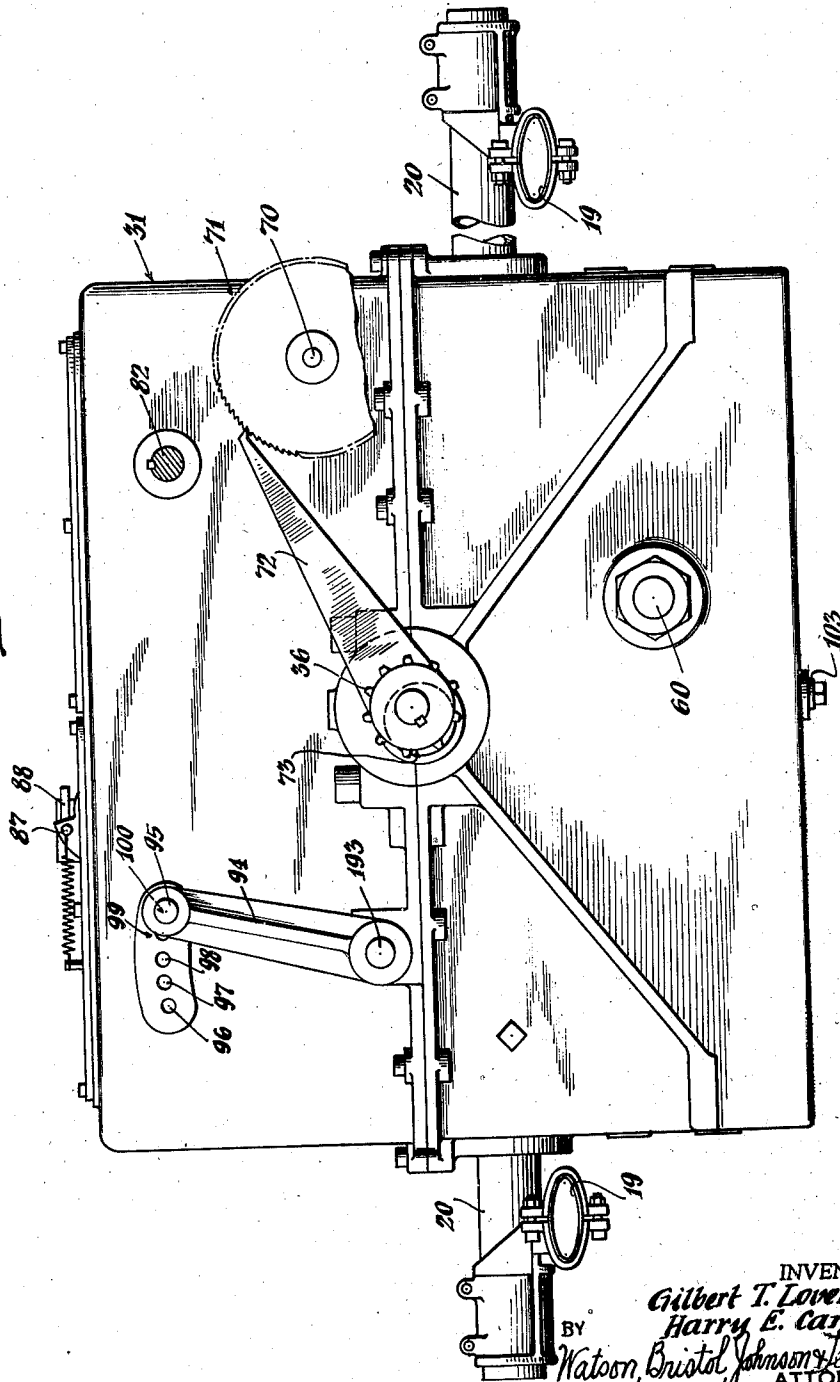
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Filed July 8, 1941

