Feb. 7, 1956 S. A. PETERSEN 2,733,873

MANDREL

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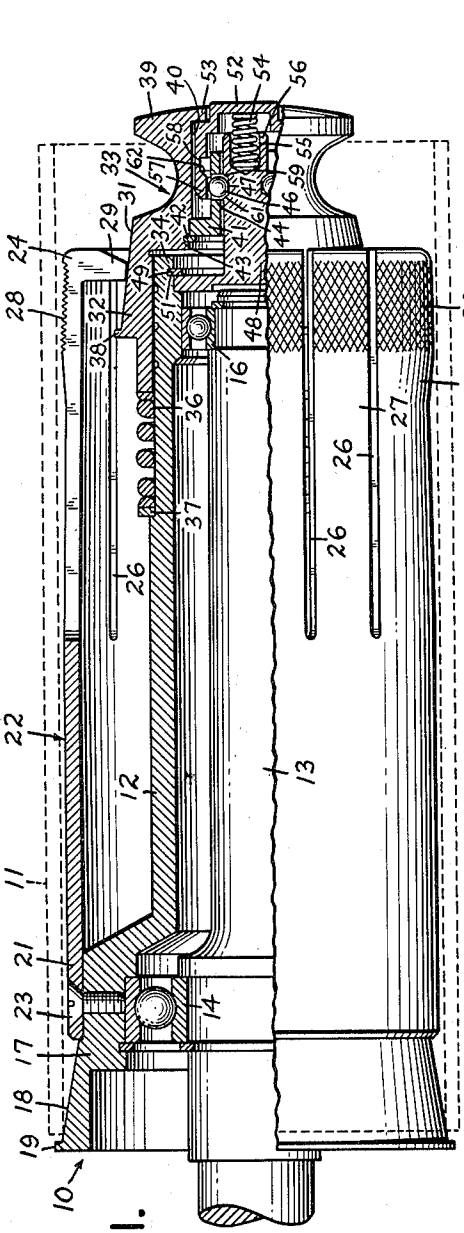

FIG. 1.

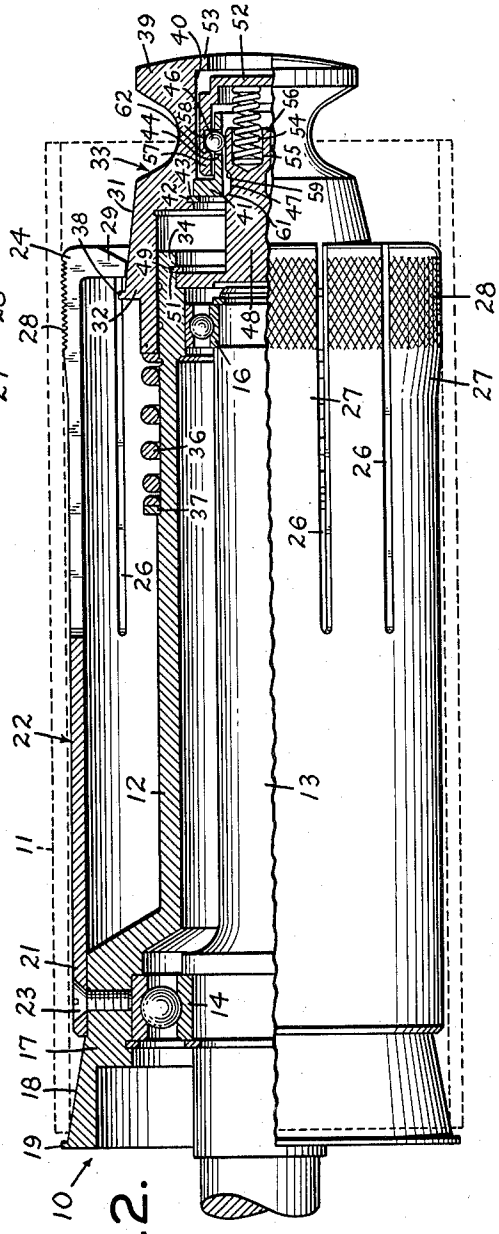

FIG. 2.

