

May 2, 1967

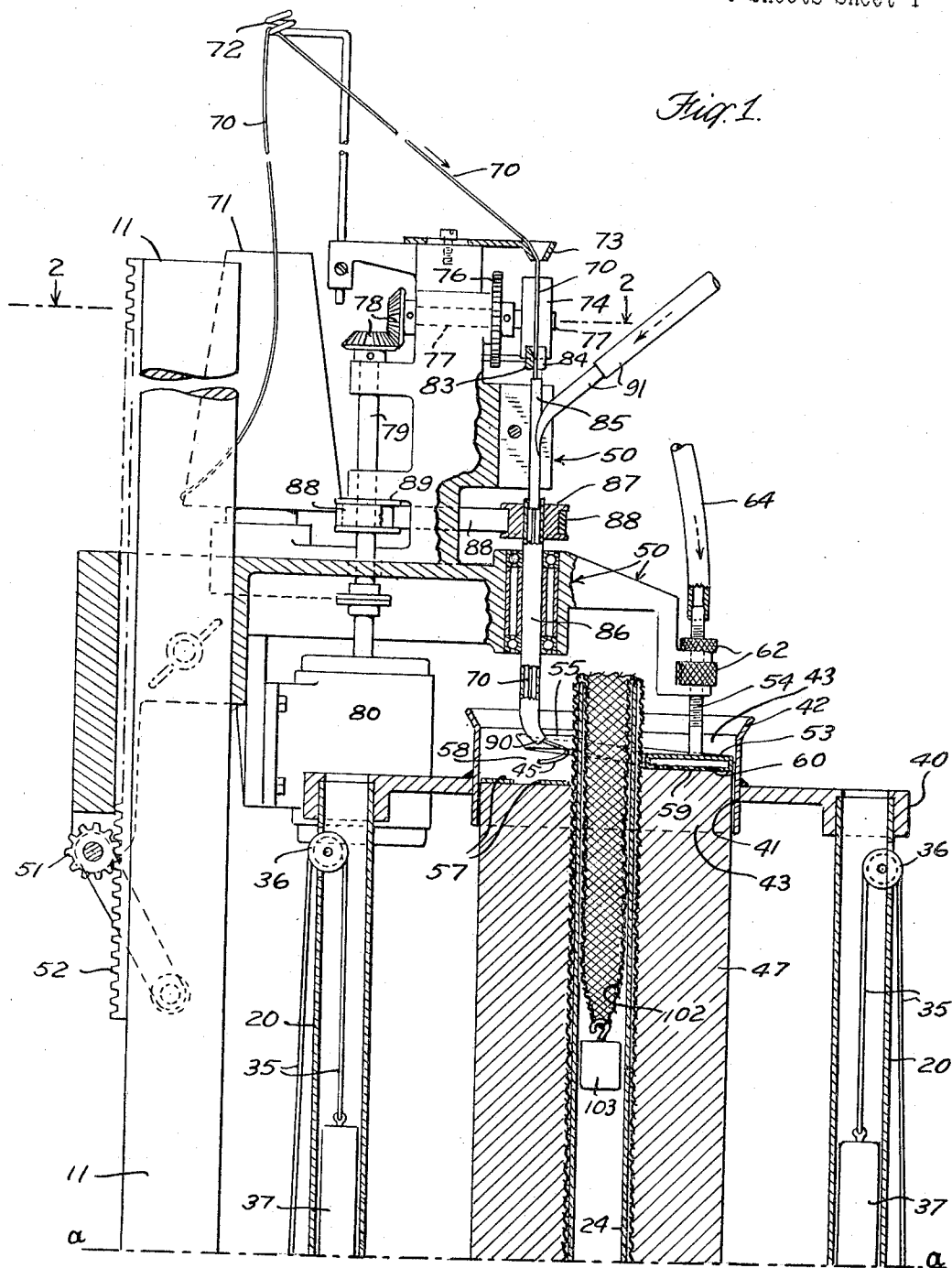
C. J. RUSSO

3,316,609

APPARATUS FOR PRODUCING A YARN PACKAGE

Filed April 16, 1964

3 Sheets-Sheet 1



INVENTOR
CARL J. RUSSO

