Oct. 30, 1962 R. W. CHIDGEY, JR., ETAL 3,061,215

APPARATUS FOR WINDING YARN

Filed Jan. 21, 1960 2 Sheets-Sheet 1

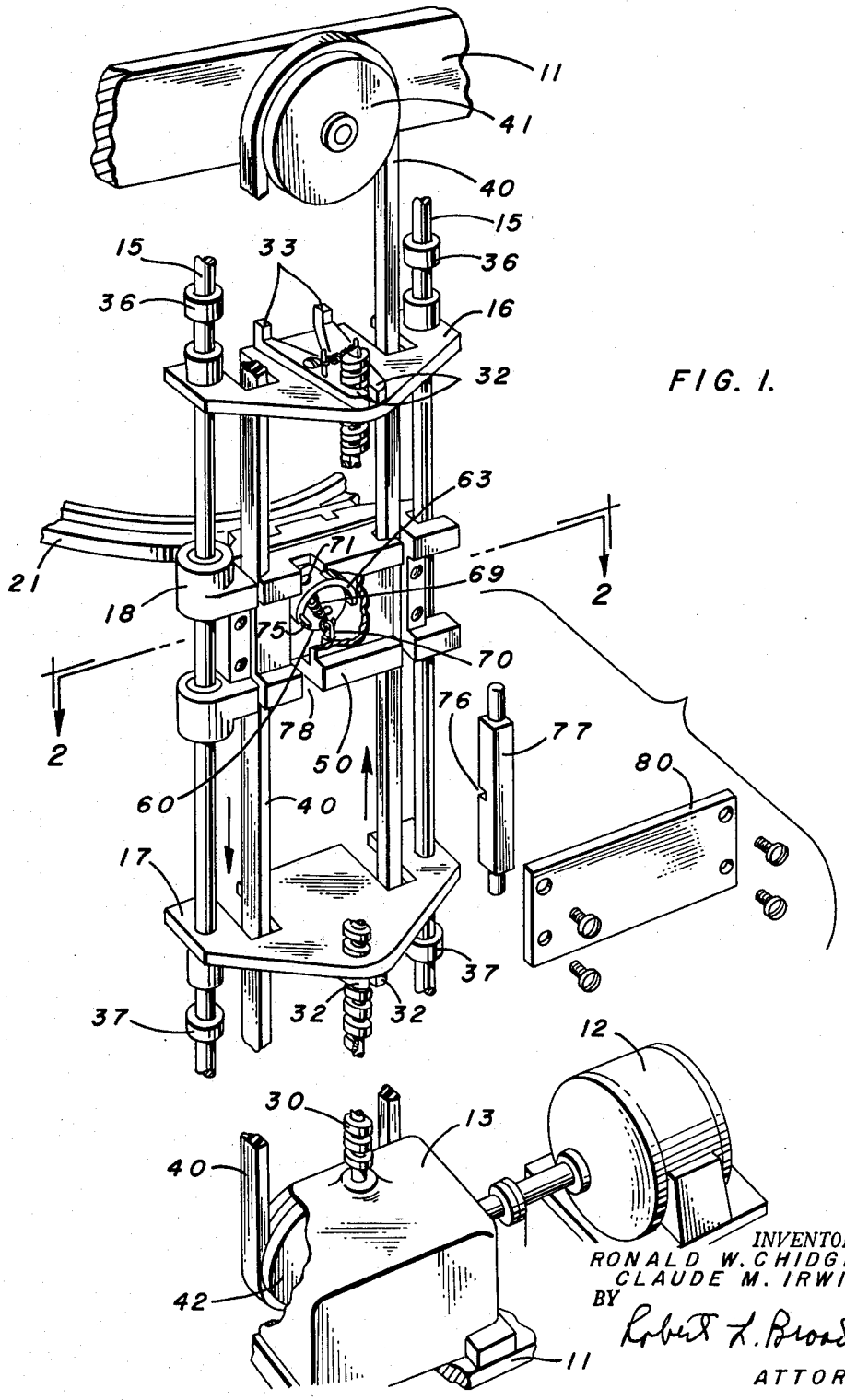

FIG. 1.