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MANDREL

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This invention relates to machines for winding yarn into package form, and relates more particularly to mandrels employed in yarn winding machines on which tubular yarn package supports are mounted for rotation therewith.

In the winding of yarns on tubular yarn package supports, or tubes, it is customary to employ a mandrel mounted for rotation and provided with means for gripping the tube. The tube, which is generally made of paper, is placed on the mandrel and the gripping means are moved into engagement with the tube to hold it firmly on the mandrel. After this loading operation, the tube is rotated to wind yarn thereon by placing a driven rotating roller into contact with the outside of the tube and with layers of yarn wound on the tube. When the winding operation is completed, the driven roller is moved away from the wound tube and the rotation of the tube and mandrel is stopped. The wound tube is then unloaded from the mandrel by releasing the gripping means from contact with the tube and then removing the tube from the mandrel. The mandrels used in the prior art have been difficult to load and unload and have necessitated many time-consuming operations on the part of the operator in placing the tube on the mandrel, effecting the engagement of the gripping means with the tube, releasing the gripping means and removing the tube.

It is an object of this invention to provide a new and improved mandrel for yarn package supports which will be free from the foregoing and other difficulties.

A further object of this invention is the provision of a novel mandrel for yarn tubes which is easily and rapidly loaded and unloaded.

Other objects of this invention will be apparent from the following description and claims.

According to this invention, the mandrel for a yarn package support comprises a member mounted for rotation having gripping means and means for forcing said gripping means into engagement with said yarn package support, a spring for operating said forcing means, and releasable means for holding said forcing means in inoperative position. The releasable means has a trigger action. Thus the releasable means prevents the operation of the forcing means when operatively engaged therewith, and, when said releasable means is released, frees the forcing means so that the spring can move the forcing means to urge the gripping means into engagement with the yarn package support.

More particularly, the mandrel of this invention comprises a barrel mounted for free rotation on an arbor. The barrel is provided with a skirt for engaging an end of the yarn tube as the tube is slipped over the mandrel, and with a sleeve, having an expansible portion mounted around the barrel. One end of the sleeve is fixed to the barrel, while the other, expansible, end of the sleeve is composed of a plurality of fingers provided with roughened outer surfaces and with inwardly directed flanges. These flanges are adapted to be engaged by a cam surface of a cap slidably mounted on the barrel. A spring, also mounted on the barrel, pushes the cap in a direction to cause the cam surface to move the flanges outwardly, thus expanding the sleeve and forcing the roughened surfaces of the fingers of the sleeve into gripping engagement with an inner surface of the yarn tube.

When no yarn tube is mounted on the mandrel, the cap is normally maintained in a position in which it is prevented from moving in the direction to expand the sleeve. The cap is locked in this inoperative position by a movable detent which is maintained in locking position by a holding means. This holding means may be moved to allow the detent to be released from its locking position, thereby permitting the spring to push the cap in the direction to expand the sleeve. The holding means is mounted in such a manner that this detent-releasing movement is in the same direction as the movement of the yarn tube when the tube is being slipped over the mandrel, so that one continuous motion of the tube in the hand of an operator is sufficient to slip the tube over the mandrel and to move the holding means, thus causing the tube to be gripped firmly on the mandrel.

The cap is generally mounted to project beyond the free end of the mounted yarn tube, that is, beyond the gripped end of the tube. Operatively connected to the cap, for operating on the detent, is a restoring means for returning the detent to its locking position when the cap is moved manually against the action of its spring to its inoperative position. Thus, removal of a fully wound tube from the mandrel requires only a simple continuous motion of the hand of the operator. The hand of the operator, in approaching the free end of the tube, engages and pushes the cap inwardly to its inoperative position, thus releasing the tube from the mandrel, and then grasps the tube at its free end and slides the tube off the mandrel.

