July 17, 1956 E. R. JONES ET AL 2,755,027

TEXTILE BOBBIN DRIVE

Original Filed Feb. 7, 1948 2 Sheets-Sheet 1

Fig. 2.

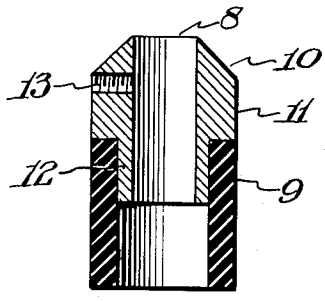


Fig. 1.

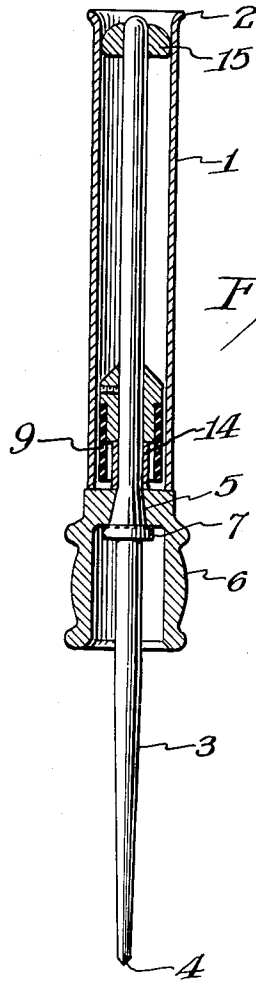
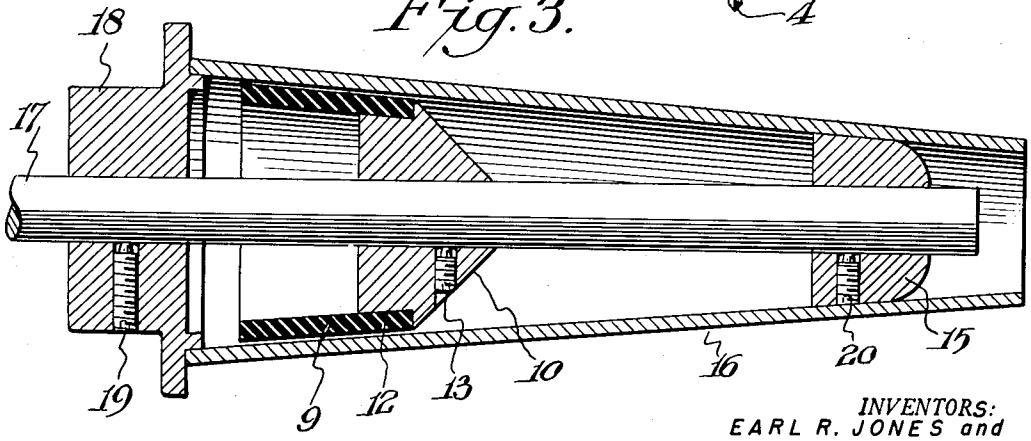


Fig. 3.



