United States Patent [19]

Wuest

[11] **3,741,488**

[45] **June 26, 1973**

[54] **APPARATUS AND METHOD OF PRODUCING YARN RESERVES ON BOBBIN-RECEIVING MEMBERS**

[75] Inventor: **Olivier Wuest**, Winterthur, Switzerland

[73] Assignee: **Rieter Machine Works, Ltd.**, Winterthur, Switzerland

[22] Filed: **Aug. 11, 1970**

[21] Appl. No.: **63,017**

Related U.S. Application Data

[63] Continuation of Ser. No. 744,864, July 15, 1968, abandoned.

[30] **Foreign Application Priority Data**

July 19, 1967 Switzerland 10300/67

[52] **U.S. Cl.** ..... **242/18 PW**

[51] **Int. Cl.** **B65h 54/34**

[58] **Field of Search** ..... 242/18 PW, 27.1; 57/34 TT

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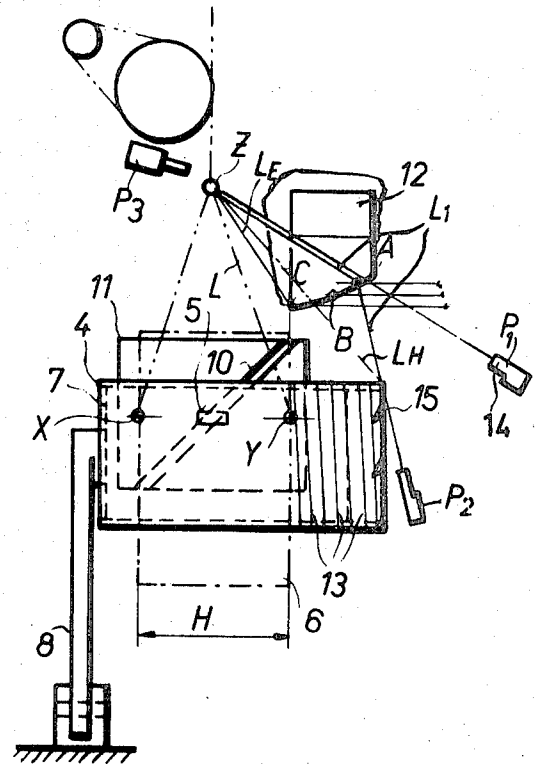
Primary Examiner—Stanley N. Gilreath

Attorney—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

A cam having a yarn guide surface is mounted above the sleeve on which the yarn is to be wound. The cam projects into the yarn path to deflect the yarn away from the yarn guide for winding of the yarn into a bobbin. After engaging the end of the sleeve, the speed of the yarn towards the yarn guide is braked by the cam so that a large yarn reserve can be built up on the sleeve prior to winding of the bobbin.

