

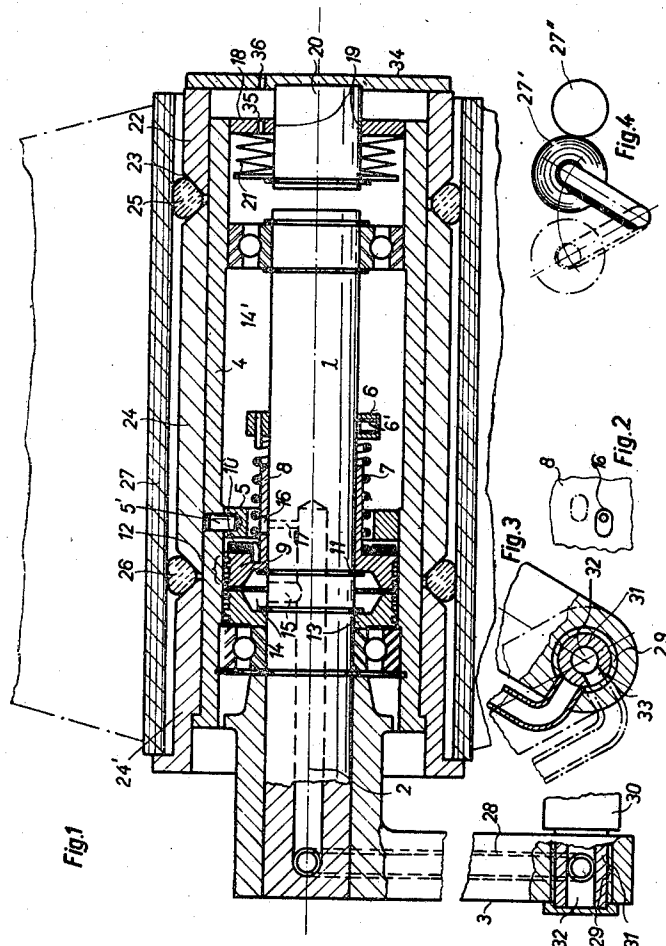
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EXPANSIBLE BOBBIN MANDREL

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EXPANSIBLE BOBBIN MANDREL

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14 Claims

ABSTRACT OF THE DISCLOSURE

The bushing of the expansible bobbin mandrel is subjected to an initial higher pressure on one side to move the bushing into braking relation with the rotatable cylinder while turning to cut off pressure flow to the pressure chamber containing the piston of the chuck mechanism. After braking, the pressure is equalized on both sides of the bushing to cause the piston to move out of the cylinder to relax the deformable rings.

This invention relates to an expansible bobbin mandrel for holding bobbin sleeves on a reeling machine. More particularly, this invention relates to an expansible bobbin mandrel for holding bobbin sleeves on a yarn reeling machine.

Expansible bobbin mandrels have been used heretofore in order to secure bobbin sleeves in place during a winding operation on a reeling machine. In many cases, these expansible bobbin mandrels have been associated with various braking gears and chuck holders which have respectively controlled the braking of a rotating sleeve on the mandrel and the releasing of the sleeve from the mandrel for removal and replacement. However, these expansible bobbin mandrels have frequently allowed the bobbin sleeves to become loosened before the sleeves have been brought to an actual standstill. This has usually been due to an independent actuation of the chuck holders from the braking gear. In addition, this loosening of the sleeves has led to an undesirable phenomena of wear on the sleeve as well as on the elements supporting the sleeve.

Accordingly, it is an object of the invention to ensure the braking of a bobbin sleeve to standstill before releasing of the sleeve from an expansible bobbin mandrel.

It is another object of the invention to depend the release of a bobbin sleeve from an expansible mandrel on the braking of the sleeve to a standstill.

It is another object of the invention to interconnect the chucking mechanism and braking mechanism for an expansible bobbin mandrel in a manner to actuate the chucking mechanism after the braking mechanism has stopped rotation of a bobbin sleeve on the mandrel.