5 Sheets-Sheet 2

Fig. 5



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Filed July 8, 1941

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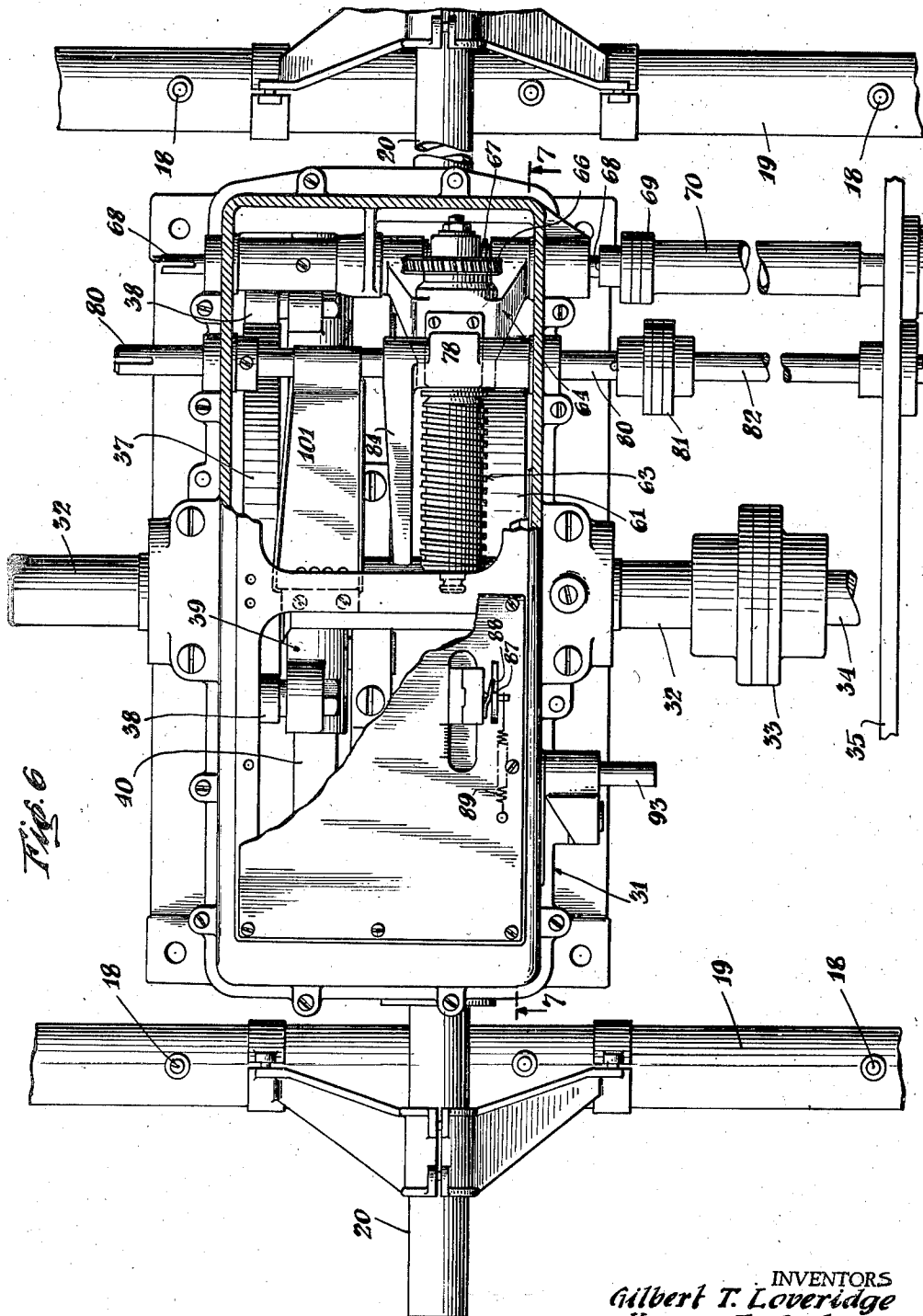


Fig. 6

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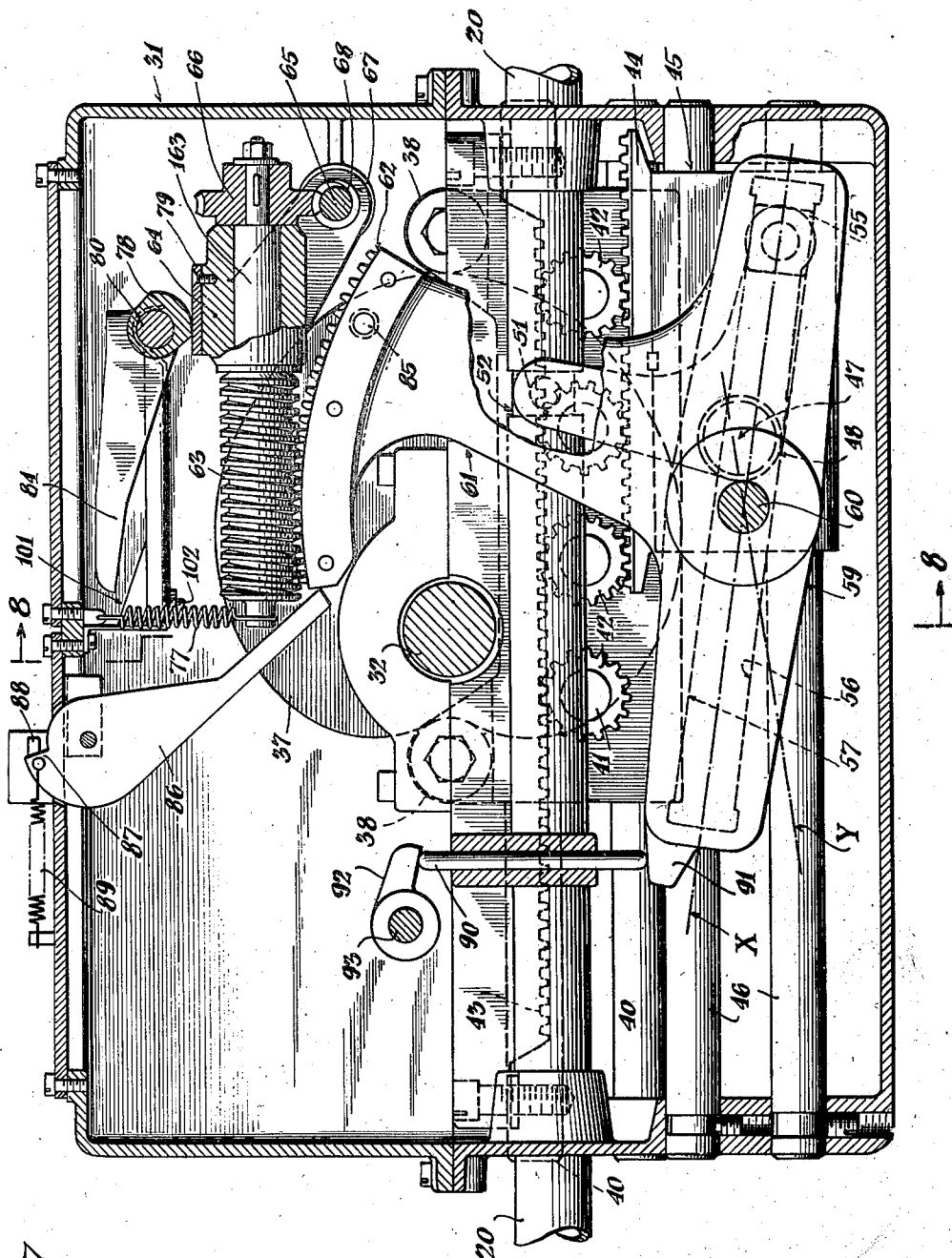