BY

C. J. Russo

ATTORNEY

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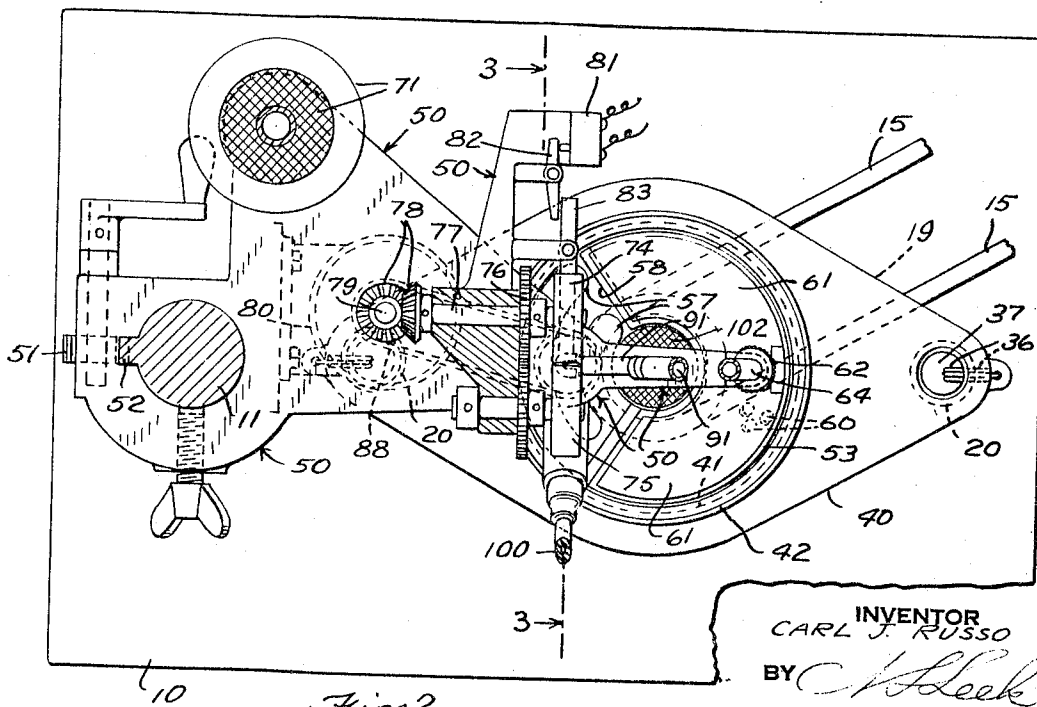
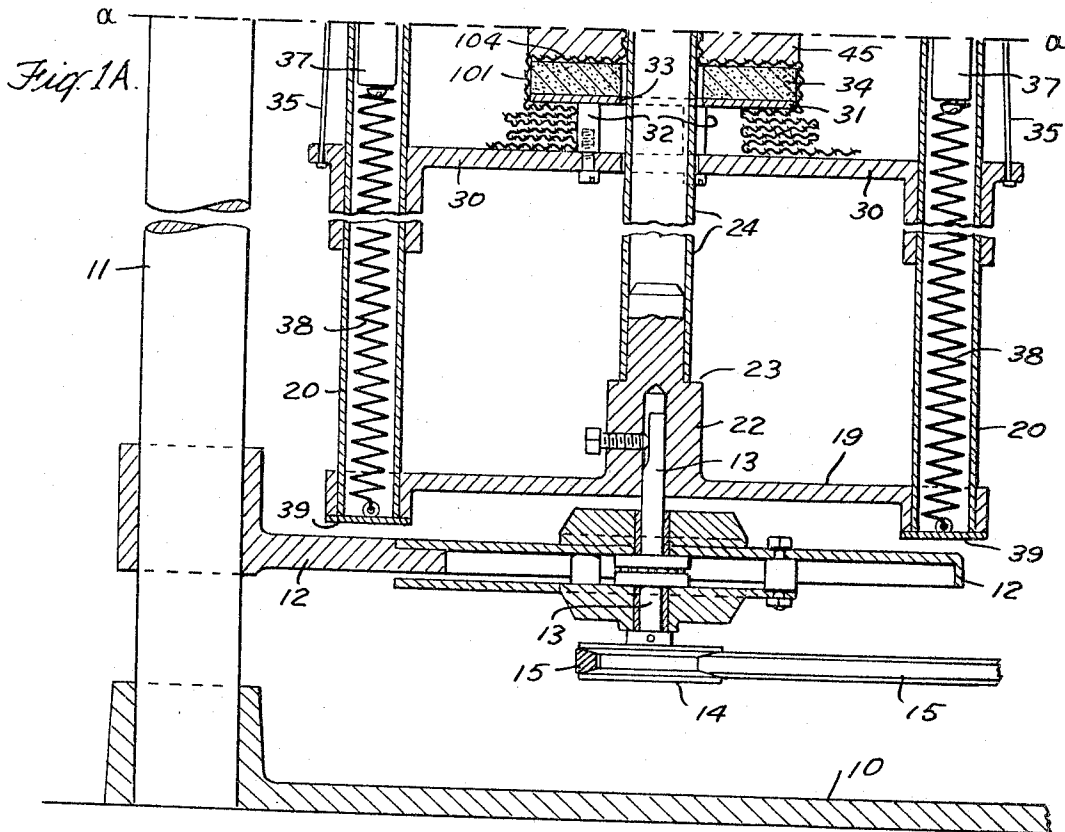
C. J. RUSSO