21 Claims, 6 Drawing Figures



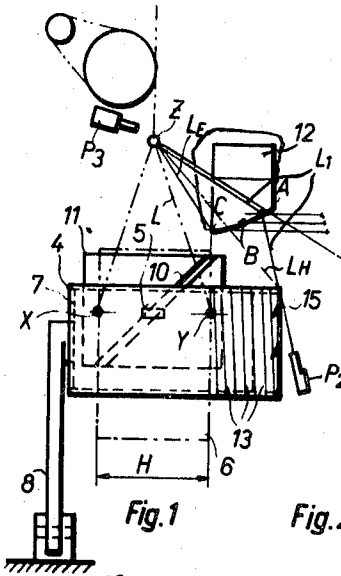


Fig.1

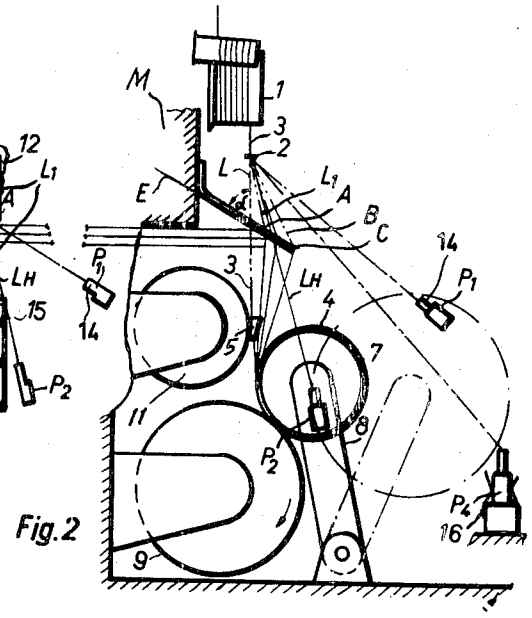


Fig.2

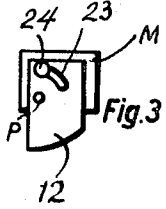


Fig.3

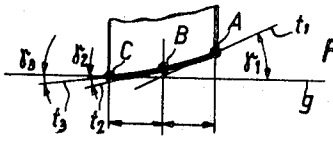


Fig.4

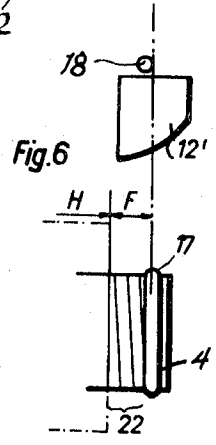


Fig.6

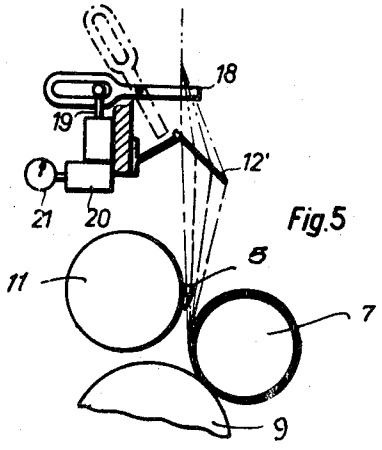


Fig.5

INVENTOR.
OLIVIER WUEST

BY

Kenyon & Kenyon
ATTORNEYS

APPARATUS AND METHOD OF PRODUCING YARN RESERVES ON BOBBIN-RECEIVING MEMBERS

This is a continuation of application Ser. No. 744,864 filed July 15, 1968, now abandoned.

This invention relates to an apparatus and method of producing yarn reserves on bobbin-receiving sleeves. More particularly, this invention relates to an apparatus and method of producing yarn reserves at stretch-winding stations.

It has been known to produce a tying-on bunching of yarn on drawn-twisters by lowering the guide rings below the conventional winding stroke. However, this principle cannot be used in draw-winding machines. That is, the stroke movement of the yarn traversing mechanism used cannot be readily shifted during the time required for building up a yarn reserve to a location outside the traverse motion zone proper and brought to a standstill or slowly brought in as far as the traverse motion zone.

Accordingly, the heretofore known stretch-winders have been provided with bobbin-receiving members having a slot or the like at one end for laterally engaging the yarn to be wound thereon, and a stationary yarn guide which is positioned centrally over the bobbin-receiving part of the sleeve. In use, after the yarn has been laterally engaged on the end of the sleeve, the yarn travels rapidly towards the center of the bobbin sleeve due to the extremely marked inwardly effective component of the yarn tension of the yarn travelling-in from the yarn guide caused by the usually high degree of lateral deflection of the yarn. As a result, a helical line of, at most, one convolution has been produced on the sleeve up to the point at which the traversing stroke is reached. However, such a length of yarn has not been an adequate and useful yarn reserve.

It has also been known to provide spinning and reeling machines with devices for building up lateral yarn reserves on bobbin sleeves. However, these devices have been relatively complicated in design and expensive to manufacture and maintain. Further, while such devices may be adequate for use with a few reeling stations, these devices cannot readily be used in stretch-winders that can have up to two hundred winding stations.

Accordingly, it is an object of the invention to form large lateral yarn reserves on bobbin-receiving sleeves.

It is another object of the invention to move a yarn laterally towards the bobbin-receiving zone of a sleeve under a braking force so as to build up a large yarn reserve prior to entry of the yarn into the bobbin-receiving zone.

It is another object of the invention to interrupt the travel of a yarn towards a yarn traversing zone of a rotating sleeve in order to build up a yarn reserve laterally of the zone.