Fig. 7

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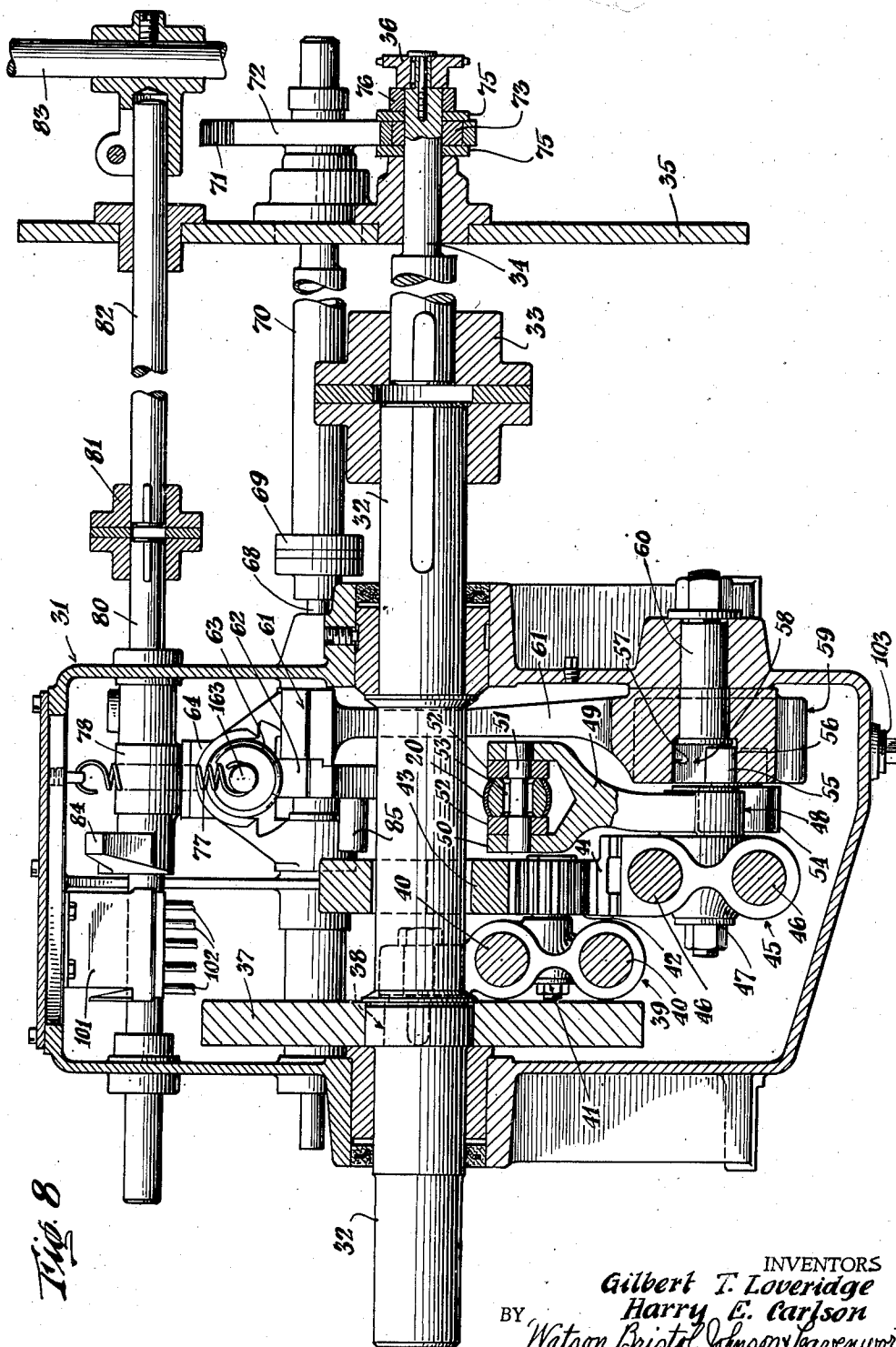


Fig. 8

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UNITED STATES PATENT OFFICE

2,379,813

RAYON BOBBIN SPINNING MACHINE AND
METHOD OF OPERATION

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Application July 8, 1941, Serial No. 401,476

14 Claims. (Cl. 242—43)

The present invention relates to bobbin spinning machines for the production of rayon by the viscose process and method of operations performed thereby to produce rayon bobbin packages.