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Filed April 16, 1964

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INVENTOR
CARL J. RUSSO

BY *Sheek*

ATTORNEY

May 2, 1967

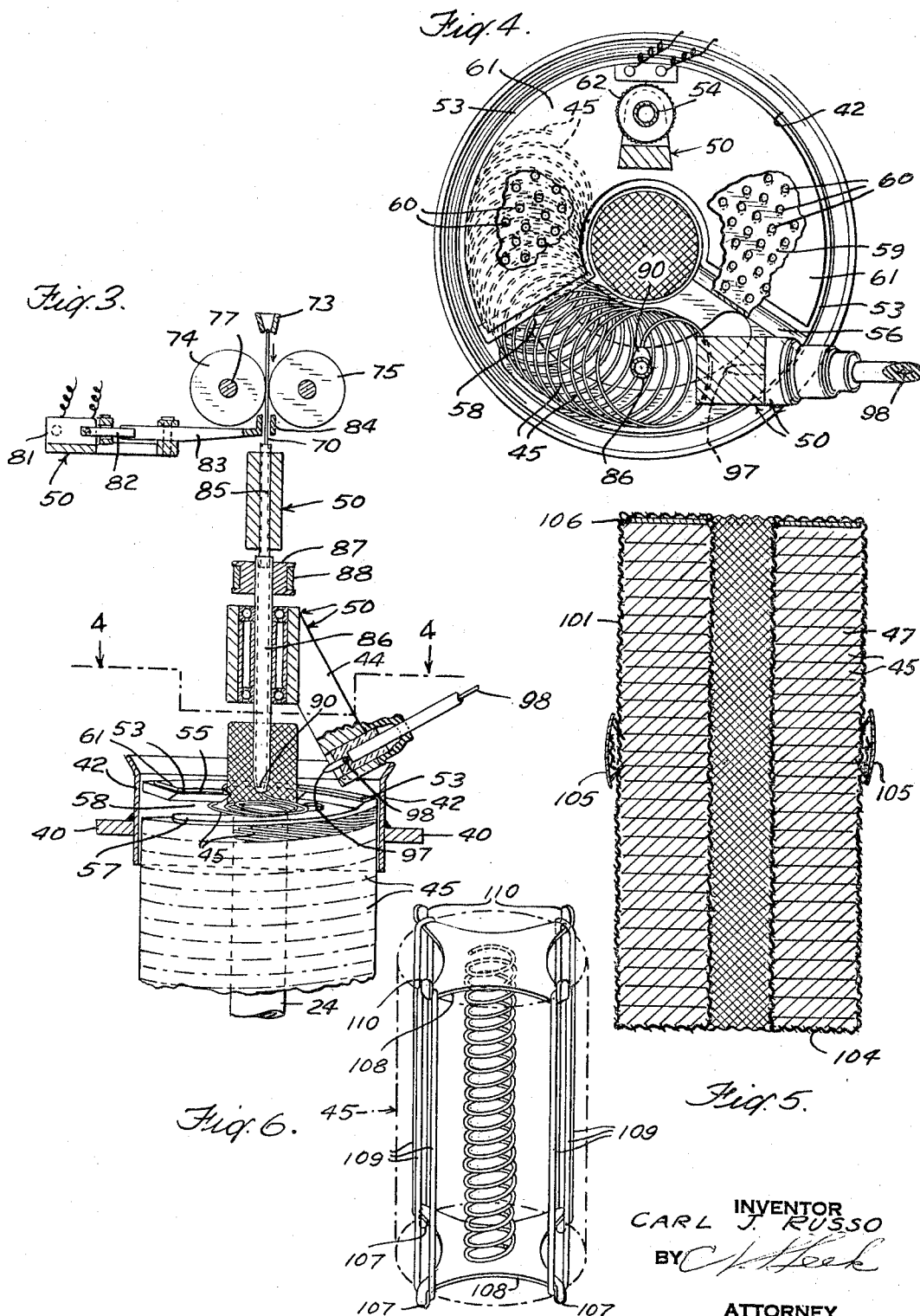
C. J. RUSSO

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1

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APPARATUS FOR PRODUCING A YARN PACKAGE

Carl J. Russo, Chatham, Wilmington, Del., assignor to Joseph Bancroft & Sons Co., Wilmington, Del., a corporation of Delaware

Filed Apr. 16, 1964, Ser. No. 360,253

11 Claims. (Cl. 28—21)

This invention relates to apparatus for making a yarn package and has for an object to provide means for laying yarn in a series of tensionless loops to form a self-supporting package which is suitable for subsequent processing.

Another object is to provide a yarn package wherein the yarn is disposed in annular layers which are contained in and held compacted by a fabric which extends over both the inner and outer peripheral surfaces of the package.

Another object is to provide a yarn package of the above type which is held in a compacted and substantially self-supporting form.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In accordance with the invention the package is built up on a rotating disc in the form of annular layers of successively overlapped loops. A fabric sock or sleeve is disposed around the inner and outer peripheral surfaces of the package and holds the same in self-supporting, compacted form which is adapted for subsequent processing as in a standard dye vat or in a heated setting zone. In another embodiment, the package is held compacted and in a self-supporting state by tension members which extend over the opposite ends of the package.