INVENTORS
RONALD W. CHIDGEY, JR.
CLAUDE M. IRWIN
BY
Robert L. Broad Jr.
ATTORNEY

Oct. 30, 1962 R. W. CHIDGEY, JR., ETAL 3,061,215

APPARATUS FOR WINDING YARN

Filed Jan. 21, 1960 2 Sheets-Sheet 2

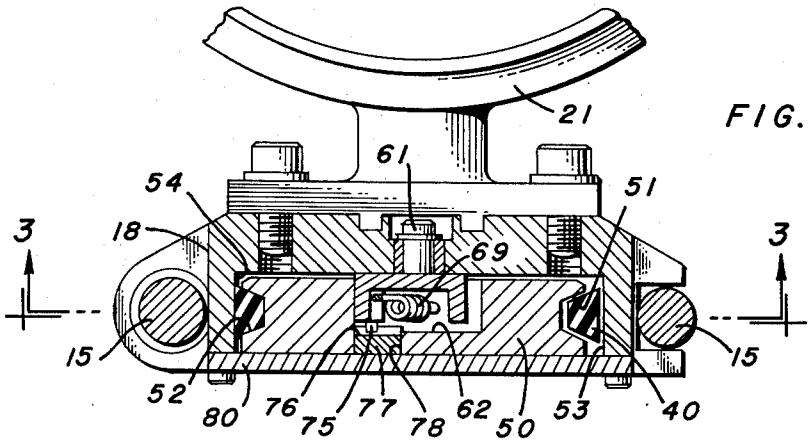

FIG. 2.

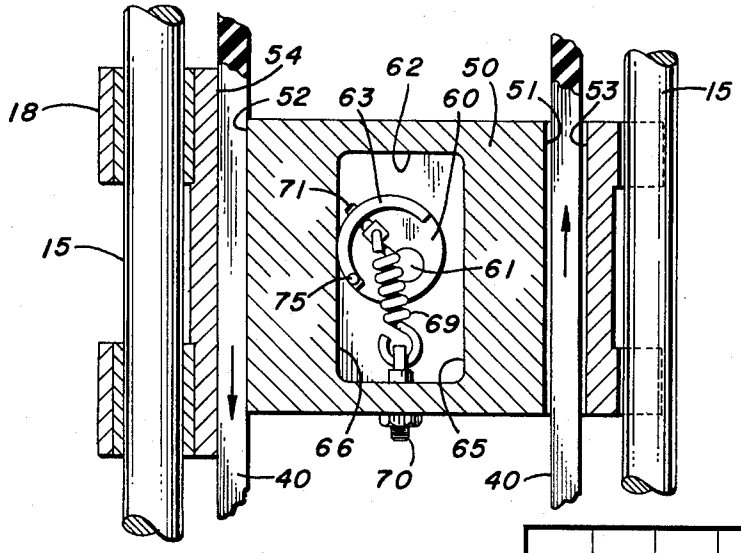

FIG. 3.

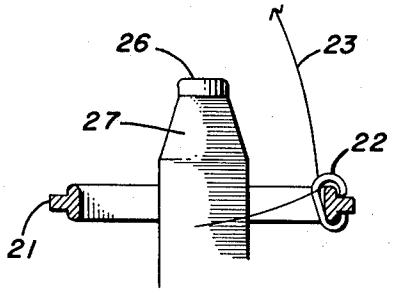

FIG. 4.

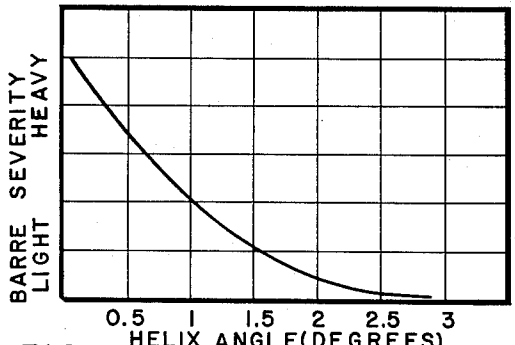

FIG. 5.

INVENTORS
RONALD W. CHIDGEY, JR.
CLAUDE M. IRWIN
BY
Robert F. Brood Jr.
ATTORNEY

United States Patent Office 3,061,215 Patented Oct. 30, 1962

3,061,215

APPARATUS FOR WINDING YARN

Ronald W. Chidgey, Jr., and Claude M. Irwin, Pensacola, Fla., assignors, by mesne assignments, to Monsanto Chemical Company, a corporation of Delaware

Filed Jan. 21, 1960, Ser. No. 3,818
1 Claim. (Cl. 242—26.3)

This invention relates to apparatus for winding yarn and more particularly to apparatus for winding yarn onto a bobbin in such a manner as to eliminate pirn taper barre in a fabric made up from the yarn.

