Dec. 1, 1970 KANAME WATABE ET AL 3,543,503

APPARATUS FOR WINDING A YARN

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Fig. 1

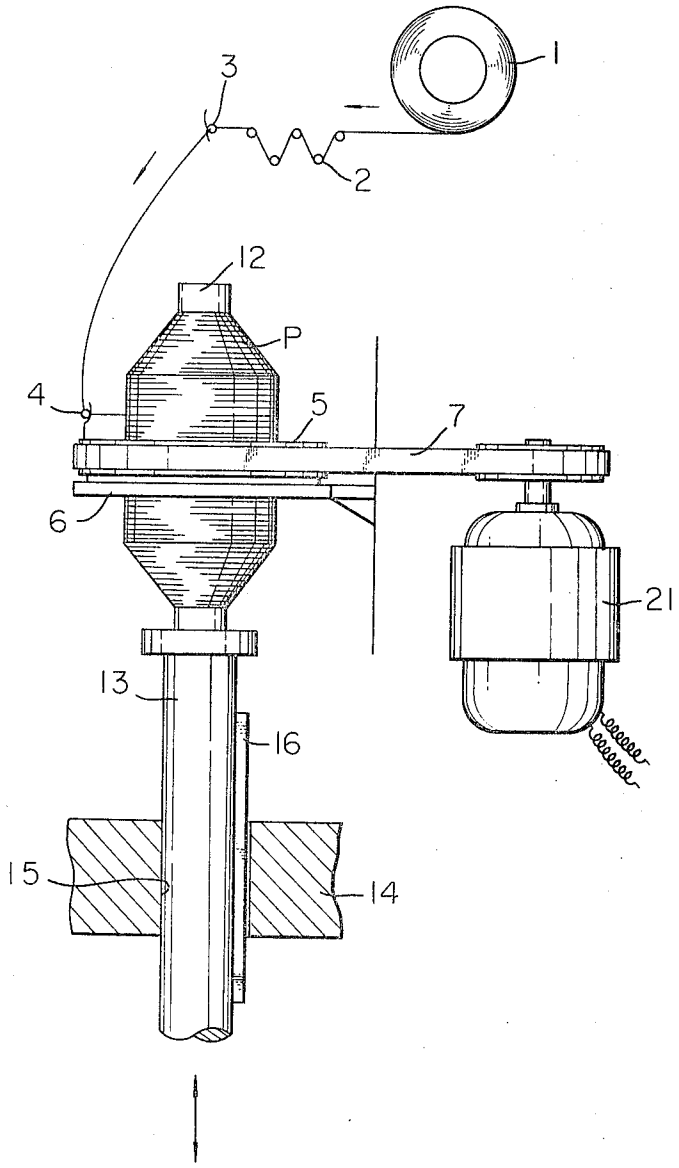


Fig. 2

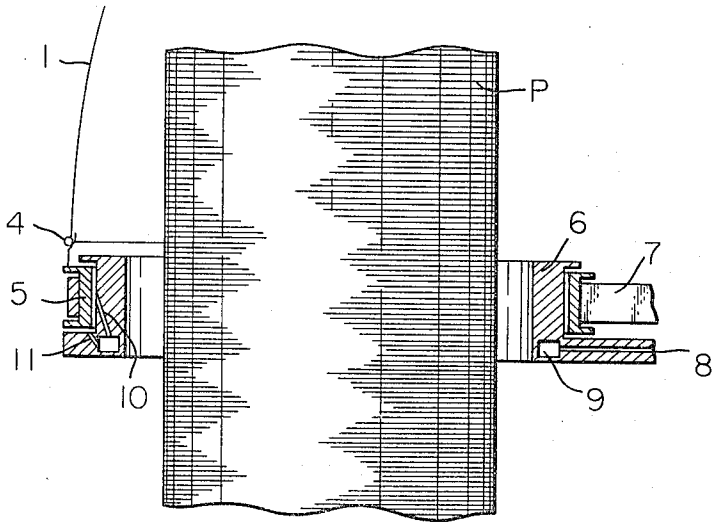


Fig. 5

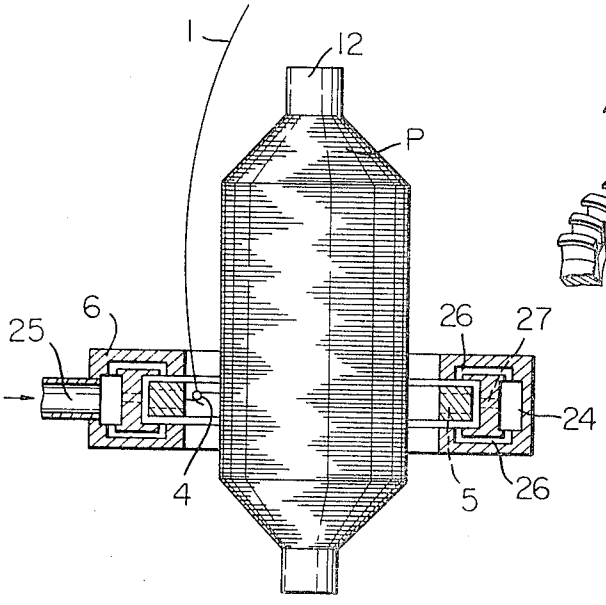
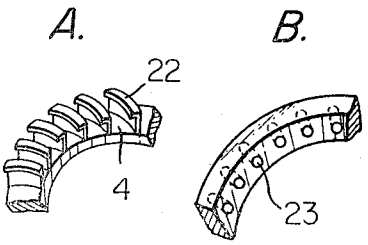