The details of the apparatus and the nature of the invention will be better understood from the following description, taken in connection with the accompanying drawings in which a specific embodiment has been set forth for purposes of illustration.

In the drawings:

FIG. 1 is a vertical section of the upper portion of a packaging apparatus according to the invention;

FIG. 1A is a similar vertical section of the lower portion of the apparatus which when joined to FIG. 1 along the line A—A illustrates the complete device;

FIG. 2 is a horizontal section taken on the line 2—2 of FIG. 1;

FIG. 3 is a vertical section taken on the line 3—3 of FIG. 2 with parts in elevation;

FIG. 4 is a horizontal section taken on the line 4—4 of FIG. 3 but on a larger scale;

FIG. 5 is a vertical section through the finished package; and

FIG. 6 is a perspective, on a smaller scale, of a modified form of yarn package.

Referring to the drawings more in detail the apparatus is shown as comprising a base 10 having a vertical support post 11 disposed at one side thereof. The post 11 carries near its lower end a fixed bracket 12 in which a vertical shaft 13 is journaled to extend above and below the bracket 12. The shaft 13 is driven from a pulley 14 by a belt 15 from a source of power, not shown.

Above the bracket 12 the shaft 13 carries a support disc 19 having thereon a pair of diametrically oppositely spaced tubes 20. The disc 19 is formed with a hub 22 having a shoulder 23 against which a core tube 24 is seated.

