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Miller

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[54] **BOBBIN-SUPPORTING CHUCK**

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[51] **Int. Cl.**... **B65h 54/54**, B65h 75/30, B65h 79/00

[58] **Field of Search** 242/46.4, 46.2, 46.3, 46.6, 242/72, 72.1

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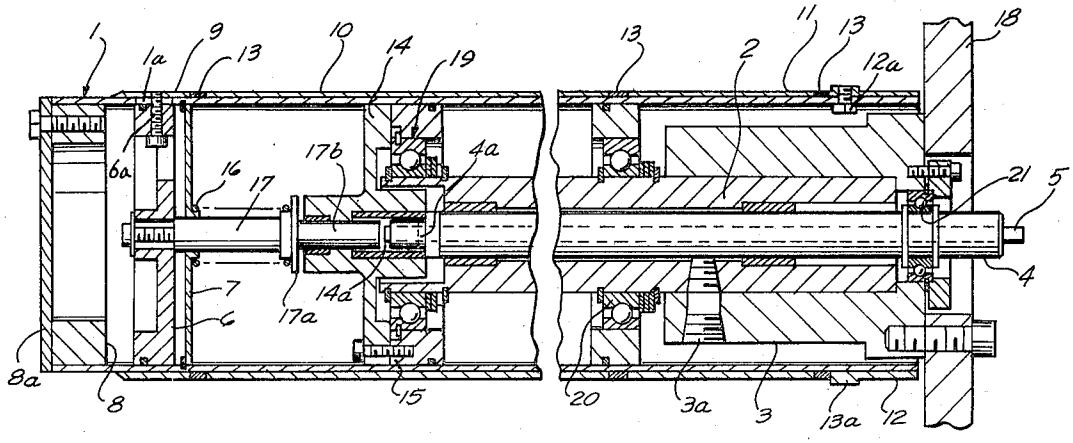
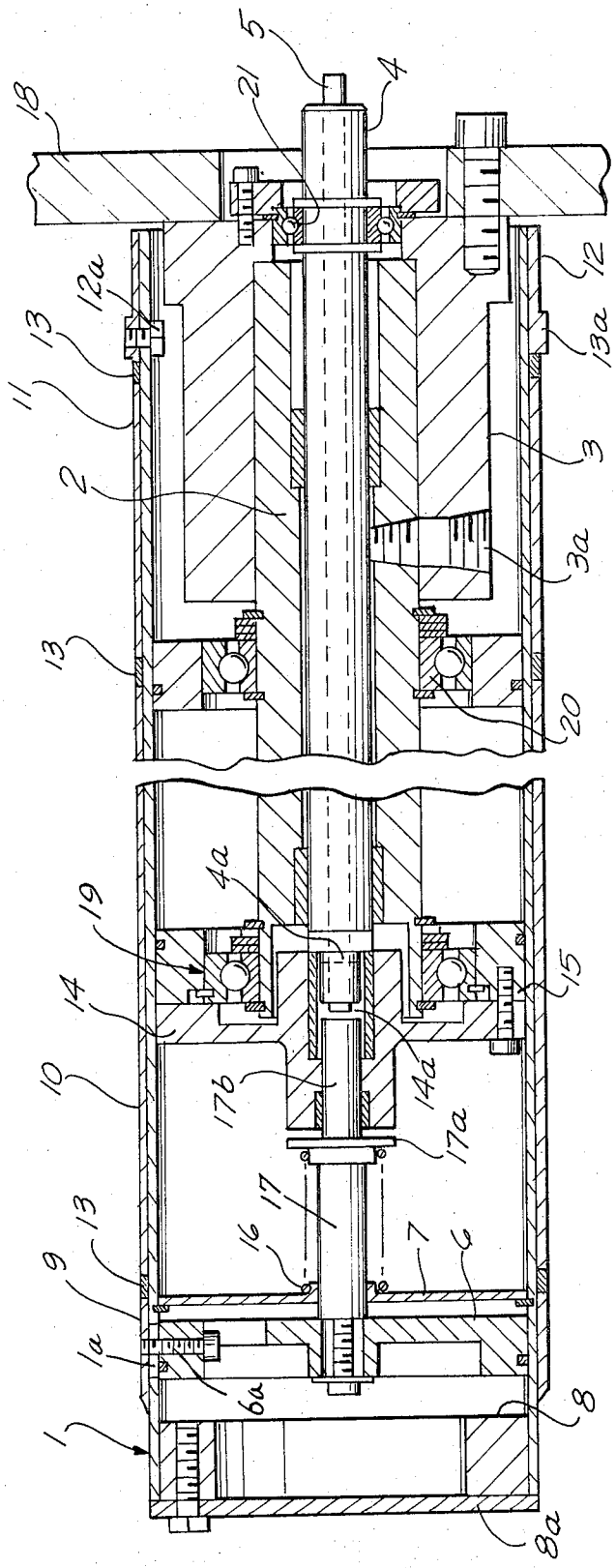
[57] **ABSTRACT**

A bobbin-supporting chuck for filament winders has a hollow tubular shaft which is stationarily mounted, and which is surrounded by a chuck roll, with bearings mounting the latter on the former for rotation. The chuck roll periphery carries axially compressible rings of elastomeric material so that, when compressed, they will project radially and frictionally retain a bobbin mounted on the roll. A slidable rod extends through the hollow shaft and cooperates with an internal arrangement for effecting the compression of the elastomeric rings.