Briefly, the invention provides a cam surface in the path of a yarn being delivered to the yarn traversing zone of a bobbin-receiving sleeve in order to slow the velocity of the yarn in approaching the yarn traversing zone. The sleeve is rotatably mounted and is constructed to catch the yarn delivered from a stationary yarn guide above the sleeve so that, after the yarn is caught, rotation of the sleeve causes the yarn to wind-up thereon. A yarn traversing mechanism is mounted between the sleeve and the stationary yarn guide to engage the yarn during winding on the sleeve and to move the yarn laterally to and fro across the yarn traversing zone of the sleeve so that a bobbin is built up in this zone. The cam surface is also disposed between the sleeve and stationary yarn guide in a zone laterally adjacent to the bobbin receiving zone. The cam surface is mounted so as to deflect the yarn out of its normal straight line path between the stationary yarn guide and sleeve. In this way, the yarn is placed under a tension which has a component directed laterally towards the bobbin receiving zone of the sleeve and is wound up on the sleeve adjacent to the bobbin receiving zone to form a relatively large yarn reserve. This component of tension is sufficient to cause the yarn to move along the cam surface towards the bobbin receiving zone of the sleeve although the cam surface is shaped to increasingly deflect the yarn from the plane of the tangent between the sleeve and stationary yarn guide to thereby brake the velocity of the yarn. That is, the yarn is deflected at an increasing amount of deflection while the gradient or rate of deflection decreases as the yarn moves along the cam surface towards the bobbin receiving zone of the sleeve. The end of the cam surface is positioned such that the yarn snaps into the yarn traversing mechanism upon moving from the end of the cam surface.

The invention thus provides a method in which an adequately large yarn reserve separate from the package proper is formed laterally on a rotating winding-on sleeve before transfer of the yarn to the bobbin receiving or package zone of the sleeve where the yarn is wound into a bobbin. The bobbin tying-on reserve which is formed may be readily taken off so that the commencing portion of the bobbin may be reliably engaged and so that the outer end of a fresh bobbin may be tied to the yarn lead of a bobbin undergoing a yarn doffing procedure in a further processing of the bobbins.

The method may also be amplified in such a manner that the lateral travel of the yarn is interrupted during a predetermined time before reaching the yarn traversing zone for the purpose of building-up a bunching.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a front view of an apparatus for carrying into effect the method of the invention;

FIG. 2 illustrates a side view of FIG. 1;

FIG. 3 illustrates a detail of a pivotally mounted cam surface according to the invention;

FIG. 4 illustrates a detail of a curved cam surface according to the invention;

FIG. 5 illustrates a side view of a modified apparatus of the invention for forming a bunching laterally of the package proper; and

FIG. 6 illustrates a front view of the modified apparatus of FIG. 5.

Referring to FIGS. 1 and 2, a machine M such as a stretch-winder of known construction has a winding-on or reeling portion which commences with a stationary yarn guide 2 disposed under a drawing roller 1 to receive yarn 3 from the roller 1. A sleeve or tube 4 which serves as a yarn receiving member is positioned below the stationary yarn guide 2 and cooperates with an adjacent traversing yarn guide 5 so that the yarn 3 is wound onto the sleeve 4 over a traversing motion zone H under the direction of the traversing yarn guide 5 to

form a bobbin 6. The sleeve 4 is removably mounted so as to be replaced by another sleeve on a bobbin mandrel 7 which is secured on a swivelly mounted carrier arm 8. The carrier arm 8 is biased in a known manner towards a rotating drive roller 9 so as to cause a driving contact between the sleeve 4 and drive roller 9.

The traversing yarn guide 5 is slidably mounted in a guide groove 10 of a rotating roller 11 and is otherwise fixed in place, as is known, relative to the roller 11 so as to reciprocally move back and forth upon rotation of the roller 11. The reciprocating movement of the traversing yarn guide 5 is imparted to the yarn 3 as the yarn travels through the guide 5.

The sleeve 4 is provided with a slot 15 in the periphery at the end of the sleeve 4 which projects out of the plane of the roller 11.