A general object of the invention is the provision of a readily and economically constructed rayon bobbin spinning machine which can be used in the particular efficient method of the invention to spin unusually large cakes or packages having unique characteristics particularly adapted to production of a low cost uniform product free from knots which is suitable for market.

A more specific object of the invention is the provision of unusually large packages which make for a material saving in cost of production due to saving in labor and time for doffing.

Another object of the invention is the provision of a unique machine for the production of such a package comprising a cake wherein no thread or filament thereof in any layer or course is whipped over the shoulders of the cake thereby permitting efficient redrawing of an undamaged thread.

A still further object of the invention is the provision during the spinning of a binding net over the cake which effectively protects it for further processing resulting in greatly improved redrawing operations.

Still another object of the invention is the provision of an efficient method of producing such a package by operation of the present machine whereby the travel of traverse bar carrying a thread guide is constantly foreshortened during the period of spinning a cake to produce tapered shoulders over which no thread filament is whipped.

A further object is the provision of a method of spinning a bobbin package in which the thread is so laid down in all courses or layers that it can be easily removed by pulling off substantially endwise of the bobbin while stationary without catching, snagging, stretching or breaking the thread or component filaments thereof.

An additional object is the provision of such a mechanism for producing such packages by such a procedure which is positive in operation, effective in foreshortening successive travel of thread guide step-by-step for successive courses, gives adequate warning of completion of a predetermined period of spinning and provides for easy and efficient resetting; and structural embodiments which are readily constructed and allow efficient use and operation thereof.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others, and the apparatus embodying features of construction, combinations and arrangement of parts, adapted to effect such steps, all as exemplified in the detailed disclosure hereinafter set forth and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a cross-sectional elevational view of an embodiment of the machine of the present invention showing bobbins with cakes spun thereon;

Fig. 2 is a transverse cross-sectional view through a spindle supported bobbin, cake thereon and thread guide;

Fig. 3 is an elevational view of a completed package of the present invention;

Fig. 4 is an explanatory diagrammatic depiction of the formation of the tapered shoulders of the cake;

Fig. 5 is an enlarged elevational end view of a cam box unit of the present invention showing some parts in section and some broken away;

Fig. 6 is a top plan view with parts in section and parts broken away of a cam box unit shown in Fig. 5;

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6; and

Fig. 8 is a sectional view taken on line 8—8 of Fig. 7.

Prior to the present invention it was common practice in making rayon thread in accordance with the viscose process to use a bobbin spinning machine wherein the composite thread made up of a plurality of filaments is collected untwisted on bobbins. Thereafter the so-formed cakes of thread on the bobbins, subsequent to treatment, must be twisted such as by a twisting machine. Each bobbin is placed vertically on a spindle and is rotated at high speed which by centrifugal action causes the thread to "balloon" away from the periphery of the cake as it is guided on to a horizontal bobbin rotating at a slower speed. This rotating of the bobbin carrying the cake from which the thread is "ballooned" imparts a twist. The spinning bobbin, formed from suitable material such as aluminum, was limited in

size by the amount of thread to be spun thereon which could be efficiently removed without damage in the process of twisting on such a machine. Such bobbins were frequently about 5" in diameter and were adapted to receive a cake of thread weighing from about one-half to a pound when dried subsequent to processing. Such small amounts of thread require frequent doffing which may take about three minutes for a crew of six men to perform on a double bank machine of ordinary size. Further such machines during operation provided for variable traverse bar reciprocation so that periodically the loops of thread are whipped over the shoulders to bind them down. This does not create difficulty in removing the thread on a twisting machine due to the "ballooning" effect.

However with larger cakes wherein time and labor for doffing are economically conserved it is not advisable to attempt to remove the thread directly from the bobbin in a twisting machine for certain reasons, e. g., damage to thread or filaments thereof might result from centrifugal force. If it is attempted to draw the thread off endwise from the package while stationary, as in a redrawing operation for transfer to smaller bobbins to be placed in the twisting machine, loops of thread or filaments thereof, which were whipped over the shoulders, may frequently cause catching, snagging, stretching and/or breaking the thread or component filaments thereof. In fact it has been found that with aluminum bobbins about eight inches in diameter and eighteen inches long which can readily receive cakes which will produce three to five pounds of dry yarn, great and unsuitable variations in short length denier will occur. It was found that in three pound packages of 300 denier yarn wherein the thread had been whipped first over one shoulder and then over the other, error in short length denier of as much as 90 denier occurred. These and other difficulties are efficiently eliminated by the present invention.