INVENTORS:
EARL R. JONES and
THOMAS A. NEWELL
BY Fred O. Gross

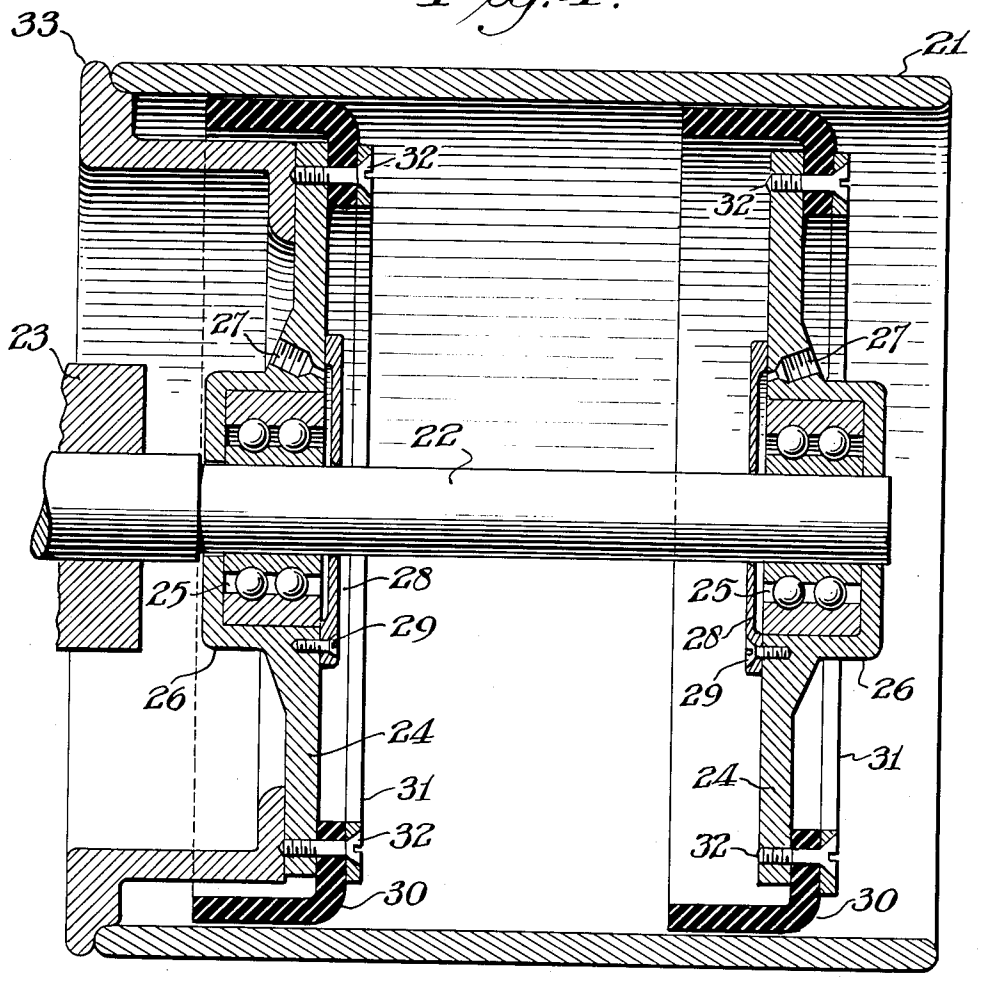
ATTORNEY.

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Fig. 4.



INVENTORS:
EARL R. JONES and
THOMAS A. NEWELL
BY Fred A. Lewis

ATTORNEY.

United States Patent Office

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TEXTILE BOBBIN DRIVE

Earl R. Jones, Roxborough, and Thomas A. Newell, Landenberg, Pa., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware

Continuation of abandoned application Serial No. 6,956, February 7, 1948. This application April 25, 1951, Serial No. 222,896

10 Claims. (Cl. 242—46.5)

This invention relates to the driving of bobbins in the textile industry and is a continuation of our Appn. Ser. No. 6,956, filed Feb. 7, 1948, now abandoned. More particularly, it relates to textile machines where bobbins are rotated by drive spindles which operate at relatively high speeds.

An object of this invention is to provide an improved bobbin drive assembly that is positive in action.

A further object of the invention is to provide an improved bobbin driving means free of bushings and drive slots in the bobbin tubes themselves.

A still further object of the invention is to provide a driving means independently positioned but in cooperative relationship with other elements of the assembly.

Another object of the invention is to provide a driving means positioned intermediate the principal supporting surfaces of the bobbin.

These and other objects will become apparent as the description of this invention proceeds and is read in connection with the accompanying drawings and the appended claims.

In the drawings illustrating our invention, Figure 1 is a sectional, side elevation view of a draw-twist type bobbin at rest and positioned to be driven upon a drive spindle.

Figure 2 is a detailed side elevation sectional view of the bobbin driving mechanism of Figure 1.

Figure 3 is a sectional, side elevation view of a coning type bobbin at rest and positioned to be driven upon a drive spindle.

Figure 4 is a sectional, side elevation view of a spinning machine bobbin positioned at rest in driving relationship upon its supporting chuck.

Referring to Figure 1 the bobbin 1 utilized in draw-twisting operations may be fabricated from various materials such as paper and is of elongated cylindrical shape. It may or may not be expanded outwardly at its upper end 2 to prevent yarn run-off at the start of wind-up.