The cap of the mandrel of this invention is hollowed to receive a ball retaining sleeve and a spring-pressed, cup-shaped push button. The ball retaining sleeve has an aperture adapted to receive a detent ball whose diameter is greater than the thickness of the sleeve, so that the ball projects from one or both sides of the sleeve. Within this sleeve is mounted a grooved post which is attached to the barrel of the mandrel. The groove of this post is adapted to receive a projecting portion of the ball so as to lock the cap to the barrel in the inoperative position. The groove of the post has a tapered shoulder adapted to force the ball out of the groove when there is movement of the ball relative to post. To retain the ball in the groove of the post, the spring-pressed, cup-shaped push button is provided with a rim adapted to engage the ball. The button is also provided with a groove spaced from its rim and adapted to receive part of the ball. When it is desired to release the cap from its inoperative position the button is pushed, against the force of its spring, into a position when the ball can be received in the groove of the button, thereby permitting the ball to leave the groove of the post and unlocking the cap from the barrel. As stated, the cap, when released, is moved by its spring to its operative or expanding position in which it expands the expansible sleeve into engagement with the yarn tube. When the cap is in this expanding position the tip of the grooved post engages the ball and thereby retains the ball in the groove of the button. When the cap is moved manually, back to its inoperative position, during the doffing or unloading of the yarn tube, the ball retaining sleeve carries the ball to a position where the ball can be received in the groove of the post, thus allowing the ball to leave the groove of the button. When this happens, the spring of the push button urges said button to a position where

its rim once more engages the ball, and the cap is retained in inoperative position.

In the accompanying drawing, which illustrates certain preferred embodiments of this invention,

Fig. 1 is an elevational view, partly in section, illustrating the position of the parts of the mandrel before the yarn tube is loaded thereon, and

Fig. 2 is an elevational view, partly in section, illustrating the position of the parts of the mandrel when the yarn tube is loaded thereon.

Like reference numerals indicate like parts in both views of the drawing.

In the drawing reference numeral **10** indicates generally a rotatable mandrel adapted to support a cylindrical tube **11**, shown in dotted lines, on which yarn is to be wound. In order to place the tube **11** on the mandrel **10** the tube is slipped over the mandrel from right to left, as shown in the drawing. The mandrel **10** comprises a barrel **12** supported for free rotation on an arbor **13** by any suitable means such as ball bearings **14** and **16** mounted near opposite ends of said barrel. The barrel **12** is provided with a skirt **17** having a tapered outer surface **18** adapted to be engaged by one end of the tube **11**, the tapered outer surface **18** being provided with a circumferential flange **19** for limiting the horizontal movement of the tube. The inner surface of the skirt **17** is adapted to be engaged by a suitable brake (not shown) for use when it is desired to stop the rotation of the barrel **12**. The skirt **17** is also adapted to support one end **21** of an expansible sleeve **22**, which may be fixed to said skirt by any suitable means, such as screws **23**. At its other end **24** the expansible sleeve **22** is provided with longitudinal, circumferentially spaced slits **26** which divide this end of the sleeve into a plurality of resilient fingers **27** having knurled portions and inwardly directed flanges **29**. The knurled portions **28** are adapted to be pressed into engagement with the inner surface of the tube **11** by the action of a cam surface **31** which engages the flanges **29**. The cam surface **31** is located on the outside of an annular projection **32** on a cap **33**, which projection is slidably mounted on the surface of the barrel **12**, particularly over the head **34** of the barrel **12**. A helical spring **36**, encircling the barrel **12** and located between a shoulder **37** on said barrel and the end of projection **32**, urges the cap **33** to the right. If the cap **33** is allowed to move to the right, in response to the urging of spring **36**, its cam surface **31** will move fingers **27** outwardly thus forcing the knurled surfaces **28** into engagement with the tube **11**. An abutment **38** adjacent the cam surface **31** serves to limit the expanding movement of the cap **33**.