In accordance with the present invention unusually large bobbins of the above indicated dimensions are adapted efficiently to receive cakes which will result in from three to five pounds of dry yarn which can be easily and efficiently removed without damage by redrawing from the stationary bobbins to smaller bobbins which can then be operated in usual twisting machines. This is accomplished by constantly foreshortening the travel of the thread guide of the spinning machine step-by-step so that each of the successive courses or layers of thread is shorter than the preceding one and no thread filament is whipped over resulting tapered shoulders. Such a cake which is free of any loops of thread whipped over shoulders to bind them down may be somewhat unstable during subsequent treating, washing and drying prior to twisting. This is effectively overcome in accordance with the present invention by providing a binding net about the finished cake to form a stable package. This is accomplished by resetting the step-by-step traverse travel foreshortening mechanism just prior to doffing, such as for about the last thirty seconds of the spinning period between doffs so that a few courses or layers, say two to four, or about thirty yards of thread similar to but slightly longer than the initial courses or layers of the cake will be applied to the cake to provide the net covering. This protection of the cake greatly improves the condition of the package so that efficient redrawing can be obtained.

Referring to the drawings like numerals refer to like parts throughout. In Fig. 1 is shown various conventional parts of a bobbin spinning machine combined with mechanism of the present invention. This machine 10 includes the usual double bank, back to back, of spinning devices inclusive of spinning baths 11, 11, pumps 12—12, candle filters 13—13, jets 14—14, spindles 15—15 and driving mechanism (not shown) for the spindles inclusive of a constantly and infinitely variable speed reducer of well known type to accommodate the gradually increasing diameter of the cakes while providing for constant rate of take-up. As in the usual machine the threads 16—16 each comprising a plurality of filaments being drawn from one of the jets 14—14 are passed through or over guides such as glass hooks 17—17 carried by supports 18—18 suspended from laterals 19, 19 mounted on a traverse bar 20 to be reciprocated thereby. The motion of the traverse bar 20 is such and so related to the rotation of the bobbins 21—21 as to cross-wind the threads in successive layers on the bobbins to produce open cakes to permit efficient access of treating fluid to the interior as is well-known in the industry.

Each package comprises a bobbin 21, preferably a perforated tube of aluminum about eight inches in diameter and about eighteen inches long, on which is built up a series of successive courses or layers 22—27, et seq., of cross-wound thread with the initial or first course or layer of the cake 22 the longest and the others successively foreshortened so that no thread or filament thereof is whipped over the resulting tapered shoulder 28, as indicated in Fig. 4. The resulting cake 29 is provided with a covering net 30 securely binding the threads in position which is formed by spinning a few courses or layers that are similar to the first or initial courses or layers of the cake such as 22 and 23, but which are longer than any of the latter since those net courses or layers constitute the first courses or layers spun after the traverse travel foreshortening mechanism has been reset, i. e. the first courses or layers drawn in a period of spinning between successive doffs.

The mechanism of the present invention comprises a cam box or casing 31, provided with a drive shaft 32 journaled therein connected by a suitable coupler 33 to a driving stub shaft 34 suitably journaled in a rigidly mounted control panel 35 which if desired may be an end wall of the machine. A spur gear or sprocket 36 mounted on the end thereof is adapted to be connected in any suitable manner to the variable speed reducer which drives the bobbin spindles. A heart cam 37 is mounted on the shaft 32 for rotation therewith and the surfaces therein are adapted for cooperation with a pair of follower rolls 38, 38 mounted upon and carried by a carriage 39. The carriage 39 is provided with a pair of parallel bores in which are slidably received a pair of guide bars or rods 40, 40 fixed in the casing 31 to serve as guides in the reciprocation of the carriage 39.

The carriage 39 also carries one or more stub shafts 41—41 on which are journaled one or more pinions 42—42 which are meshed with a fixed rack 43 and a movable rack 44. The movable rack 44 is mounted upon a second reciprocating carriage 45 which similar to the carriage 39 has a pair of parallel bores slidably receiving a pair of guide bars or rods 46, 46 also fixed in the casing 31.

This second carriage 45 in addition to carrying

the rack 44 is provided with a stub shaft 47 upon which is journaled the fulcrum of a bell crank 48. One end 49 of the bell crank 48 is forked as shown in Fig. 8 to provide a pair of spaced apart arms 50, 50 between which is spanned a pin 51 carrying a pair of spaced apart cross-heads 52, 52. An enlarged hole 53 through the traverse bar 20 receives the pin 51 with the cross-heads 52, 52 slidably mounted in grooves in opposed sides of the traverse bar 20. This mechanism constitutes the drive for the traverse bar 20 with the pair of carriages 39 and 45, the associated racks 43 and 44 and pinions 42—42 acting as a pinion gear multiplier to increase the distance of travel or reciprocating operation provided by the heart cam 37.

The other arm 54 of the bell crank is provided at the end thereof with riding means or a follower 55 such as a cross-head adapted to ride along a plane surface 56 or 57 which constitute planular slides preferably formed by a groove 58 provided in the side of an elongated member 59 pivotally mounted within the casing 31 by a stud 60. This permits desired tilting of the slides to alter the angle or position of the bell crank 48 to vary the distance of travel imparted to the transverse bar 20 as will be explained more fully hereinafter.