Briefly, the invention provides an expansible bobbin mandrel with a chuck mechanism for releasably holding a bobbin sleeve on the mandrel and a braking mechanism for bringing a rotating bobbin sleeve on the mandrel to a standstill. The chuck mechanism and braking mechanism are interconnected to each other so that the chuck mechanism is actuated to permit release and removal of the sleeve from the mandrel only after the braking mechanism has brought the rotating bobbin to a standstill. In this regard, the braking mechanism and chuck mechanism are actuated from a single actuating means; however, a control means is interposed in the actuating means to permit completion of the braking operation of the braking mechanism prior to initiation of the effective releasing operation of the chuck mechanism. This control means is constructed to initially follow the actuation

of the braking mechanism so as to prevent actuation of the chuck mechanism while, after braking of a bobbin sleeve to rest, the control means is returned to its initial position to permit subsequent actuation of the chuck mechanism.

The expansible bobbin mandrel of the invention increases operational safety due to an arresting of the bobbin rotation prior to the loosening of the bobbin sleeve. Also, since the expansible mandrel requires only a single actuating means or system for actuating the braking function as well as the loosening function of the respective braking and chuck mechanisms, a simplified mandrel construction is provided. Further, there is substantially no dependence upon the structural dimensions of the expansible mandrel for operation of the above functions of the expansible mandrel. Still further, the construction of the expansible mandrel is of a very compact nature wherein all rotating elements are coaxially arranged in symmetrical relation with respect to rotation so that balancing of the mandrel is obviated after assembly.

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 cross-sectional view of an expansible bobbin mandrel according to the invention;

FIG. 2 illustrates a detail of the control means of the expansible bobbin mandrel of the invention;

FIG. 3 illustrates a fragmentary view of the actuating means of the expansible bobbin mandrel in a bobbin creeling position; and

FIG. 4 illustrates a side view of an expansible bobbin mandrel of the invention on which a rotatable bobbin is mounted in contact with a drive roller during a creeling operation.

Referring to FIG. 1, the expansible bobbin mandrel includes a shaft 1 having a central bore 2 which is fixedly mounted in an arm 3 and which rotatably supports a cylinder 4 on anti-friction roller bearings. A braking mechanism is incorporated within the cylinder 4 to arrest rotation of the cylinder 4 and includes a ring 5 fixedly secured to the internal surface of the cylinder 4 as by a dowel pin 5' and a ring 6 fixedly secured to the external surface of the shaft 1 as by a locking screw 6'. In addition, the braking mechanism includes a compression and torsion spring 7 which is mounted concentrically of the shaft 1 and anchored at one end in the fixed ring 6 and engaged with a bushing 8 at the other end. The bushing 8 is both rotatable and slidable with respect to the shaft 1 to act as a control means within the actuating means and is mounted concentrically on the shaft 1 for movement relative to the fixed ring 6 under the biasing force of the spring 7 against a snap ring 11 mounted on the shaft 1. In addition, the bushing 8 has an annular flange 9 which includes a brake lining 10 on one face facing the fixed ring 5 on the cylinder 4 in normally spaced relation and which is recessed on the opposite face to overlie the snap ring 11. The outer surface of the flange 9 is provided with a non-contact labyrinth sealing zone 12 for sealing relationship with the cylinder 4. Further, a sealing flange 13 is tightly secured on the shaft 1 adjacent the bushing flange 9 in similar sealing relation with the cylinder 4 so as to seal off the interior of the cylinder 4 at this end. In addition, the sealing flange 13 is recessed on the side opposite the bushing flange 9 so as to define a chamber 14. The actuating means for the braking mechanism includes a pressure fluid system having central bore 2 in the shaft 1 which communicates with the chamber 14 through a radially directed port 15 and with a chamber 14' in the interior of the cylinder 4 on the side of the bushing 8 op-

posite chamber 14 through another radially directed port 17 in the shaft 1 and an opening 16 in the bushing 8. The port 17 is smaller in diameter (i.e. cross-sectional area) than the port 16 and is normally coincident with the bushing opening 16.