Further, supplementary yarn guiding cam 12 is disposed on the frame of the machine M above the sleeve 4 and adjacent the traversing motion zone H. This yarn guiding cam 12 is sized to project into the path of the yarn 3 between the stationary yarn guide 2 and sleeve 4 so as to deflect the yarn 3 away from the traversing yarn guide 5.

In operation, in order to produce an adequate yarn reserve in the form of a multiplicity of windings 13 on the sleeve 4 prior to the build-up of the bobbin 6 proper, the yarn 3 from the drawing roller 1 is drawn-in during running of the machine M, for example, by a suction gun 14, from the stationary yarn guide 2 and manually retained at a predetermined position P_1 spaced from the sleeve 4. The mouth of the suction gun 14 is then moved into a second position P_2 near the end of the sleeve 4 and within the projected plane of the sleeve 4 into path L_h, wherein the yarn 3 is engaged by or caught within a slot 15 at the end of the sleeve 4. The winding-on operation is thus commenced and the yarn 3 is immediately passed onto the cam 12 which deflects it into path L_1.

During the winding-on operation, the yarn 3 continues to move laterally along the cam 12 through travel path L_E while being wound in a plurality of windings 13 on the sleeve 4. During this time, the yarn travel is braked by the cam 12 in the axial direction of the sleeve 4 so that an adequate number of windings 13 of small pitch are wound on the sleeve and laterally of the traversing motion zone H. Upon reaching the end of the cam 12, the yarn 3 jumps into a path L which brings it within the traversing yarn guide 5 and within the plane of the tangent between the stationary yarn guide 2 and sleeve 4. The bobbin 6 is then built up in a known manner.

After the bobbin 6 has been completed, a bobbin change takes place. This is effected by positioning the suction gun 14 in a position P_3 (FIG. 1) over the yarn guide 2 and by severing the yarn slightly below the gun mouth. A fresh length of yarn is thus sucked into the suction gun 14. During this time the sleeve 4 carrying the bobbin 6 remains on the mandrel 7 and the bobbin 6 remains in driven abutment with the drive roller 9. Any yarn remaining in the traversing yarn guide 5 is laid on the bobbin 6. The fresh yarn is then inserted via the suction gun 14 in the stationary yarn guide 2 and guided downwardly into a holding device 16 at a position P_4 (FIG. 2) below the winding station. The holding device 16 which clamps the yarn in this position is arranged so that the yarn does not interfere with the carrier arm 8 when the arm 8 swivels away from the drive roller 9. Since the operator now has both hands free, a bobbin change can be effected by swiveling the carrier arm 8 away from the drive roller 9 (FIG. 2) and, after braking of the sleeve 4, replacing the full sleeve 4 with an empty sleeve. The fresh sleeve, after being fitted on the mandrel 7, is brought into abutment with the drive roller 9 due to pivoting of the carrier arm and commences to rotate.

The gun is then displaced upwardly and towards the right into position P_1, and once again, by guiding the gun mouth into position P_2, it is ensured that the yarn is engaged by the entrainment slot 15 in the sleeve 4 and bears constrainedly against the lead cam 12. The procedure involved in the build-up of a reserve winding is then repeated in the same manner as already described hereinabove.

The position and shape of the yarn guiding cam 12, which effects the deflection of the yarn 3, can very readily be ascertained empirically by ensuring that the yarn travel, after engagement in the yarn slot 15 of the sleeve 4, moves slowly and substantially uniformly i.e. at uniform speed towards the traversing motion zone H. Depending on the nature of the cam or curve (i.e. whether it is a spherical or plane curve) surface and depending on the position in space, there are many yarn guiding cams which satisfy these requirements. Advantageously, a cam having a plane cam or curve surface is used wherein the plane E (FIG. 2) of the cam surface is inclined at an angle α of approximately 30° to 120° relative to the plane of normal yarn travel L, constituted by the three points X, Y and Z (FIG. 1). Referring to FIG. 4, the tangents t_1, t_2 and t_3 extending in the plane E to the surface of the cam 12 enclose with a straight line g, which extends parallel to the bobbin axis in the plane E, at the outer end, at point A, an angle of $\gamma_1 = 30°$, in the center, at point B, an angle of $\gamma_2 = 15°$ and at the inner end, at point C, an angle of $\gamma_3 = 5°$. The spacing of point A from the bobbin center is approximately 1.5 times the diameter of the bobbin sleeve 4 and point C approximately the diameter of the bobbin sleeve 4. A spherical curve or cam surface can also be provided on the cam 12, if the curve or cam surface is located in a plane so as to be projected on to a space surface. Further, while the above angles are exemplitive of optimum conditions for the illustrated structure, the angles for the respective tangents can be in various ranges. For example, the tangent t_1 may enclose an angle δ_1, at point A of less than 90°, and preferably 30° to 40°; the tangent t_2 at point B may enclose an angle δ_2 of from 15° to 30°; and the tangent t_3 at point C may enclose an angle δ_3 greater than 0° and preferably 5° to 20°. Also, the spacing of point A from the bobbin center can be from 1.4 to 1.8 times the diameter of the sleeve 4 while the spacing of point C is approximately 1.0 to 1.6 times the diameter of the sleeve 4.