The angle of tilt of the slides 56 and 57 is to be varied in accordance with a predetermined plan of operation and for this purpose is provided with an arm 61 having mounted on the end thereof a segmental gear 62. In fact the structure 56—62 logically can be considered to be a segmental gear structure pivoted at 60 and provided with a pair of slides 56 and 57.

A worm gear 63 suitably journaled in a support 64 pivotally mounted about an axis 65 carries a driving pinion 66 meshed with a worm gear 67 on a shaft 68 having its axis in coincidence with the axis 65. The shaft 68 is coupled by a suitable coupling member 69 to the stub shaft 70 journaled in the wall or control panel 35.

The end of the stub shaft 70 carries a ratchet 71 mounted for rotation therewith providing means for driving the worm gear 63. The ratchet 71 is rotated clockwise step-by-step by a pawl 72 eccentrically mounted on a stub shaft 34 by means of an eccentric block 73 having its axis offset from the axis of shaft 34 and positioned between a pair of plates 75, 75 mounted and held in position on the shaft 34 in any suitable manner such as by a collar 76 interposed between the shank of the driving gear or sprocket 36 and the eccentric structure. Thus as the drive shaft 34 is operated to rotate the heart cam 37 this ratchet and pawl structure is operated to rotate step-by-step the segmental gear structure carrying the slides 56 and 57.

To permit disengagement of the worm gear 63 from the segmental gear 62 so that the latter may be reset to initial position after having been moved by the worm gear to its final position, that is moved to the extreme right in Fig. 7, the end of the worm gear shaft 163 is biased away from the segmental gear 62 by suitable means. Such means may comprise a spring 77 having one end thereof attached to the casing 31 and the other end connected to the end of the worm gear shaft with suitable provision for permitting free relative rotation. The worm gear 63 is held in engagement with the segmental gear 62, stressing biasing spring 77, by a cam 78 engaging a plate 79 on the top of the mounting bracket 64. Cam 78 is mounted upon a shaft 80 journaled in the

walls of the casing 31 and coupled by a suitable coupling member 81 to a stub shaft 82 which in turn is journaled in the wall or control panel 35 and has affixed thereto a handle 83 adapted for manual operation. Shaft 80 also carries a reset arm 84 rotatable therewith to engage a pin 85 mounted on the segmental gear 62 so that as the cam 78 is rotated to permit the spring 77 to lift the worm gear 63 out of engagement with the segmental gear 62, the arm 84 will be rotated counterclockwise to engage the pin 85 and return the segmental gear to its initial position.

Although not essential to the invention it is desired to provide the mechanism with an alarm system comprising an arm 86 pivoted to the casing 31 with a nose 87 thereon projecting through the casing to engage a switch arm 88 adapted to operate a suitable switch, such as a micro-switch, in an electrical circuit including an alarm device. It will be seen from an inspection of Fig. 7 that as the segmental gear 62 is rotated to the left the arm 86 is pivoted against the restoring force of a biasing spring 89 finally to engage the switch arm 88 and cause closure of the alarm circuit.

An indexing device is provided for predetermining the greatest length of travel of the transverse bar 20. This comprises a plunger 90 journaled in a portion of the frame structure in the casing 31 and adapted to have its lower end engaged by some portion of the tiltable planular slide device, such as a nose member 91. The upper end of the plunger 90 is engaged by an arm 92 fixed upon an index shaft 93 journaled in casing 31 and adapted to be coupled to a stub shaft 193 journaled in wall or control panel 35 carrying an index arm 94 provided with a spring biasing detent device 95 adapted selectively to be engaged in a series of index holes or recesses 96, 97, 98, 99 and 100. The arm 94, when in a position so that detent 95 engages the recess 96 provides for a seven-inch travel of transverse bar 20 and when in the position shown in Fig. 5 with the detent in engagement with the recess 100 provides for a sixteen inch travel. The intermediate recesses provide quarter inch variations between sixteen and seventeen inches in the travel of the transverse bar.

The casing 31 provides an oil-tight pan structure forming a cam box in which may be mounted an oil pan 101 associated with oil conduits 102—102 leading to various bearings in a manner not indicated in detail since this feature is not essential to the invention and details thereof will be obvious to anyone skilled in the art. A drain plug 103 may be provided in the bottom of the cam box for draining off used oil.

In operation; with empty bobbins 21—21 mounted upon spindles 15—15, threads 16—16, each comprising a plurality of filaments, are drawn up over the glass guide hooks 17—17 and after operation of the machine is commenced so that the bobbins are rotating ends of the threads are given a wrap around the bobbins which will immediately be overlaid by a cross-wound strand to secure it in position. Operation of the machine is such that the bobbins are rotated and the transverse bar 20 reciprocated through driving mechanism including a constantly and infinitely variable speed reducer which gradually reduces at a definite predetermined rate the speed of rotation of the spindles 15—15 and the speed of travel of the transverse bar 20 to compensate for the gradual increase in diameter of the cakes as they are built up in successive layers on the bobbins and

further to provide for a constant rate of take-up of the threads by the bobbins while compensating for the constant foreshortening of traverse travel during the spinning of the successive courses or layers of the cake.