A cover 18 is secured in the end of the cylinder 4 to seal off the cylinder 4 at this end and to define the limit of chamber 14'. A chuck mechanism for holding a bobbin sleeve 27 on the cylinder 4 includes a piston 20 which is slidably mounted in a bore 19 in the cover 18 in sealed relation. The piston 20 is spring loaded at one end by a compression spring 21 in a direction towards the bushing 8 and is secured at the opposite end to a tube 22 of the chuck mechanism which is slidably mounted on the outside surface of the cylinder 4 by a plate 34 in a suitable manner. The tube 22 has a chamfered surface 23 at the free end and cooperates with a similarly chamfered coaxial tube 24 slidably mounted on the cylinder to support a deformable rubber ring 25 therebetween. Similarly, the coaxial tube 14 has a chamfered surface at the opposite end which cooperates with another chamfered coaxial tube 24' on the opposite end of the cylinder 4 to support a deformable rubber ring 26. The rubber rings 25, 26 when deformed by the bringing together of the coaxial tubes 22, 24, 24' engage a bobbin sleeve 27 in locking relation both axially and radially to permit creeling of a yarn package on the bobbin sleeve 27 in a known manner.

The above described actuating means is also used to activate the chuck mechanism while the bushing 8 is interposed in the actuating means to control the activation of the chuck mechanism.

The lower end of the arm 3 is secured in a bearing box 29 which is slidably rotatably mounted on a fixed bearing bolt 31 of a machine frame 30. A line 28 outside the arm 3 communicates with the bore 2 of the shaft 1 and ends in the bearing box 29 of the arm 3. Also, the bearing bolt 31 has an axial bore 32 which communicates with a radial opening 33 to coincide with the end of the line 28 in the bearing box 29 when in the position indicated by the dot-dashed lines. This position corresponds to the removal position of a bobbin 27' (FIG. 4) from a drive roll 27".

The bore 32 of the bearing bolt 31 is connected to a suitable pressure fluid source (not shown), such as an air pressure source, such that when the arm 3 is positioned in the dot-dash line position of FIG. 3, pressure fluid is conveyed into the bore 2 of the shaft 1 whereas, when the arm 3 is positioned in the full line position of FIG. 3, pressure fluid is prevented from flowing into the bore 2 of the shaft 1.

In operation, when the arm 3 is swiveled away from the drive roller 24" to remove the bobbin 27' from driving contact with the drive roller 24" as is known, the arm 3 assumes the position indicated by the dot-dashed lines of FIGS. 3 and 4. A flow of pressure fluid is then conveyed from bore 32 through the line 28 to the bore 2 in the shaft 1. The pressure fluid then passes through the ports 15 and 17 although at different rates due to the throttling effect of the smaller port 17. This allows the pressure in the smaller chamber 14 between the bushing 8 and flange 13 to build up immediately while the pressure in the larger chamber 14' is slowly increased. Because of the difference in pressure between the chambers 14, 14', a force is imposed on the bushing flange 9 to move the bushing 8 against the bias of the spring 7 towards the fixed ring 6. This movement of the bushing 8 brings the brake lining 10 into frictional sliding engagement with the fixed ring 5 on the cylinder 4 to arrest the rotation of the cylinder 4 and, consequently, the rotation of the sleeve 27. The sliding engagement of the ring 6 on the bushing 8 transfers a momentum to the bushing 8 to cause the bushing 8 to angularly turn on the shaft 1 against the bias of the spring 7. The turning of the bush-

ing 8 brings the opening 16 out of alignment with the port 17 such that the flow of pressure fluid to the chamber 14' is cut off (see FIG. 2). The pressure in the chamber 14' is thus prevented from being built up to an amount sufficient to move the piston 20 in opposition to the biasing force of the spring 21.