In the formation of one type of yarn package, the yarn is wound onto the bobbin in such a manner that the finished package has a cylindrical central portion and tapered ends. Because of stresses, the typical synthetic yarn in the tapered ends of the package undergoes changes in characteristics which cause streaks in a fabric made up from the yarn. These streaks are commonly referred to as "pirn taper barre," since the yarn in the streak comes from the tapered portion of the yarn package. It is well known that thermoplastic yarns, such as nylon, have a certain amount of elasticity and, after being drawn or stretched, tend to shrink. Pirn taper barre is believed to be a result of varying pressures set up in portions of the yarn package by shrinkage of the yarn, or a result of varying denier caused by this shrinkage. As a result of this problem, the ultimate user of the synthetic yarn has found it necessary to unwind the yarn from this package, reprocess it, and rewind it into another package before using it, in order to eliminate streaks in the finished fabric. This, of course, is undesirable. With this problem in mind, one of the objects of this invention is to provide a novel and improved method and apparatus for winding yarn into a tapered package in such a manner that pirn taper barre is eliminated.

Another object of this invention is to provide apparatus for winding yarn onto a bobbin at a predetermined angle relative to the bobbin.

A further object of this invention is to provide apparatus for rapidly traversing yarn being wound into a package.

Still another object of this invention is to provide apparatus for traversing yarn along a bobbin at a uniform speed from one end of the bobbin to the other.

A still further object of this invention is to provide apparatus for traversing a yarn along a bobbin without a decrease in traversing speed near the ends of the traversing stroke.

One of the embodiments of the invention contemplates a method of winding a yarn onto a bobbin wherein the yarn is traversed at a high speed, without a decrease in traversing speed near the ends of the traverse stroke. The traversing speed is sufficiently high that the yarn is laid onto the bobbin at a helix angle of several degrees relative to the axis of the bobbin. As a result of winding the yarn onto the bobbin at a high helix angle, pirn taper barre is eliminated. The helix angle is a function of winding speed and traversing speed. Inasmuch as the yarn winding speed is quite high, it is necessary to traverse the yarn at a high speed in order to obtain the desired helix angle, without which pirn taper barre results.

An apparatus for winding the yarn in the above-described manner may include a continuous belt having one span traveling in one direction along a path parallel to the bobbin and having another span traveling along a path parallel to the bobbin in the opposite direction. A traversing block carrying a conventional yarn guide is mounted for reciprocation along a path parallel to the bobbin. A gripper member movably mounted on the traversing block cooperates with the block to grip the spans of the moving belt alternately near the beginning

of the path of travel in one direction and near the beginning of the path of travel in the other direction in such a manner that the traversing block is rapidly reciprocated to traverse the yarn. Inasmuch as the belt is moving at a uniform speed and the traversing block moves at the same speed as the belt, the yarn is traversed onto the bobbin at a high speed without a decrease in the traversing speed near the ends of the traverse stroke.

Other objects and advantages of the invention will become apparent when the following detailed description is read in conjunction with the appended drawings, in which

FIGURE 1 is a fragmentary perspective view of one embodiment of the invention showing the general layout of the various elements of the invention;

FIGURE 2 is an enlarged sectional view of the traversing block showing the manner in which the traversing block and a gripper block cooperate to grip the belt;

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 2 showing a cam which actuates the gripper block;

FIGURE 4 is a fragmentary sectional view showing a traveler mounted on a traversing ring for directing yarn onto a bobbin; and

FIGURE 5 is a graph showing the relationship of barre severity to helix angle.

FIGURE 5 shows the relationship of barre severity to helix angle in a synthetic yarn wound into a package having tapered ends and then made up into a fabric without further processing, the helix angle being the angle at which the yarn is laid or wound onto the bobbin. When conventional yarn winding methods and apparatus are used, the yarn is laid onto the bobbin at a helix angle well under 1°. As FIGURE 5 shows, this will result in heavy barre, unless the weaver reprocesses the yarn. This has been a longstanding problem, the weaver invariably having to reprocess the yarn before it is made up into a fabric.

The method of the present invention comprises winding the yarn onto the bobbin at a helix angle greater than about 2–2.5°. The helix angle is a function of yarn takeup speed and yarn traverse speed. It is necessary, from an economy standpoint, to use a high yarn takeup speed. Consequently, the traverse speed must be high, in order to obtain a helix angle of at least 2–2.5°.

As an example of the method, yarn was wound onto a bobbin in such a manner as to form a yarn package having a cylindrical central portion and tapered end portions, such as is the result of conventional warp winding. The yarn was wound or laid onto the bobbin at a speed of 426 yards per minute. The length of the traverse stroke at the beginning of the winding operation was 10.5 inches, and the yarn was traversed at 30 strokes per minute. As a result of these takeup and traversing speeds, the helix angle was approximately 2.5°. Pirn taper barre was undetectable in fabric woven from this yarn.