On each revolution of the drive shaft 34 by the sprocket 36 from the speed reducer the pawl 72 rotates the ratchet 71 step-by-step so that the shaft 70 rotates the shaft 68 which in turn through the worm gear 67 rotates the spur gear 66. The spur gear 66 rotates worm gear 63 which step-by-step advances the segmental gear 62 from an initial position predetermined by the index means. This index means as previously indicated comprises arm 84, shaft 83, arm 82 and plunger 80 which bears against the nose 81 on the tiltable slide member 59. Assuming that this latter mechanism has been set for a sixteen inch travel of the traverse bar 20, that is with the detent 95 in engagement with the recess 100, the traverse bar 20 during the winding of a first course or layer of thread upon the bobbin will cause the guide hook 17 to lead the thread from one end of the bobbin to the other through an axial distance of seventeen inches. Then the segmental gear 62 will be advanced a step by the previously described mechanism to reduce the angle of tilt of the slide member 59. This will cause the traverse bar to carry the guide hook 17 a foreshortened distance so that the next course or layer wound upon the bobbin will be of less length than the preceding course thereby preventing any thread or filaments thereof overlapping the ends of the first course. This operation is repeated through the major portion of the spinning period between doffs of finished packages, each of the succeeding courses or layers of cross-wound thread being foreshortened to provide sloping shoulders in the cakes over which no filaments are whipped.

The reciprocation of the traverse bar 20 with such foreshortening is obtained by means of operation of the heart cam 37 which reciprocates the carriage 39 through a predetermined travel of uniform distance. The fixed rack 43, pinions 42-44 and the carriage mounted movable rack 44 multiply or double this distance in travel. Accordingly the carriage 45 carries bell crank 48 periodically back and forth a uniform distance with follower or cross-head 55 sliding back and forth along the inclined slides 56 and 57. This in turn causes the bell crank arm 48 to reciprocate the traverse bar 20 with the cross-heads 52-52 providing for the necessary freedom of movement efficiently to accomplish this end.

The tiltable slide member 59 will provide for maximum travel of the traverse bar 20 when the former is at a maximum angle of tilt such as, for example, that shown in Fig. 7, and as represented by the broken line X. This travel will be foreshortened step-by-step by reducing step-by-step this angle of tilt, length of travel about one-half that provided during one period of spinning being obtained when the slide member 59 is substantially horizontal, that is when the slide surface is substantially parallel to the path of the fulcrum of the bell crank 48. That condition obtains in the present mechanism with the arms of the bell crank being located substantially at right angles to each other and with the axis of the fulcrum lying substantially in the same horizontal plane in which the pivotal axis of the slide member is disposed. As the slide member 59 is then gradually tilted away from the horizontal in the reverse direction by continuing the rotation of segmental gear in the same direction the travel of the

traverse bar is gradually further foreshortened, shortest travel during the spinning of a cake being obtained when the tiltable slide member has been tilted away from the horizontal at an angle about equal to the angle of tilt for maximum travel. This latter condition is indicated on Fig. 7 by the broken line Y. Variations in such relationships of course will produce different operations while still making for step-by-step foreshortening of travel of the traverse bar.

A unique method of making bobbin packages of rayon can be accomplished by operation of this mechanism. For example after a cake of cross-wound thread of suitable size of the character indicated has been built up of successive layers on a bobbin and when the alarm indicates that the predetermined limit of foreshortening of travel has been reached, the travel foreshortening mechanism can be reset to its initial position by rotating the reset shaft 82 by the manual lever 83. This will disengage the worm gear 63 from the segmental gear 62 and return the latter to initial position wherein greatest travel of traverse bar 20 is obtained. In that position suitable indexing means (not shown), which may be used if desired, will indicate the precise position in which the thread of the worm gear 63 will mesh with teeth of the segmental gear 62 so that when the shaft 82 is then rotated in the reverse direction by means of the hand lever 83, the worm gear 63 will again be meshed with the segmental gear 62 and a few maximum-length courses or layers of thread can be spun upon the finished cake to provide a binding net. Thereafter the machine is stopped and the finished packages of unique structure, each comprising a bobbin carrying a cake with sloping shoulders bound into a stable condition by covering nets, are doffed or replaced on the spindles by empty bobbins.

This procedure permits the efficient formation of unique cakes many times the size of cakes previously known in the industry and accordingly makes for economy in time and labor necessary to doffing operations, which desirably cheapens the manufacture of high quality yarn even though the present invention requires an intermediate step of redrawing. The redrawing operation, comprising transfer of the thread from these large packages to smaller bobbins which are then mounted in twisting machines, is a much more economical operation than the frequent labor- and time-consuming operations essential to doffing.

Although only one cam box unit has been indicated in the present drawing, it is to be understood that a plurality thereof may be used in a single machine with respective shafts coupled together for simultaneous operation so that a number of traverse bars may cooperate to support laterals from which the said guides are dependent. To this end all shafts journaled in a cam box unit extend through the walls thereof on both sides to be coupled by suitable coupling members or devices as in the manner of coupling those shafts to the operating stub shafts journaled in the machine wall.