Upon bringing of the cylinder 4 to a standstill, the force on the bushing 8 transferred from the ring 5 diminishes to zero. This allows the bushing 8 to return to its normal position under the force of the spring 7 so that the port 17 again communicates with the chamber 14'. Simultaneously, the ring 5 and cylinder 4 return an equivalent amount. The pressure in the chamber 14' is then built up to the pressure level in the hollow chamber 14 so that the bushing 8 is returned to its initial position away from the ring 5. At about the same time, the spring 21 is compressed by the pressure fluid to cause the piston 20 to move out of the cylinder 4. This causes the tube 22 to move in the same direction outwardly of the cylinder 4. The rubber ring 25 thus becomes relaxed and tube 24 moves in the same direction. The other rubber ring 26 thus also becomes relaxed. Because the rings 25, 26 become relaxed, their outer dimensional configuration becomes lessened such that their grip on the bobbin sleeve 27 substantially diminishes to zero. The yarn filled bobbin sleeve 27 can then be removed and replaced by a fresh bobbin sleeve.

After a fresh bobbin sleeve is placed on the mandrel, the arm 3 is swiveled back towards the drive roll 27 to engage the bobbin sleeve with the drive roll 27. By thus covering the opening 33 in the bearing bolt 31, the conveyance of the pressure fluid to the central bore 2 of the shaft 1 is cut off. The pressure in the chambers 14, 14' can then be temporarily relieved through blowoff openings 35, 36 in the cover 18 and plate 34 so that the spring 21 can retract the piston 20 back into the cylinder 4. This causes the tube 22 to cooperate again with the tubes 24, 24' to deform the rings 25, 26 into gripping contact with the sleeve.

It is noted that a three-way-valve can be incorporated in the pivot of the arm 3 to permit blowing off of the pressure fluid through the central bore 2 by way of the line 28.

Having thus described the invention, it is not intended that it be so limited as changes may be readily made therein without departing from the scope of the invention. Accordingly, it is intended that the foregoing Abstract of the Disclosure and the subject matter described above be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An expansible bobbin mandrel for bobbin sleeves comprising
 - a fixedly mounted shaft,
 - a cylinder rotatably mounted on said shaft,
 - a braking mechanism within said cylinder for arresting rotation of said cylinder on said shaft,
 - a chuck mechanism mounted on said cylinder for releasably gripping a bobbin sleeve disposed concentrically on said cylinder, and
 - an actuating means for actuating said braking mechanism and said chuck mechanism in sequential order whereby said braking mechanism arrests rotation of said cylinder prior to actuation of said chuck mechanism.
2. An expansible bobbin mandrel as set forth in claim 1 whereby said actuating means includes a control means or preventing actuation of said chuck mechanism during actuation of said braking mechanism.
3. An expansible bobbin mandrel as set forth in claim 1 wherein said braking mechanism includes a ring fixed to said cylinder, a bushing slidably mounted on said shaft and having a brake lining thereon for engaging said ring, a spring secured at one end to said shaft and at the opposite end to said bushing to resiliently maintain said brake lining out of engagement with said ring, and where-

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in said actuating means includes a first chamber on one side of said piston opposite said spring for containing a pressure fluid under pressure whereby a higher pressure of the pressure fluid in said chamber than on the other side of said bushing causes said bushing to move against said spring to effect engagement of said braking lining with said ring.

4. An expansible bobbin mandrel as set forth in claim 3 wherein said bushing includes an opening therein, and whereby said actuating means further includes a second chamber on the opposite side of said piston from said first chamber for containing pressure fluid under pressure, a central bore in said shaft for conveying pressure fluid therethrough, a first port in said shaft communicating said bore with said first chamber to feed pressure fluid into said first chamber and a second port in said shaft of less diameter than said first port communicating said bore with said second chamber and being coincident with the aperture in said bushing to feed pressure fluid into said second chamber at a throttled rate whereby the pressure in said first chamber is increased at a faster rate than the pressure in said second chamber to cause said higher pressure on said bushing for moving said bushing against said spring.