Using the same yarn takeup speed and stroke length and varying traverse speeds, other runs were made. FIGURE 5 illustrates the results of these runs. When the helix angle is above 2–2.5°, pirn taper barre is not detectable. As the helix angle is decreased from this range, pirn taper barre becomes more and more noticeable. Of course, if the barre is noticeable at all, the fabric is not usable.

Referring now in detail to the drawings, which show a device for performing the method, a frame **11** is shown supporting a driving motor **12** and a gear box **13**. The frame **11** also supports a pair of guide rods **15** upon which are slidably mounted a pair of striker plates **16** and **17** and a traversing block **18**. The block **18** carries a ring **21** having mounted thereon a traveler **22** of a well known type for directing a yarn **23** onto a bobbin **26** mounted

concentrically within the ring 21 and rotated in a well known manner by apparatus of a well known type. Reciprocation of the ring 21 applies the yarn 23 to the rotating bobbin 26 to form a package 27.

The positions of the striker plates 16 and 17 determine the distance of travel of the traversing block 18, and consequently, the distance of traversing of the yarn 23. In order to form a package having tapered ends such as that illustrated in FIGURE 4, it is necessary to move the striker plates 16 and 17 slowly together as the traversing block 18 is reciprocated to build the package 27. This movement is achieved by means of a screw 30 rotatably supported on the frame 11 and having opposite ends threaded in opposite directions. The screw 30 is driven from the gear box 13 and is connected to the striker plates 16 and 17 by spring loaded jaws 32 pivotably mounted on the striker plates 16 and 17. These jaws are provided with handles 33 which may be manually moved together to disengage the jaws 32 from the screw 30. When the jaws 32 are disengaged from the screw 30, the striker plates 16 and 17 may be freely moved up and down the guide rods 15.

Collars 36 secured to the guide rods 15 by set screws determine the uppermost or starting position of the upper striker plate 16. Lower collars 37 secured to the guide rods 15 by set screws determine the lowermost or starting position of the lower striker plate 17. The collars 36 and 37 may be set at different positions on the guide rods 15 to vary the starting positions of the striker plates 16 and 17.

AV-belt 40 for reciprocating the traversing block 18 is carried by pulleys 41 and 42, the pulley 41 being mounted on the frame 11 and the pulley 42 being driven through the gear box 13. The pulley 42 is rotated in such a direction that the span or portion of the belt 40 to the right of the pulleys 41 and 42 (FIGURE 1) moves upward along a path parallel to the bobbin and the left span or portion of the belt 40 moves downward along a path parallel to the bobbin. Thus, one span of the belt 40 is moving in one direction parallel to the bobbin while the other span of the belt is moving in the other direction parallel to the bobbin.

The traversing block 18 is provided with a rectangular groove in which is slidably mounted a gripper block 50 having at its opposite ends vertical grooves 51 and 52 (FIGURE 2) which conform in shape to the inner portion of the V-belt 40. The right portion or span of the belt 40 passes through the groove 51 between the gripper block 50 and a surface 53 of the traversing block 18. The left portion of the belt 40 passes through the groove 52 between the gripper block 50 and a surface 54 of the traversing block 18. The gripper block 50 is adapted to be moved to the right or left to grip either span of the belt 40. When the gripper block 50 is moved to the left as shown in FIGURE 2, the left portion or span of the belt 40 is gripped between the block 50 and the block 18, and the block 18 with the ring 21 is carried downward at the speed of travel of the belt 40. When the gripper block is moved to the right, the right portion or span of the belt 40 is held between the block 18 and the block 50, and the block 18 with the ring 21 is carried upward.

A circular, eccentric cam 60 having a longitudinally extending flange 63 extending partially around the periphery thereof is provided with a supporting pin 61 rotatably attached to the block 18 in such a manner that the cam 60 may be rotated relative to the block 18. The cam 60 is positioned in an opening 62 in the gripper block 50, the block 50 having surfaces 65 and 66 which the flange 63 is adapted to engage to move the block 50 in one direction or the other. A tension spring 69 is attached at one end to a bolt 70 secured to the block 50 and at the other end to a screw 71 extending through the flange 63. The spring 69 urges the cam 60 against one of the surfaces 65 or 66 to cause one span or the other of the belt 40 to be gripped.