It will thus be seen that among others, the objects set forth above are efficiently attained by the practice of the present invention and since certain changes may be made in carrying out the above process, and modifications effected in the apparatus for practicing the principle thereof, without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompany-

ing drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a member pivotally mounted to said bar at one point, pivotally mounted at another point on reciprocable means adapted for travel of uniform distance and having riding means at a third point; a tiltable plane surface over which said riding means is adapted to slide; and means for changing step-by-step the angle of tilt of said surface to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

2. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planar slide engaged by said follower; and means for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

3. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planar slide engaged by said follower; means for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake; and means for resetting the tilting means to its initial position.

4. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planar slide engaged by said follower; and gearing driven by a ratchet device for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

5. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted on said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planar slide engaged by said follower, said slide being pivotally mounted at a fixed point and having gear teeth; a chain of gears having the

driven one thereof meshed with said gear teeth; and a step-by-step ratchet to actuate the driving gear of said chain for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

6. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planar slide engaged by said follower, said slide being pivotally mounted at a fixed point and having segmental gear teeth; a worm gear meshed with said gear teeth; and means including a step-by-step ratchet to actuate said worm gear for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

7. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a segmental gear pivotally mounted at a fixed point and having a pair of opposed planar slides between which said follower is adapted to ride; a worm gear meshed with said segmental gear; and means including a step-by-step ratchet to actuate said worm gear for changing step-by-step angle of tilt of said slides to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

8. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a segmental gear pivotally mounted at a fixed point and having a pair of opposed planar slides between which said follower is adapted to ride; a worm gear pivotally mounted about a driving shaft and in one position meshed with said segmental gear; means including a step-by-step ratchet to actuate said worm gear through the driving shaft for changing step-by-step angle of tilt of said slides to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake; and means to disengage said worm gear from said segmental gear and to return the latter to initial position for repeating operation.

9. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planar slide engaged by said follower; means for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake; a switch device for

closing an alarm circuit having a member engageable by said slide at a predetermined position; and means for resetting the tilt-changing means to its initial position.

10. In a rayon bobbin spinning machine, the combination comprising, a traverse bar carrying a thread guide; means for reciprocating said traverse bar including a bell crank having one end pivotally mounted to said bar, the fulcrum being carried by driven reciprocating means adapted for travel of uniform distance and the other end provided with a follower; a tiltable planular slide engaged by said follower, said slide being pivotally mounted at a fixed point and having segmental gear teeth; a worm gear pivotally mounted about a driving shaft and in one position meshed with said gear teeth; a spring biasing said worm gear away from said gear teeth; cam means to hold said worm gear in mesh with said gear teeth; means associated with said cam means adapted to engage said slide to return it to initial position when said worm gear is disengaged; and means including a step-by-step ratchet to actuate said worm gear for changing step-by-step the angle of tilt of said slide to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

11. In a rayon bobbin spinning machine, the combination comprising, heart cam means, a member reciprocable by said means, a bell crank having its fulcrum carried by said member, a reciprocatively mounted traverse bar carrying a thread guide for movement substantially parallel to the axis of a bobbin rotating member and engaged by one end of said bell crank, a tiltable plane surface, a follower on the other end of said bell crank adapted to slide along said surface, and means for changing step-by-step the angle of tilt of said surface to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

12. In a rayon bobbin spinning machine, the combination comprising, heart cam means, a rack and pinion gear multiplier mechanism operable by said cam means, a member reciprocable by said mechanism, a bell crank having its fulcrum carried by said member, a reciprocatively mounted traverse bar carrying a thread guide for movement substantially parallel to the axis of a bobbin rotating member and engaged by one end of said bell crank, a tiltable plane surface, a follower on the other end of said bell

crank adapted to slide along said surface, and means for changing step-by-step the angle of tilt of said surface to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

13. In a rayon bobbin spinning machine, the combination comprising, a rotatable heart cam, a reciprocatively mounted carriage carrying cam followers, a pinion gear mounted on said carriage, a fixed gear rack meshed with said pinion, a second reciprocatively mounted carriage having a gear rack meshed with said pinion, a bell crank having its fulcrum carried by said second carriage, a reciprocatively mounted traverse bar carrying a thread guide for movement substantially parallel to the axis of a bobbin rotating member and engaged by one end of said bell crank, a tiltable plane surface, a follower on the other end of said bell crank adapted to slide along said surface, and means for changing step-by-step the angle of tilt of said surface to decrease step-by-step the successive travels of said bar substantially throughout the period of spinning a cake.

14. Method of making a cross wound package of rayon comprising, reciprocating a thread filament guide by traverse mechanism through successive travels from an initial long travel, slightly foreshortening step-by-step the successive travels of said guide to a relatively short final travel, subsequent to reciprocation of said guide through its first few long travels drawing thread filaments across it onto a rotating bobbin to cross wind a plurality of successively shorter thread filament layers thereon until a shortest layer is formed by movement of said guide through the relatively short final travel to produce a finished cake, resetting the traverse mechanism prior to doffing the package to produce the initial long travel of said guide which is longer than that employed in forming the first layer of thread filaments wound on the bobbin, and reciprocating said guide through the first few long travels while drawing thread filaments across it onto the rotating finished cake to wind a crosswise binding net of a few layers around the cake, with the first layer of the net being longer than the first cake layer of thread filaments wound on the bobbin and the remaining layers of the net being progressively shortened.

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