A plate 30 is disposed to slide vertically on the tubes 20 above the support disc 19 and is provided with a central opening to provide clearance for the core tube 24. This plate carries a package support disc 31 mounted on spacing studs 32 and formed with a central opening 33 to

2

provide clearance for the core tube 24. A liner 34 of a soft material such as felt is disposed on the disc 31. The plate 30 is counter-balanced by cords 35 which extend upwardly over pulleys 36 mounted in the upper ends of the tubes 20 with their ends attached to counter weights 37 which are adapted to be raised or lowered within the tubes. The arrangement is such that the plate 30 and the package support disc 31 are normally held in their upper position but are free to be retracted downwardly as the yarn package is built up thereon. To counter-balance the increasing weight of the yarn package, tension springs 38 are attached to the weights 37 and to fixed members 39 in the tubes 20 in a manner to be extended as the weights are raised in the tubes 20.

A top plate 40 having a central opening 41 of a size to receive the package to be formed is mounted at the upper ends of the tubes 20. A vertical annular flange 42 is carried by the top plate 40 in the opening 41 and forms with the core tube 24 an annular space 43 in which the yarn loops 45 are successively laid for forming the yarn package 47.

A bracket 50 is slidably disposed on the post 11 and is provided with an adjusting pinion 51 engaging a rack 52 on the post 11 for adjusting the elevation of the bracket 50. A helical ring 53 is mounted on a hollow tube 54 on the bracket 50 and is disposed in the annular space 43. The ring 53 is made hollow from its leading end 55 to its trailing end 56 in the direction of movement of the yarn package 47 and has a pair of fingers 57 extending from the trailing end 56 toward the leading end 55. Due to the helical shape of the ring 53 the leading end 55 is displaced vertically from the ends of the fingers 57 to form an opening 58 through which the yarn loops 45 are fed to form the package. The lower wall 59 of the ring 53 is provided with a series of inclined air holes 60 from which air is discharged downwardly and forwardly to assist in forming the package. Air is supplied to the hollow ring 53 by the tube 54 which is adjustably secured by threaded nuts 62 to permit the ring 53 to be adjusted with respect to the bracket 50. The tube 54 is connected by a duct 64 to a suitable source of air not shown.

The yarn 70 is fed from a cop 71 mounted on the bracket 50 through a guide 72 to a pair of feed rolls 75 and 74 which are interconnected by gears 76 for operating in unison. The feed roll 74 is mounted on a shaft 77 which is driven by gears 78 from shaft 79 of motor 80. The yarn is driven by feed rolls 74 and 75 through a vertical tube 85 adjustably carried by the bracket 50. The tube 85 registers closely with a rotating tube 86 which is journaled in the bracket 50 and carries a pulley 87 which is driven by a belt 88 from a pulley 89 on the motor shaft 79. The rotating tube 86 extends below the bracket 50 and has at its lower end an angularly projecting tip 90 which is disposed above and near the plane of the fingers 57 and adjacent the opening 58.

Air is supplied to the tube 85 by a branch tube 91 which extends upwardly therefrom and is connected to a suitable source of air under pressure not shown. The air passing through the tubes 85 and 86 assist in feeding the yarn 70 through the tubes and discharging the yarn from the tip 90 as it rotates so as to lay the yarn on the fingers 57 in the form of successive loops 45.

In order to prevent the yarn 70 from becoming entangled in feed rolls 74 and 75 in the event of a yarn obstruction in tubes 85 and 86, an arm 83 having slot 84 through which the arm passes senses any irregularities in the yarn and the flow of same and actuates lever 82 which interrupts stop switch 81 disconnecting the current supply to the driving motors.

Static eliminator 97 attached to arm 44 fixed to bracket 50 connected by wire 98 to a source of current not shown

is disposed in the plane of rotation of the tip 90 and adjacent the path of the tip so that the yarn passes through the field of the static eliminator at each rotation of the tip.

A sock 101 in the form of a fabric tube with which the package is to be covered is disposed around the core tube 24 with one end 102 folded over the top of the core tube 24 into the bore of the tube and held under tension by a weight 103. The lower end of the fabric tube 101 extends over the soft cover disc 34 downwardly around the periphery of the package support disc 31 and into the space between the disc 31 and the plate 30.