Fig. 6

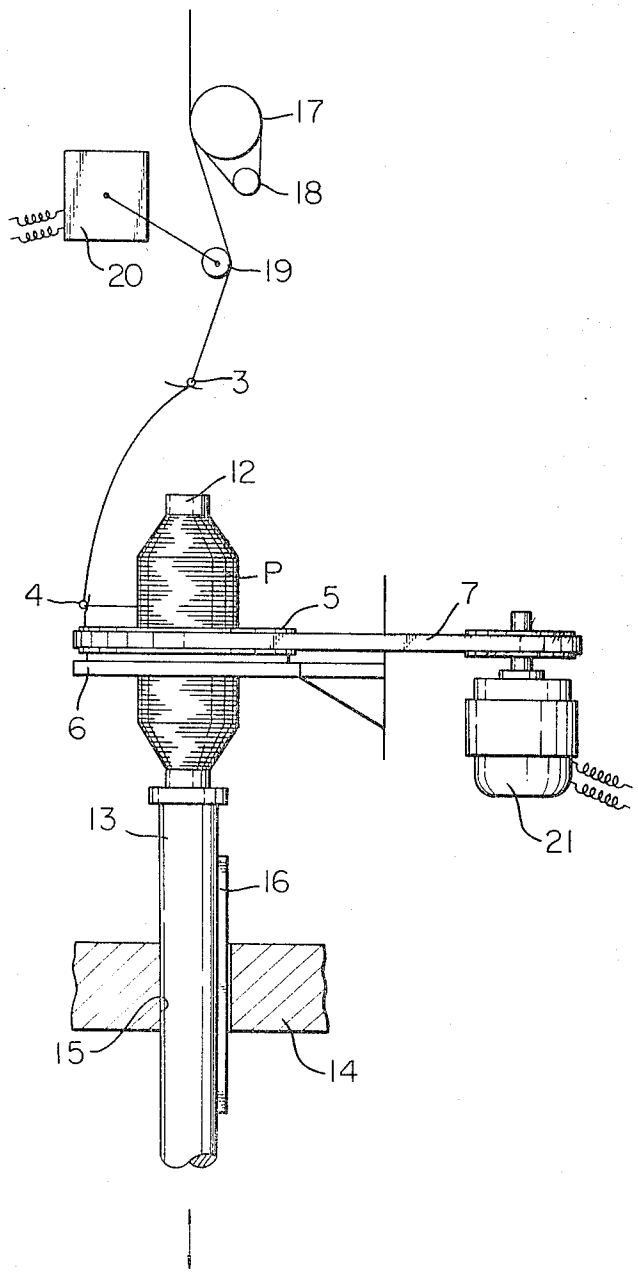


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Fig. 3

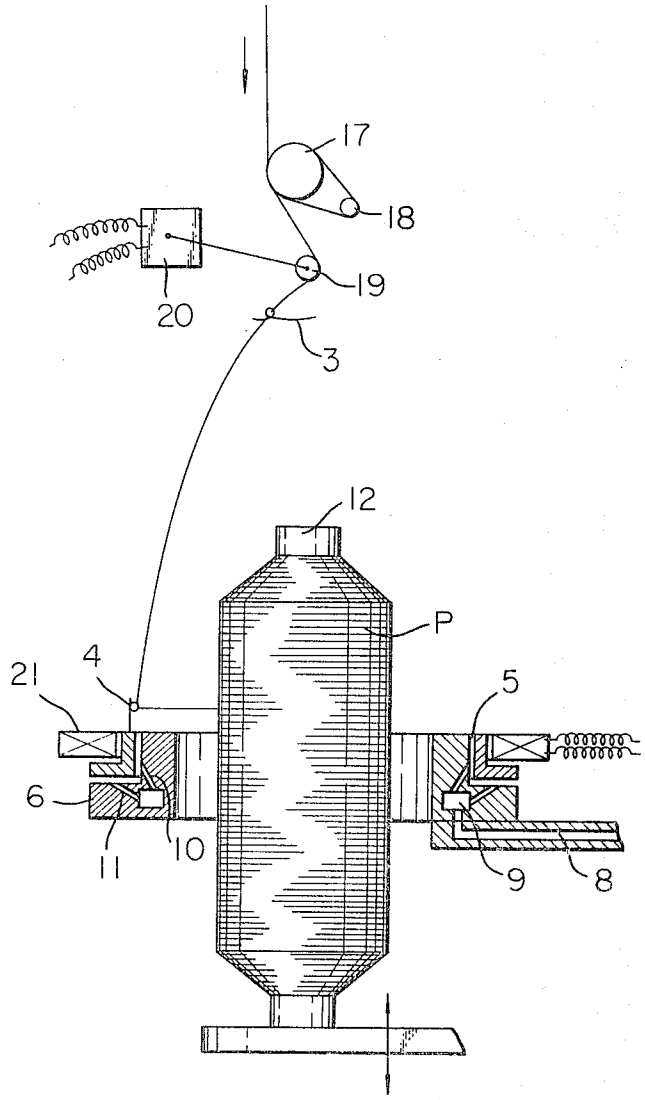


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Fig. 4



United States Patent Office 3,543,503 Patented Dec. 1, 1970

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APPARATUS FOR WINDING A YARN

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Filed May 21, 1968, Ser. No. 730,863
Claims priority, application Japan, May 26, 1967, 42/33,420; Aug. 4, 1967, 42/50,099; Jan. 25, 1968, 43/4,644
Int. Cl. D01h 7/52, 7/58
U.S. Cl. 57—75 1 Claim

ABSTRACT OF THE DISCLOSURE

Apparatus for winding a yarn package on a stationary bobbin and of the kind in which the yarn is passed through a snail wire to a yarn guide rigidly coupled with a ring which surrounds the axis and which is driven to rotate about the axis so that non-twisted yarn can be obtained when the yarn is left off from the package for certain after-treatment of the yarn.

This invention relates to apparatus for winding a yarn package on a stationary bobbin and of the kind in which the yarn is passed through a snail wire to a yarn guide rigidly coupled with a ring which surrounds the axis and which is driven to rotate about the axis so that non-twisted yarn can be obtained when the yarn is let off from the package for certain after-treatment of the yarn.

As it is known in twisting technology that there is winding-off twist when the wound package is unwound overhead while standing still, it might be expected in applying the method according to the invention that if non-twisted yarn is subjected to the winding process then the twist precedently applied by winding on the bobbin is counterbalanced and a non-twisted yarn is wound off.