5. An expansible bobbin mandrel as set forth in claim 4 wherein said bushing is rotatably mounted on said shaft for turning thereon against said spring during sliding engagement of said brake lining with said cylinder to move the aperture on said bushing out of coincidence with said second port whereby flow of pressure fluid into said second chamber is stopped until braking of said cylinder to a standstill.

6. An expansible bobbin mandrel as set forth in claim 4 wherein said chuck mechanism includes a piston slidably mounted in said cylinder within said second chamber, a spring biasing said piston into said second chamber, a first tube secured to said piston and slidably mounted on said cylinder, a second tube mounted on said cylinder coaxial of said first tube, a deformable means between said first and second tubes for gripping a bobbin sleeve thereon, whereby the pressure fluid in said second chamber is adapted to move said piston out of said cylinder for moving said first tube from said deformable means to release the gripping force on the bobbin sleeve.

7. An expansible bobbin mandrel as set forth in claim 2 which further includes an arm fixedly mounting said shaft therein, said arm being swively mounted on a bearing bolt having a bore therein for movement between a bobbin rotating position and a bobbin removal position, and said actuating means includes a line mounted on said arm and communicating said bore with said first chamber with said arm in said bobbin rotating position to convey pressure fluid from said bore to said first chamber and closing off said bore from said first chamber with said arm in said bobbin removal position to prevent flow of pressure fluid into said first chamber.

8. An expansible bobbin mandrel as set forth in claim 7 wherein said actuating means includes a blow off opening for relieving the fluid pressure in said first chamber.

9. An expansible bobbin mandrel as set forth in claim 1 wherein said chuck mechanism includes a piston slidably mounted in one end of said cylinder, a spring biasing said piston into said cylinder, a first tube secured to

said piston and slidably mounted on the outside of said cylinder, a second tube slidably mounted on said cylinder, a third tube mounted on said cylinder and deformable means between said first and second tubes and said second and third tubes for gripping a bobbin sleeve thereon, and wherein said actuating means includes a chamber on one side of said spring within said cylinder for receiving pressure fluid whereby an increase in pressure in said chamber moves said piston against said spring out of said cylinder to move said tubes from out of deformable contact with said deformable means to release a gripped bobbin sleeve thereon.

10. An expansible bobbin mandrel as set forth in claim 9 wherein said deformable means includes a rubber ring and said tubes have a chamfered surface in contact with said rubber ring adjacent thereto.

11. An expansible bobbin mandrel as set forth in claim 1 wherein said braking mechanism includes a brake means for engaging said cylinder and means for urging said brake means out of engagement with said cylinder, and wherein said actuating means includes a first pressure fluid responsive means for moving said brake means into engagement with said cylinder, a second pressure fluid responsive means for actuating said chuck mechanism to release the gripping of a bobbin sleeve thereon, and means for building up the pressure in said first fluid responsive means at a faster rate than in said second pressure fluid responsive means whereby the movement of said brake means into engagement with said cylinder as effected prior to actuation of said chuck mechanism to release the gripping of a bobbin sleeve.

12. An expansible bobbin mandrel as set forth in claim 1 wherein said actuating means includes a first means for actuating said braking mechanism to arrest rotation of said cylinder, a second means for actuating said chuck mechanism to release the gripping of a bobbin sleeve thereon, and third means for actuating said first means prior to said second means.

13. An expansible bobbin mandrel as set forth in claim 12 wherein said first means and said second means are each pressure responsive and said third means builds up the pressure acting on said first means and said second means at different rates whereby said first means is responsive to said third means before said second means.

14. An expansible bobbin mandrel as set forth in claim 13 wherein said first means includes a first port communicating with one side of said brake means and said second means includes a second port of smaller cross-sectional area than said first port communicating with the opposite side of said brake means, each of said ports being in communication with said third means.

References Cited

UNITED STATES PATENTS

2,365,980	12/1944	Thomas	242—46.2
2,469,590	5/1949	Blount	242—46.2
2,564,746	8/1951	Bauer	242—46.2

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