In operation the plate 30 and the package support disc 31 are first held in their uppermost position by the weights 37 with the upper surface 104 of the sock 101 as it rests upon the liner 34 in substantial contact with the under surface 59 of the ring 53. As the yarn is fed from the cop 71 by the feed rolls 74 and 75 into the rotating tube 86 it is discharged from the rotating tip 90 so that it is laid in successive loops 45 on the fingers 57. The surface 104 of the sock on the rotating disc 31 wipes the loops 45 from the fingers 57 through the opening 58 where they are gripped between the surface of the sock 101 and the wall 59 of the ring 53. The air currents from the openings 60 in the under surface 59 of the ring 53 causes these loops to lie upon the sock in successive overlapped layers which extend around the periphery of the core tube 24 as the support disc rotates. As the loops are laid in successive layers the thickness builds up upon the surface 104 and the pressure exerted by the ring 53 and the air currents on the yarn causes the disc 31 and the plate 30 to be retracted downwardly against the force of the counter weights 37 and of the tension springs 38. The air currents serve to reduce the friction of the under-surface of ring 53 against the yarn loops although, if this friction is not excessive, it may be possible in some instances to omit the air jets and the corresponding air cushion formed thereby. The holes 60 in the plate 53 may be arranged in concentric rows according to the areas of the package which are to be subjected to the air stream. It may, for example, be desirable to supply air for cushioning and compacting the package to the inner and outer peripheries of the package or alternatively to the center line of the package in which event, the air holes 60 would be correspondingly arranged in the ring 53. In some instances, it may be desirable to heat the undersurface of the ring 53 so as to pre-shrink the yarn and also to reduce the friction of the ring against the yarn. This may be accomplished by applying a suitable heating element 61 to the ring or by passing hot air or steam through the hollow ring. In either event the ring should be uniformly heated so as to eliminate variations in temperature of the surface which the yarn loops contact. As the disc 31 is depressed the sock 101 is pulled downwardly over the top of the core tube 24 so that it remains in contact with the inner annular surface of the package 47.

When the plate 30 reaches the lower limit of its movement the yarn package 47 thereon extends upwardly substantially the full length of the core tube 24. Clearance is then obtained by raising the bracket 50 and its supported parts including ring 53 to afford access to the package. A disc 105 of cardboard or other stiff material may be placed over the top of the winding and pressed downwardly by hand so as to compact the package without disturbing the loops 45. The lower end of the sock 101 is then folded up around the outside of the package and the top end 102 of the sock is lifted out of the core tube, weight 103 removed and the sock folded down around the upper part of the outer surface of the package 47 to form a complete self-sustaining unit as shown in FIG. 5. The meeting ends of the sock are secured by suitable means such as clips 105 and the core tube 24 is removed from the package. The package with its sock cover may then be removed from the liner 34

for processing as in a dye bath or in a yarn setting zone.

In the embodiment of FIG. 6 the package is held compacted between a lower star-shaped disc 107 and a similarly shaped upper disc 108 by a set of elastic bands 109 which are held in place by raised tips 110 on the respective discs. These discs may be composed of cardboard or a rigid plastic composition or a thin metal, as desired. In making this package, the lower disc 107 may be disposed on liner 34 on disc 31 of FIG. 1A. This type of package may be sufficiently rigid and self-sustaining in cases where the yarn possesses substantial friction against displacement, for example, when the package is composed of crimped yarn.

Due to the tensionless state in which the yarn is laid in the package it may be subjected to shrinkage in the processing step without introducing tension in the yarn.

The blanket of air from the openings 60 in the under side 59 of the ring 53 causes the yarn loops to lay flat on the preceding layers of yarn loops as the package is built up. The air jets assist in compacting the yarn in the package and in eliminating the drag of the surface of the ring on the yarn loops as the package rotates. The static eliminator 97 eliminates static on the yarn 70 which might interfere with the laying of the yarn loops in overlapped shingled form as the package is built up.