A pin 75 secured to the cam 60 extends into a transverse notch 76 in a bar 77 which is slidably mounted in a groove 78 in the gripper block 50. A plate 80 secured to the traversing block 18 retains the gripper block 50 and the bar 77 within the rectangular groove in the block 18. The ends of the bar 77 extend above and below the traversing block 18 and are adapted to engage the striker plates 16 and 17 as the block 18 is reciprocated to traverse the yarn 23. This changes the position of the bar 77 in the groove 78 to thereby change the position of the cam 60 for changing the direction of the block 18.

As illustrated in the drawings, the left portion or span of the belt 40 is gripped between the blocks 18 and 50 and the block 18 is moving downward. When the block 18 nears the lower striker plate 17 the lower end of the bar 77 will engage the striker plate 17. This stops the bar 77 and causes the cam 60 to be rotated clockwise, whereupon the flange 63 engages the surface 65 of the block 50 to move this block to the right for gripping the right portion or span of the belt 40. This causes the block 18 and the ring 21 to be moved upwardly.

When the block 18 nears the upper striker plate 16, the bar 77 engages the plate 16 and is stopped, whereupon the cam 60 is rotated counterclockwise into engagement with the surface 66 of the gripper block 50. This urges the gripper block 50 to the left into the position illustrated in the drawings, whereupon the traversing block 18 begins to move downward.

In operation of the device, the traversing block 18 is reciprocated to traverse the yarn 23 as described above. During the winding of the package 27 the screw 30 is continuously rotated to slowly advance the striker plates 16 and 17 from the starting positions toward each other. This causes the distance of travel of the traversing block 18 to be continuously shortened until the package 27 is completed. As a result, a yarn package having a cylindrical body and tapered ends is formed on the bobbin. The handles 33 are then manually moved together to disengage the jaws 32 from the screw 30 and the striker plates 16 and 17 are manually moved to their starting positions. Another bobbin 26 is mounted on the machine and the above procedure is repeated.

Because of the construction and mounting of the cam 60 and the spring 69, it can be seen that the cam 60 will operate with a snap action to thereby give an extremely fast change of direction to the block 18. Also, it is not necessary that the bar 77 be moved far enough to jam the cam 60 against the gripper block 50. When the bar 77 moves the cam 60 to a point where the screw 71 passes the position comparative to top dead center, the spring 69 takes over to snap the cam 60 into its new position. The result is a fast reversal of the direction of travel of the block 18 and the ring 21. Since the block 18 and the ring 21 travel with the belt, it is clear that the speed of traverse does not decrease near the ends of the stroke, as is the case in conventional yarn traversing mechanisms.

It is to be understood that the embodiment disclosed herein is merely illustrative of the invention and that many other embodiments may be contemplated without departing from the spirit and scope of the invention.

What is claimed is:

A device for guiding yarn onto a rotating bobbin, comprising a frame, a pair of guide rods mounted on the frame parallel to the axis of the rotating bobbin, a pair of stop members slidably mounted on the guide rods, means on the frame for moving the stop members toward each other on the guide rods, a traversing block slidably mounted on the guide rods between the stop members and having a rectangular groove extending thereacross, a pair of pulleys mounted on the frame, a belt carried by the pulleys and having two spans extending through said rectangular groove parallel to the axis of the bobbin, means on the base for rotating the pulleys so that one of said spans moves in one direction while the other said span moves in the opposite direction, a gripper block slidably mounted

in the rectangular groove in the traversing block for cooperating with said traversing block to alternately grip one and then the other of the spans of the belt, said gripper block having a central opening, a cam pivotally attached to the traversing block and positioned in the central opening in the gripper block for engaging and actuating said gripper block, a tension spring secured to the cam and to the gripper block for urging said cam into engagement with the gripper block, a bar slidably mounted on the gripper block parallel to said guide rods and having ends extending past the edges of said gripper block and also having a transverse notch, and a pin secured to the cam and extending into the transverse notch in the bar in such a manner that movement of the bar pivots the cam, said bar being adapted to engage the stop members for pivoting the cam and thereby reversing the direction of the traversing block.

References Cited in the file of this patent

UNITED STATES PATENTS

1,582,107	Whiteside	Apr. 27, 1926
1,918,587	Bryant	July 18, 1933
2,285,438	Jones	June 9, 1942
2,296,420	Campbell	Sept. 22, 1942
2,609,163	La Cesa	Sept. 2, 1952
2,764,363	Stammwitz	Sept. 25, 1956
2,911,835	Smith	Nov. 10, 1959

FOREIGN PATENTS

17,065	Netherlands	Feb. 15, 1928
373,438	Italy	July 26, 1939
783,344	Great Britain	Sept. 25, 1957