6 Claims, 1 Drawing Figure

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BOBBIN-SUPPORTING CHUCK

BACKGROUND OF THE INVENTION

The present invention is a continuation-in-part of my earlier-filed U.S. Pat. application Ser. No. 262,973, filed June 15, 1972 and co-pending.

This invention relates to chucks, and more particularly to bobbin-supporting chucks for winders of filamentary and analogous material.

The production or processing of filamentary material, whether it be textile filaments, glass filaments or metallic filaments, requires winding apparatus. Such apparatus requires an arrangement for holding tubes, spools, bobbins or the like while filament is wound onto them.

An apparatus of the general type here in question is disclosed in my aforementioned co-pending application. In common with all apparatus of this type, it utilizes a bobbin-supporting chuck, that is a device or arrangement which holds and supports the bobbin tube, spool or the like onto which the filament is to be wound. Various types of such chucks are known, and can be classified basically in two classes as to the manner in which they are driven. One type is center driven, that is it has a positive drive in that a shaft of the chuck is driven, with the chuck in turn supporting the bobbin. The other type is surface or friction driven, that is a driven roller contacts the periphery of a bobbin tube or spool which is on the chuck, and subsequently the periphery of a package of filament which is wound on to the bobbin spool or tube, and by rotating the roller the bobbin on the chuck and with it the latter, is also rotated.

The chucks known in the prior art have heretofore been mostly satisfactory. However, in this field higher and higher windings speeds are required in keeping with the trend towards faster and therefore more economical operations, and another requirement that is made is for larger and heavier yarn packages which must be supported by the chuck. Thus, yarn speeds of over 4,000 meters per minute, that is the speed of advancement of the yarn in that period of time, are now common practice. It is also known to rotate the chuck at or beyond 24,000 rpm and to produce packages having a weight in excess of 300 pounds. With these parameters, the prior-art chucks present problems which have not heretofore been solved.

In particular, it is quite clear that the speeds and weights which are now either already in use or coming into use will result in the generation of a considerable amount of vibration and forces, taxing the materials of the chuck construction to a high degree. The prior art contains no constructions that could avoid the disadvantages resulting from such a vibration and forces.

SUMMARY OF THE INVENTION

Accordingly, it is a general object of the present invention to provide an improved bobbin-supporting chuck which is not possessed of these disadvantages.

More particularly, it is an object of the present invention to provide such an improved bobbin-supporting chuck for winders of filamentary material, in which the higher and higher rotational speeds and greater and greater weights which are being required in the industry, do not produce the disadvantages mentioned before.

Another object is to provide such a chuck in which the greatest possible mass of material is concentrated in the supporting structure for the chuck, thereby improving the chuck's stability and reducing its tendency towards vibrations.

Still a further object of the invention is to provide such a chuck which can be at will used for either center or (i.e., positive) driving or surface (i.e., frictional) driving contrary to the chucks known from the prior art which are suitable for either one or the other but not both types of driving.

In keeping with these objcts, and others which will become apparent hereafter, one feature of the invention resides in a bobbin-supporting chuck for winders of filamentary material. The chuck comprises, briefly stated, an elongated stationary component adapted for cantilever mounting on a support and having an open-ended center passage. A chuck roll concentrically surrounds the component with clearance and journal means is located in the clearance and journals the chuck roll on the component for rotation about the same. Yieldable friction means is provided on the outer periphery of the chuck roll and is responsive with a radial expansion to the application of a force acting substantially axially of the roll. Biasing means is provided on the chuck roll and is operatively associated with friction means to permanently tend to exert upon the same a force acting substantially axially of the chuck roll. Slidable rod means extends through the center passage and has a first end portion exposed exteriorily of the component for engagement, and a second end portion positioned for sliding engagement with the biasing means so as to counteract the force in response to the exertion of pressure on the first end portion.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The single FIGURE is an axial section illustrating a chuck according to one embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Discussing the drawing now in detail, it will be seen that reference numeral 1 identifies a chuck roll, that is a component which is to be driven in rotation and on whose outer periphery a bobbin tube, spool or the like is to be mounted. Reference numeral 2 identifies a mounting shaft which is stationary and has a large outer diameter, as the drawing clearly indicates. The mounting shaft 2, whose large diameter assures that the chuck will have considerable stability and which in many instances may be of considerable length in order to support multiple packages of considerable weight, is mounted in turn in a support sleeve 3 in which it is held against displacement by locking plugs 3*a* or analogous suitable means. The shaft 2 is hollow, that is it has a center passage in which a drive shaft 4 is located; the drive shaft 4 is to be used if it is desired for driving the chuck roll 1 from the center via the coupling 14 which