What is claimed is:

1. Apparatus for packaging yarn which comprises a package support disc having an axial core tube extending upwardly therefrom, a fixed annular flange forming with said core tube an annular space to receive said package, a top ring disposed in said space having at least a portion of its under surface perforated and having on its upper surface a zone to receive loops of yarn, means rotating said disc under said ring to draw said loop into the space between said ring and said disc, means supplying a fluid through said perforate surface and means retracting said disc with respect to said ring and said core tube as the yarn package builds up therebetween.

2. Apparatus for packaging yarn which comprises a package support disc having an axial core tube extending upwardly therefrom, a fixed annular flange forming with said core tube an annular space to receive said package, a ring disposed in said annular space having a surface adapted to receive successive loops of yarn, means including a rotating tube having an angularly projecting tip adapted to feed and form the yarn loops as said tube is rotated, an electrode disposed adjacent the path of said tip connected to produce an alternating electric field for removing any static charge from said yarn, means rotating said disc to draw said loops successively into said annular space beneath said ring to build up a yarn package on said disc, and means retracting said disc with respect to said ring and said core tube as said package is built up on said disc.

3. Apparatus for packaging yarn which comprises a package support disc having an axial core tube extending upwardly therefrom, a fixed annular flange forming with said core tube an annular space to receive said package, a ring disposed in said annular space and forming with said disc a package forming zone, means feeding said yarn in the form of successive loops into said zone, means including a counter-weight mounting said disc for retraction from said ring as the yarn package is built up thereon, and spring means connected to apply an increasing restraining force to the retraction of said disc as the weight of the package increases.

4. Apparatus for forming a yarn package which comprises a rotatable support disc carrying an axial core tube and a pair of spaced guide tubes, a plate slidably mounted on said tubes and adapted to rotate with said support disc, package support means carried by said plate, means building up said yarn package on said plate, counterweights disposed in said guide tubes and connected to permit said plate to be retracted as the package is built up thereon, and tension springs connected to said

5

counterweights to oppose the retraction of said plate and to balance the increasing weight of said package.

5. Apparatus for forming a yarn package which comprises a rotatable support member having an axial core tube, a package support disc rotating with said member and retractable with respect to said core tube as the package is built up on said disc, a fabric sleeve disposed around said core tube having one end inserted in said core tube and having its other end extended over said disc and around the periphery thereof, means retracting said disc as the package is built up thereon and thereby withdrawing said fabric sleeve from said core tube so as to form an inner liner for the yarn package, the ends of said sleeve being adapted to be folded over the bottom and top of said package to form a self-supporting unit.

6. Apparatus for packaging yarn which comprises a package support disc having an axial core tube extending upwardly therefrom, a ring disposed around said core tube and spaced from said disc to provide a package forming zone therebetween and having an opening to receive a succession of yarn loops means laying a succession of yarn loops in advance of said opening, means rotating said disc to draw said loops through said opening into the space between said ring and said disc, means heating said ring for facilitating the passage of the yarn loops thereunder and means progressively retracting said disc from said ring as the package builds up therebetween.

7. Apparatus as set forth in claim 6 in which said ring is hollow in cross section and is formed with at least a portion of its under surface perforated and means is

6

provided for passing a fluid through said perforations onto the yarn loops as they advance thereunder.

8. Apparatus as set forth in claim 7 in which said perforations are inclined in the direction of movement of said loops.

9. Apparatus as set forth in claim 6 in which the means for laying said loops comprises a rotating tube having an angularly disposed tip and an electrode is disposed adjacent the path of said tip for removing static from said yarn.

10. Apparatus as set forth in claim 9 in which a sock is disposed around said core tube to contact the inner peripheral surface of said annular yarn package and is adapted to be folded around the outer surface of said yarn package after the latter has been built up around said core tube.

11. Apparatus as set forth in claim 9 including feed rolls disposed to feed yarn into said rotating tube, drive means for said feed rolls and stop mechanism responsive to an interruption in the feed of said yarn to stop said drive means for thereby preventing the yarn from becoming entangled in said feed rolls.

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L. K. RIMRODT, *Assistant Examiner*.