Referring to FIG. 3, the yarn guiding cam 12 can be pivotally mounted about a pole P on the machine M within a predetermined plane as defined by a curved slot 23 in the cam 12 and a stud 24 on the machine M which projects into the slot 23. This can be useful for adaptation of the yarn travel movement during the build up of the reserve windings.

Referring to FIGS. 5 and 6, a waste bunching 17 can also be formed on the sleeve 4 laterally of the bobbin 6 especially in those instances where the entire stretch-winder machine is to be started up from a standstill position with the yarn already drawn in on the sleeve 4.

This allows the yarn which has not been drafted under normal operating conditions to be initially wound on the sleeve as waste material in the bunching **17**. To this end and in a very simple manner, a rod **18** is mounted over the cam **12'** which in this instance is mounted in a modified manner from the machine frame as shown in FIG. **5**. The rod **18** is pivotally mounted at a point spaced a distance F from the traversing motion zone H to project into the path of the yarn leading from the stationary yarn guide **2** to the cam **12'** so as to prevent lateral movement of the yarn along the cam **12** towards the bobbin receiving zone. A pneumatic piston system **19** is connected to the rear of the rod **18** and is reciprocated by an electromagnetic valve **20** to swivel the rod **18** into or out of the yarn path. The electromagnetic valve **20** is actuated via a time relay **21** so that the rod **18** can be held in the path of the yarn for a time sufficient to allow the waste bunching to be built up.

In operation, the rod **18** is swiveled into the path of the yarn to assume the position shown in FIG. **5** before the machine is started. The yarn is then laid against the rod **18**. After starting of the machine, the yarn continues to be wound on the sleeve **4** to form the bunching **17** (FIG. **6**). After a predetermined period of time, which is adjustable depending on the arrival of normally drafted yarn, the relay **21** actuates the valve **20** to cause the piston assembly **19** to swivel the rod **18** into the dotted line position of FIG. **5** out of the path of the yarn. The yarn then continues to move along the cam **12'** towards the traversing motion zone H in order to build up an adequately large yarn reserve of windings **22** before the yarn is engaged by the traversing yarn guide.

What is claimed is:

1. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said plane between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a stationary cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said stationary cam having an elongated yarn guiding surface for receiving the yarn thereon, said yarn guiding surface being shaped to increasingly deflect the yarn out of said tangential plane and to control the axial movement of the yarn as the yarn moves along said surface in the direction of said zone.

2. The combination as set forth in claim **1** wherein said yarn guiding surface is located in a plane intersecting said tangential plane above the rotational axis of said sleeve.

3. The combination as set forth in claim **2** wherein said yarn guiding surface is a plane curve successively approaching said zone of said sleeve.

4. The combination as set forth in claim **3** wherein the degree of approach of said plane curve yarn guiding decreases with the approach towards said zone.

5. The combination as set forth in claim **1** wherein said yarn guiding surface begins at a point located 1.4 to 1.8 times the diameter of said sleeve radially from the rotation axis of said sleeve.

6. The combination as set forth in claim **1** wherein said yarn guiding surface is slightly convex in a direction towards said sleeve radially.

7. The combination as set forth in claim **1** wherein said yarn guiding surface ends at a point located 1.1 to 1.6 times the diameter of said sleeve radially from the rotation axis of said sleeve.

8. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said tangential plane between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having a yarn guiding surface for receiving the yarn, said surface being disposed to pass through said tangential plane in a plane inclined at an angle of from 30° to 120° with respect to said tangential plane to increasingly deflect the yarn out of said tangential plane as the yarn moves along said surface in the direction of said zone.

9. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said plane between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having a surface for receiving the yarn, said surface being shaped to deflect the yarn out of said tangential plane, said cam surface beginning at a point located laterally outside a radial plane passing through an end of said sleeve and ending at a point immediately adjacent a radial plane passing through the beginning of said first zone.

10. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said plane between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having a surface for receiving the yarn, said surface being of curvilinear shape to deflect the yarn out of said tangential plane, wherein a tangent to the beginning of said cam surface encloses an angle of approximately 30° to 40° with a line parallel to the rotation axis of said sleeve in the plane of said cam surface.

11. The combination as set forth in claim **10** wherein a tangent to the center of said cam surface encloses an angle of approximately 15° to 30° with said line.

12. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said place between said sleeve and said stationary yarn guide for

moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having a surface for receiving the yarn, said surface being of curvilinear shape to deflect the yarn out of said tangential plane, wherein a tangent to the end of said cam surface adjacent said zone encloses an angle of approximately 5° to 20° with a line parallel to the rotation axis of said sleeve in the plane of said cam surface.

13. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential place therewith, and a yarn traversing guide projecting into said plane between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having a surface for receiving the yarn, said surface being shaped to increasingly deflect the yarn out of said tangential plane as the yarn moves along said surface in the direction of said zone and means pivotally mounted to project into the path of the yarn on said surface for abutting the yarn to hold the yarn against travel on said surface.

14. The combination as set forth in claim **13** which further comprises a pneumatic system connected to said means to pivot said means into and out of the path of the yarn and a time relay connected to said system for activating said system after a predetermined period of time.

15. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said plane between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having a surface for receiving the yarn, said surface being of curvilinear shape to deflect the yarn out of said tangential plane wherein a tangent to the beginning of said cam surface encloses an angle of less than 90° and a tangent to the end of said cam surface encloses an angle of greater than 0° respectively with a line parallel to the rotation axis of said sleeve in a plane of said cam.

16. In combination with a rotatable sleeve for winding of a bobbin of yarn thereon in a first zone, a stationary yarn guide spaced from said sleeve to direct the yarn to said sleeve in a tangential plane therewith, and a yarn traversing guide projecting into said place between said sleeve and said stationary yarn guide for moving the yarn reciprocally across said zone; an apparatus for building up a yarn reserve on said sleeve outside said zone comprising a cam mounted between said stationary yarn guide and said sleeve in lateral relation to said zone, said cam having an elongated yarn guiding surface for receiving the yarn, said surface being shaped to increasingly deflect the yarn out of said tangential plane as the yarn moves in the direction of said zone, said surface ending at a point immediately adjacent a radial plane passing through the beginning of said first zone to permit the yarn to snap into said yarn traversing guide upon moving from said surface.

17. A method of producing a yarn reserve on a bobbin receiving sleeve comprising the steps of

deflecting a travelling yarn out of a yarn winding plane tangential to the sleeve through which the yarn is guided into a first zone,

shifting the deflected yarn laterally from said first zone towards a bobbin receiving zone on the sleeve at an increasing amount of deflection,

winding the yarn onto the sleeve in said first zone during said step of shifting to form a plurality of yarn reserve windings thereon, and

subsequently returning the yarn into said plane upon entry into said bobbin receiving zone.

18. A method as set forth in claim **17** wherein the deflected yarn is shifted slowly and at a substantially uniform speed towards said bobbin receiving zone.

19. A method as set forth in claim **18** which further comprises the step of interrupting the shifting of the yarn for a predetermined period of time to build up a waste bunching on the sleeve in said first zone.

20. A method as set forth in claim **19** wherein said step of interrupting occurs a short time prior to return of the yarn into said tangential plane.

21. A method as set forth in claim **17** wherein said step of shifting increases the amount of deflection on a decreasing gradient.

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