Cap **33** is provided with a head **39** having a central aperture **40** adapted to receive a flanged sleeve **41** which is retained in said head **39** by any suitable means, such as a snap ring **42** seated in a groove **43** in said head. The sleeve **41** has a hole **44** for the reception of a detent ball **46**, whose diameter is greater than the thickness of said sleeve. This detent ball **46** is adapted to lock the cap **33** to the barrel **12** by engaging in a circumferential groove **47** of a flanged post **48** which is adapted to be received within the sleeve **41** and is secured to the head **34** of the barrel **12** by any suitable means, such as a snap ring **49** engaging the flanged portion of the post **48** and seated in a groove **51** in the head of the barrel. The position of the ball **46** is controlled by a cup-shaped button **52**, fitting over the sleeve **41** and mounted for sliding movement within the central aperture **40** of cap **33**. Button **52** is normally urged to the right into engagement with an abutment **53** on said cap by means of an expansible spring **54** mounted within a bore **55** in the tip **56** of the post **48** and engaging the base of said button. The button **52** is provided with a rim **57** adapted to engage the top of the ball **46** and to maintain said ball in the groove **47** of the post **48**, as shown in Fig. 1. Spaced to the right of the rim **57** is a groove **58** on the inner side of the

button **52**. This groove **58** is adapted to receive the ball **46** and is of such dimensions that when the ball is within said groove **58** it is completely out of the groove **47** of the post **48**. The latter groove **47** is provided with tapered shoulders **59** and **61** so that if the ball **46** is urged either to the right or to the left by movement of the sleeve **41** these shoulders **59** and **61** will tend to urge the ball out of said groove **47**. The groove **58** on the button **52** is provided with a similar tapered shoulder **62** on the side of the groove nearer the rim **57**.

When the parts are in the position illustrated in Fig. **1** the ball **46** is urged to the right by the force of the spring **36** acting on the cap **33** and, through the cap, on ball-retaining sleeve **41**. In this position the ball **46** is pressed against the shoulder **59** of the groove **47** and thereby tends to leave said groove **47**, but is prevented from leaving said groove only by the engagement of rim **57** with said ball. When it is desired to place the tube **11** on the mandrel **10**, the operator slides the tube over the mandrel from right to left until the end of the tube engages the tapered surface **18** extending from barrel **12** and then pushes the button **52** to the left, thus moving groove **58** to a position over the ball **46**. The ball **46** is then free to leave the groove **47** of the post **48**, in response to the action of spring **36**, since rim **57** no longer engages said ball. Thus the ball **46**, ball-retaining sleeve **41** and the cap **33** are freed for movement to the right in response to the action of the spring **36**. Movement of cap **33** to the right effects movement of the cam surface **31** relative to flanges **29** thus forcing the knurled surfaces **28** of the expansible sleeve **21** outwardly into engagement with the inner surface of the tube **11** so that the tube is gripped firmly. The parts are now in the position shown in Fig. 2 with the button **52** being held in a depressed position with respect to the cap **33** due to the fact that ball **46** prevents shoulder **62** of the button from moving to the right. However, spring **54** of the button **52** is still in a partly compressed condition and presses shoulder **62** to the right against the ball **46**. This pressure urges the ball **46** out of groove **58** of the button **52**. However, ball **46** is prevented from leaving groove **58** by the engagement of said ball with tip **56** of post **48**.