is connected to a mounting member **15** located in the interior of the roll **1** and is secured thereto, as by welding. The shaft **4** can be driven in conventional manner, for instance by means of a motor which drives it directly via a coupling, or by installing a pulley on the outer portion of the shaft **4** and belt-driving the latter from a motor.

The shaft **4** in turn is hollow, being provided with an axially extending passage in which there is mounted a slidable rod or release shaft **5**, a portion of which is located exteriorily of the shaft **4**, and which extends entirely through the shaft **4** and serves, when the outer portion is inwardly depressed, to release a bobbin package mounted on the exterior of the chuck roll **1**.

The outer periphery of the chuck roll **1** is provided with a plurality — in this instance three are shown — of elastomeric annular members **13**, for instance of synthetic or natural rubber. These members surround the periphery of the roll **1** and the one at the right-hand side of the FIGURE abuts against the illustrated abutment **13***a*. Located between the annulus at the right-hand end of the FIGURE, and the next-following one towards the left, is a slidable sleeve **11**, for instance of metallic material. The same is true between any two axially adjacent ones of the elastomeric members **13**. The elastomeric member **13** at the left-hand end of the roll, that is the last one, is abutted by a sleeve **9** which is also slidable on the periphery of the roll **1**. Within the desired sliding confines of the sleeve **9** the roll **1** is provided with a suitable cutout, for instance a slot **1***a* extending axially of the roll, and through this cutout extends a coupling member **6***a* which couples the sleeve **9** at the exterior of the roll with a slidable transverse wall or element **6** located in the interior of the roll at the side of the abutment wall **7** which is the left-hand side in the drawing. The abutment wall **7** is fixedly connected with the inner side of the circumferential wall of the roll and has a central opening through which a shaft **17** extends, which carries at one end a flange **17***a* and whose other end is fixedly connected with the slidable wall **6**. A helical expansion spring **16** surrounds the shaft **17**, bearing with its opposite ends upon the flange **17***a* and the wall **7**, respectively; it will be apparent that the spring **16** thus permanently urges the shaft **17** towards the right, and in similarly urging the wall **6** to the right it permanently urges the sleeve **9** to the right and thus permanently compresses the elastomeric elements **13**. Evidently, while the element **13** which is abutted by the sleeve **9** will radially expand to some extent, it will also transmit some of the biasing force to the sleeve **10** which is located between it and the next-following elastomeric element **13** and similarly force will be transmitted to the sleeve **11** which transmits it in turn to the final elastomeric element **13** which cannot yield axially because of the abutment **13***a* which may be secured on or of one piece with a final sleeve **12** that is fixed to roll **1** by means of element **12***a*. The radial expansion of the elastomeric elements **13** which results from the axial compression causes them to frictionally engage the inner circumferential surface of a bobbin tube or spool which is slipped onto the roll **1**, to thus maintain the spool against axial and rotational displacement relative to the roll **1**. Furthermore, the elements **13** are of course compliant, that is will have a resilient yielding characteristic, so that the chuck is less influenced by any forces tending to act upon it from the package, and therefore there is little or no loss of speed due to high frequency vibration.

Reference numeral **18** designates a mounting portion, such as a machine frame, on which the sleeve **3** is mounted via the diagrammatically illustrated bolts or screws, although other means of mounting can of course be chosen.

The left-hand end of the roll **1** is journalled on shaft **2** for rotation by means of a bearing **19** and the intermediate portion is journalled by means of a bearing **20**. Shaft **4** is supported in a bearing **21** at the right-hand end of the shaft.

The left-hand end portion of the shaft **4** has a part **4***a* which is of noncircular cross section, for instance quadratic or the like, and is received in a slightly larger-dimensioned but similarly configurated recess **14***a* of the coupling **14**. Thus, when the shaft **4** is driven in rotation, it will similarly drive the chuck roll **1** via the coupling **14** which is of course fixedly connected with the inner surface of the roll **1** as illustrated. If, on the other hand, it is desired not to drive the chuck roll **1** by the center drive via the shaft **4**, but instead to drive it by a surface or friction drive engaging the package on the roll, then it is merely necessary to either disconnect the shaft **4** from whatever driving instrumentality there is provided for it, or to withdraw it axially towards the right until the portion **4***a* moves out of the recess **14***a*.