The multifilament yarn spun through the spinneret of the spinner is divided into a number of separated monofilaments state so that doubling with other filaments of different nature can be conveniently applied for the purpose of obtaining intended effects when the filaments are fabricated in apparel form as to the luster and hand etc.

The present invention contemplates the provision of a compact winding apparatus to meet this end by which it is possible to wind off efficiently at high speeds yarns having substantially no twist.

Accordingly, the present invention is directed to an apparatus which is characterized in that in the apparatus for winding yarn on a bobbin by feeding the yarn axially of the bobbin, wherein a rotating ring is disposed enclosing a non-rotating fixed bobbin in an annular bearing having an inside diameter greater than the maximum diameter of the fully wound bobbin, said ring being supported by an air bearing, the yarn is fed to the bobbin via a yarn guide directly secured to said ring, and the bobbin and ring are caused to make reciprocative movement relatively of each other axially of the bobbin.

Other objects and effects of the present invention will become apparent from the detailed description of the invention which follows and the accompanying drawings and appended claim.

FIG. 1 is a schematic view illustrating one embodiment of the invention.

FIG. 2 illustrates a ring and bearing portion in the embodiment of FIG. 1, these parts being especially shown in section.

FIG. 3 which illustrates another embodiment is one having a yarn tension detecting device and a means for controlling the electric motor.

FIG. 4 which illustrates a still another embodiment is one which uses the ring as a rotor of the electric motor.

FIG. 5 shows a view partly broken away of another embodiment of the invention wherein the ring is driven by air jet.

FIG. 6 is a view showing the construction of only the ring of the apparatus illustrated in FIG. 5.