Bobbin 1 is driven by vertical drive spindle 3, the conical lower end 4 of which is seated in a suitable bearing in the machine frame, which connection is not shown herein because it is not a part of this invention. It will be noted that drive spindle 3 is tapered outwardly a slight amount at intermediate length 5 located slightly below the mid-point of the spindle, this tapered surface providing a seat for cylindrical driving whorl 6 which is further supported by ring collar 7 firmly attached to spindle 3. When whorl 6 is pressed down over tapered surface 5 as far as the top of collar 7, it frictionally engages spindle 3 tightly enough to prevent any slippage therebetween. Whorl 6 is provided with upper and lower guide rungs and is rotated by a light drive belt (not shown) passing around the convex surface between the rungs.

Referring particularly to the illustration in Figure 2, a supporting head 8 is provided to which is firmly attached a cylindrical skirt 9 of resilient material. Skirt 9 is preferably fabricated from rubber or from one of the synthetic polymeric substances having properties akin to rubber. Skirt 9 may be advantageously joined to head 8 by vulcanization, or with an adhesive capable of uniting the members by a very firm bond, so that the combination is, for practical purposes, substantially integral.

The upper portion 10 of head 8 is preferably coned for reasons which will hereinafter be explained in detail. The intermediate portion 11 is cylindrical in shape and is recessed inwardly at its lower end to accommodate skirt 9, the outside surface of which lies in prolongation with the surface 11. The lower cylindrical portion 12 provides a rigid back support for skirt 9 and also ample bonding surface for effecting the union between the elements. Head portion 8 is provided with a threaded hole 13 for the reception of a set screw for firm connection with drive spindle 3.

This drive means is secured to the drive spindle 3 (Fig. 1) by a headless set screw which recesses in the outer opening of 13. To obviate the necessity for measurements in its placement on spindle 3, a slip collar 14 may be conveniently interposed between whorl 6 and the bottom of 8 to separate these elements a predetermined distance. Slip collar 14 serves a further important purpose in that this member prevents any displacement of head 8 toward driving whorl 6 during continued restocking operations, and thereby prevents skirt 9 from ever binding on whorl 6. Alternatively this drive means may be placed at the top or near the top of the spindle. In some instances this may require the addition of an annular ring to whorl 6 to serve as a centering device similar to that shown at 18 in Figure 3. Or, an upper supporting knob 15 may be provided at the top by shrinking or forcing one onto the spindle. The outside diameters of 15 and of the driving mechanism are preferably proportioned so that the bobbin 1 may be freely slid over these elements. It will be seen from Figure 1 that empty bobbins may then be positioned by merely sliding them downwards until the lower ends rest upon the top surface of whorl 6. Preferably driving skirt 9 is made such that its outside diameter is somewhat smaller than the inside diameter of the bobbin. This feature also permits unhampered removal of the wound bobbins, even though they may crush slightly during the winding operation.

In operation, when a spindle is to be restocked, the spindle is brought to rest by temporary disconnection with its belt, the full bobbin is removed and an empty bobbin is slid over knob 15 and skirt 9, to rest on the top of whorl 6. The conical portion 10 serves to guide the bobbin into position over surface 11 and skirt 9. The loose end of the thread to be wound is then looped one full turn around the bobbin and full power is applied through the driving means, whereupon the spindle very rapidly accelerates to its full speed of 5000 to 9200 revolutions per minute. Since head 8 is fixedly attached to spindle 3 it likewise accelerates, and the lower expanse of 9, which is not joined to head 8, bells outwardly under the influence of the centrifugal forces exerted upon it by the rotation. The outward distension of skirt 9 is resisted uniformly by abutment against the inside surface of the bobbin 1 around the entire inner periphery, resulting in a very positive, substantially instantaneous frictional engagement between the driving head and the bobbin. The result is that the bobbin accelerates with the driving head and drive spindle without any slippage, except possibly a very slight amount at the instant of start-up. The nonexistence of slippage has been verified by simultaneous stroboscopic examination of both spindles and bobbins at speeds varying from about 50 R. P. M. to about 7500 R. P. M., and, in actual draw-twist tests on commercial equipment, no slippage trouble was encountered during either the acceleration, steady speed or deceleration stages of rotation.