At the left-hand end of the chuck roll **1** there is provided a mount **8**, here illustrated as being of annular configuration, which is secured in suitable manner within the roll **1**, and which carries an end plate **8***a*, the latter in turn being connected with it by means of the diagrammatically illustrated screws or in any other desired and suitable way. This prevents the entry of contaminants into the interior of the roll **1**.

The shaft **4** is provided, as shown in the drawing, with an axial passage through which there extends a release shaft or rod **5**, an outer portion of which is located exteriorily of the shaft **4** for engagement by an operator, and an inner portion of which extends beyond the front end of the portion **4***a* of the shaft **4** and is juxtaposed with a contact portion **17***b* which extends from the flange **17***a* of the shaft **17** through an appropriate opening provided in the coupling **14** and into the recess **14***a*. When it is desired to release a bobbin or a package on the chuck roll **1**, pressure is exerted on the outer portion of the release shaft **5** in the direction towards the left of the drawing, whereby the shaft **5** will engage the contact portion **17***b*, displacing the same and thereby the shaft **17** towards the left counter to the force of the spring **16**. This in turn shifts the wall **6** towards the left and with it the sleeve **9**, so that the axially directed force on the elastomeric elements **13** will be relaxed, permitting them to return to their relaxed axial position and to retract in radial direction. They thus disengage the surface of a bobbin tube which is mounted on them and the tube can be slipped off towards the left.

It is advantageous if the shaft **2** is split in the region in which it is accommodated in the sleeve **3**, so that the tapered plugs **3***a* push it apart, causing it to expand and lock in place within the sleeve **3**, preventing any vibration due to looseness.

The types of drives which can be used for driving the shaft **4**, and the construction of the various bearings are too well known to require detailed discussion. It is, however, pointed out that all parts of the illustrated

chuck rotate, except for the components 2, 3 and the inner races of the bearings 19 and 20 and the outer race of the bearing 21.

A chuck construction in accordance with the present invention will be subject to an absolute minimum of vibrations even at very high speeds, and will be capable of supporting packages of great weight even if the chuck is relatively long. It thus overcomes the difficulties which have been encountered with the chucks of the prior art and affords advantages which have not heretofore been realized.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a bobbin-supporting chuck, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A bobbin-supporting chuck for winders of filamentary material, comprising an elongated stationary component adapted for cantilever mounting on a support and having an open-ended center passage; a chuck roll concentrically surrounding said component with clearance therebetween; journal means in said clearance and journalling said chuck roll on said component for rotation about the same; yieldable friction means on the outer periphery of said chuck roll and responsive with expansion radially of said chuck roll to the application of compressive force acting substantially axially of the same; biasing means operatively associated with said friction means so as to permanently tend to exert upon the same a compressive force acting substantially axially of said chuck roll; slidable rod means extending through said center passage and having a first end portion exposed exteriorily of said component for engagement, and a second end portion positioned for sliding engagement with said biasing means so as to counteract said force in response to exertion of pressure on said first end portion; a hollow driven shaft also extending through said center passage and surrounding said slidable rod means; and coupling means coupling said driven shaft with said chuck roll for rotating the same in unison with said driven shaft.

2. A chuck as defined in claim 1, wherein said stationary component comprises a first tubular element having one end adapted to be fixedly mounted on said support, and another end, and a second tubular element having one axial portion fixedly lodged in said first element and another axial portion extending from said one axial portion outwardly beyond said other end.

3. A chuck as defined in claim 2, said journal means comprising at least two journals, and at least one of said journals surrounding and being mounted on said other axial portion of said second tubular element.

4. A chuck as defined in claim 2, wherein said rod means and driven shaft extend through said second tubular element.

5. A chuck as defined in claim 2, wherein said friction means comprises at least one annulus of elastomeric material surrounding the periphery of said roll and at least substantially prevented from displacement in one axial direction; and wherein said biasing means comprises a sleeve surrounding said roll and being movable into axially compressing engagement with said annulus in said one axial direction, a biasing spring in the interior of said roll, and a slidable element mounted in said roll and biassed by said spring in said one axial direction, said slidable element being connected with said sleeve in motion-transmitting relationship.

6. A chuck as defined in claim 5, further comprising a fixed bracing element mounted in said roll intermediate said sliding element and said second end portion of said rod means, said bracing element having a passage extending axially of said roll; wherein said slidable element comprises a first portion located at a side of said bracing element remote from said second end portion, and a second projecting portion rigid with said first portion and extending through said passage to the other side of said bracing element, said second projecting portion having an abutment axially spaced from said bracing element; and wherein said biasing spring is an expansion spring which surrounds said second projecting portion and bears upon said abutment and said bracing element, respectively.

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