In FIG. 1 yarn 1 from the unwinding package proceeds as shown by the arrow to be conveyed to a yarn guide 4 via tensioning device 2 and snail wire 3. As shown more fully in FIG. 2, the yarn guide 4 is secured to a ring 5. In the same figure the ring 5 fits rotatably to the periphery of an annular bearing 6. The inside diameter of the annular bearing 6 is greater than that of the yarn package when fully wound. The ring 6 has a belt 7 mounted about its outer periphery and is rotatively driven by an electric motor (not shown). The numeral 8 denotes an inlet provided in the bearing from which air is introduced under pressure, while 9 is a duct provided annularly about the inside of the annular bearing 6 and is in communication with the inlet 8. The duct 9 is also in communication with the nozzles 10 and 11 from which compressed air is jetted against the bearing's outer peripheral surface to function as a lubricant between the ring 5 and the annular bearing 6.

Reverting to FIG. 1 a bobbin 12 is mounted atop a spindle 13. While the spindle 13 is fitted in a hole 15 of a rail 14 so as to be slidable vertically it is keyed 16 therein and hence cannot rotate but makes a vertically traversing movement by means of a device (not shown).

This apparatus operates in the following manner. When the ring 5 is rotated at a high speed by a motor 21 via the belt 7, yarn 1 proceeds via a tensioning device 2 to the yarn guide 4 under suitable tension and is wound on the bobbin by the rotation of the guide 4. Since the bobbin 12 in the meanwhile continues to make its vertical movement, the yarn is traversed on the bobbin and forms a package P. In this instance, the method of winding is preferably by the parallel winding technique, as shown in the drawings.

FIG. 3 illustrates another embodiment of the invention. In this embodiment the yarn 1 is supplied at a constant speed at all times by means of a feed roll 17. The yarn 1 winds about the feed roll 17 and an auxiliary roll 18, as shown in FIG. 3, and then contacts a tension detecting roller 19 to arrive at a snail wire 3. Fluctuations in the tension of the yarn is detected by means of the tension detecting roller, with the consequence that a controlling device 20 is operated to thereby control the speed of the motor to regulate the speed at which the ring 5 rotates and hence maintain the tension of the yarn being wound constant at all times.

Next, in the case of the apparatus illustrated in FIG. 4, the ring 5 itself is made the rotor of the electric motor and a stator 21 is disposed surrounding the ring 5. This apparatus is featured in that the overall size thereof has been made mechanically compact and by reducing the inertia of the rotating portion it has been made more easily responsive to the fluctuations in the yarn tension.

On the other hand, the apparatus shown in FIG. 5 is one which is rotated by jetted air. Vanes 22 or slanted holes 23 are provided in the ring 5, as shown in FIG. 6. Numeral 24 denotes a duct which has been annularly provided in the bearing 6 and compressed air is introduced into this duct from an inlet line 25. Numerals 26 and 27 denote jetting holes, the air fed to the annular duct 24 being jetted from the holes 26 to function as an air bearing between the ring 5 and the annular bearing 6, while a part of the air is jetted from the jet holes 27 to rotate the ring 5. According to this embodiment, not only is the construction of the apparatus simplified by also the wind-

ing of the package with a uniform firmness is made possible.

While the embodiments presented hereinabove are those in which the bobbin spindle made a reciprocative movement relative to the ring, it is, of course, also possible for the ring to make a reciprocative movement relative to the bobbin spindle. And in this case, it is desirable to ensure that the distance between the yarn conducting means, i.e. the snail wire, and the ring is maintained constant.

Since the setup of the apparatus of the present invention comprises an annular bearing provided so as to enclose a fixed bobbin, the inside diameter of which bearing is greater than the maximum diameter of the bobbin when fully wound, a ring on this bearing supported by means of an air bearing, and a guide secured to the ring whereby the yarn is wound on the bobbin, the apparatus is compact and is capable of high speed rotation. In addition, the yarn can be wound while being imparted a twist in the opposite direction corresponding to the winding-off twist.

Further, when a plurality of winding units are assembled as a single set and the set is driven by a single motor, the operation of all the units of the set can be controlled by the detection of the tension of one of the units.

What is claimed is:

1. An apparatus for winding yarn by feeding the yarn axially of a non-rotating bobbin; comprising means for axially reciprocating said bobbin, an annular bearing disposed concentrically about said bobbin, the inside diameter of said bearing being greater than the maximum diameter of the yarn package, a ring rotatably provided on the outside of said annular bearing, a yarn guide directly secured to said ring and means for rotating said ring whereby when said ring is caused to be rotated, the yarn is wound onto said bobbin.

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U.S. Cl. X.R.

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