When it is desired to remove the tube from the mandrel, the operator first stops the rotation of the tube by engaging a suitable brake (not shown) with the inner surface of the skirt **18** of sleeve **17**, and then presses the cap **33** to the left thus moving the ball **46** to a position over the groove **47** of the post **48**. The ball **46** is then free to move out of the groove **58** of the button **52** in response to the action of spring **54**, and the parts move to the position shown in Fig. 1.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In a mandrel for a tubular yarn package support, a barrel mounted for rotation about the axis of an arbor, an expansible sleeve around said barrel and having one end fixed to said barrel, a cap coaxial with said barrel and slidably mounted thereon, said cap having a cam surface for expanding the other end of said sleeve into engagement with an inner surface of said support, spring means urging said cap axially in a direction to expand said sleeve, a detent having a locking position in which it holds said cap in a position inoperative to expand said sleeve, means for holding said detent in said locking position, said holding means being movable axially to a position permitting said detent to move out of said locking position and thereby permitting said cap to move in a direction to expand said sleeve, and axially movable means carried by said cap for movement therewith and operatively engaging said detent for restoring said detent to said locking position on

movement of said cap in a direction opposite to the urging of said spring means.

2. In a mandrel for a tubular yarn package support, a barrel mounted for rotation about the axis of an arbor, an expansible sleeve around said barrel and having one end fixed to said barrel, a cap coaxial with said barrel and slidably mounted thereon, said cap having a cam surface for expanding the other end of said sleeve into engagement with an inner surface of said support, spring means urging said cap axially in a direction to expand said sleeve, a detent having a locking position in which it holds said cap in a position inoperative to expand said sleeve, means operatively connected with said cap, for holding said detent in said locking position, said holding means being movable axially to a position permitting said detent to move out of said locking position and thereby permitting said cap to move in a direction to expand said sleeve, and axially movable means carried by said cap for movement therewith and operatively engaging said detent for restoring said detent to said locking position on movement of said cap in a direction opposite to the urging of said spring means.

3. In a mandrel for a tubular yarn package support, a barrel mounted for rotation about the axis of an arbor, an expansible sleeve around said barrel and having one end fixed to said barrel, a cap coaxial with said barrel and slidably mounted thereon, said cap having a cam surface for expanding the other end of said sleeve into engagement with an inner surface of said support, spring means urging said cap axially in a direction to expand said sleeve, a detent having a locking position in which it holds said cap in a position inoperative to expand said sleeve, a spring pressed push button in said cap for holding said detent in said locking position, said button being movable axially to a position permitting said detent to move out of said locking position and thereby permitting said cap to move in a direction to expand said sleeve, and axially movable means carried by said cap for movement therewith and operatively engaging said detent for restoring said detent to said locking position on movement of said cap in a direction opposite to the urging of said spring means.

4. In a mandrel for a tubular yarn package support, a barrel mounted for rotation about the axis of an arbor, a tapered skirt on said barrel adapted to engage one end of said support, an expansible sleeve around said barrel and having one end fixed to said barrel adjacent said skirt, a cap coaxial with said barrel and slidably mounted thereon, said cap having a cam surface for expanding the other end of said sleeve into engagement with an inner surface of said support, spring means urging said cap axially in a direction to expand said expansible sleeve, a ball retaining sleeve carried by said cap, a detent ball in said sleeve and projecting from the inside and outside of said sleeve, a post within said ball-retaining sleeve, said post being connected with said barrel and having a groove adapted to receive a portion of said ball whereby to lock said cap to said barrel in a position inoperative to expand said expansible sleeve, said groove having a shoulder adapted to force said ball out of said groove when there is relative movement between said ball and said post, a push button within said cap and having a rim adapted to fit over said ball retaining sleeve to retain said ball in the groove of said pin, a spring for said push button, said button having a groove spaced from said rim and adapted to receive part of said ball when said button is pushed against its spring, whereby to permit said ball to leave the groove of said post and permit said cap to move to its operative position to expand said expansible sleeve, said post having a tip adapted to engage said ball to retain said ball in the groove of said push button when said cap is in its operative position, said ball retaining sleeve being adapted to move said ball back into the groove of said post when said cap is moved back to its inoperative position.

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