When the bobbin is loaded the driving belt is temporarily disconnected from the drive whorl and the spindle

is brought to rest. The cessation of rotation reduces the centrifugal forces acting on skirt **9** to zero, and the skirt immediately resumes its original cylindrical form, whereupon the package can be easily lifted off, or doffed, and the spindle re-stocked with an empty bobbin. Both the doffing and restocking operations are greatly facilitated when the driving head **8** occupies the lower third of the drive spindle length, so that, when the lower edge of the bobbin is positioned above the level of the top edge of surface **10** the bobbin can be tilted at an angle of as much as 15 degrees with the drive spindle axis and then be moved along this line instead of being limited to straight vertical displacement. In this connection, knob **15** offers no obstacle to such displacement, since its elliptical periphery affords a surface about which the bobbin can be rotated to the full angle permitted by the clearance between the outside surface of driving spindle **3** and the inside surface of bobbin **1**. Such angular displacement reduces doffing and re-stocking head room requirements as much as 25%, which permits either a much more compact arrangement of successive tiers of spindles or the winding of greater quantities of thread per spindle, which ever is preferred.

Figure 3 illustrates a second embodiment of this invention applied to the driving of a horizontally disposed paper core on a coning machine. In this figure like elements are designated by the same corresponding reference numerals used in the embodiment of Figure 1.

Coning type bobbin, or core, **16**, is shaped like the frustum of a cone and is positioned on horizontal drive spindle **17** with its smaller end oriented outwards, or in a direction away from the machine. Drive spindle **17** is driven by ordinary means known to the art, such as by belt means passed around a pulley (not shown). Collar **18** is fixedly attached to spindle **17** by recessed set screw **19**, and serves as a seat for positioning of the bobbin core in the manner already described for the whorl **6** of the draw-twist embodiment.

The driving means of this embodiment is similar to that used in draw-twisting except that, in this case, the lowermost portion **12** of the driving head is coned outwardly to accommodate a frustum-shaped skirt portion **9** which is integrally bonded to it by vulcanization or by a suitable adhesive cement. Here again it will be seen that an annular space exists between skirt **9** and core **16** when the spindle is at rest, to facilitate doffing.

Supporting knob **15** is shaped with a hemispherical top portion, to guide the core into position during stocking, and a frustum-like lower portion to provide support for the outer part of **16** when the core is in position for rotation. A recessed set screw **20** is used to pin knob **15** to drive spindle **17**; however, a shrink or force fit may be employed if preferred. Spacing collar **14** is dispensed with in this embodiment, the driving head being oriented by measurement prior to tightening set screw **13**.

The operation of the coning drive is identical to that of the draw-twist bobbin drive, the skirt distending during rotation to firmly grip the core with no discernible slippage and resuming normal shape upon the cessation of rotation, whereupon the package produced may be easily and quickly doffed. Doffing and re-stocking operations are facilitated by the construction described, since displacement need not be effected in exact prolongation with the spindle axis but can be accomplished within a range defined by acute angles thereto in the same manner as described for the draw-twist spindle. In addition, the inherent flexibility of the skirt, which causes it to assume its original diameter when at rest, permits the easy withdrawal of tightly wound yarn packages even though they may have been slightly crushed in the winding operation.

This invention is also applicable to the reverse situation wherein the bobbin transmits rotational movement to a chuck mounted on a spindle and the spindle serves as the axis for bobbin rotation as is the case with the horizontally disposed spinning machine chuck of Figure 4.

Here the bobbin **21** is cylindrical in shape and proportioned so that the diameter is approximately equal to the length dimension. Bobbin **21** is driven by frictional engagement with a roller member (not shown) which bears against its outside surface and forces bobbin **21** to turn at the same peripheral velocity but in the reverse direction from the roller. Thread to be wound on bobbin **21** is supplied to it by manual insertion between the roller and the bobbin, the free end being carried around the bobbin one full turn whereupon succeeding material is taken up evenly and without slack as rotation continues. The thread supply is regulated by a level-winding device (not shown) located just before the driving roller. The driving roller member is mounted on a counterbalanced arm so that, as more thread is progressively taken up by bobbin **21**, the clearance between the roller and the bobbin increases accordingly, and the driving engagement continues at a constant frictional level through the medium of the wound yarn layers.

Bobbin **21** is supported by a rotatable chuck assembly mounted on stationary chuck spindle **22** which is mounted in turn on the spinning machine bed plate **23**. In this assembly spider plates **24** are independently rotatable about spindle **22** by reason of their mounting upon ball bearings **25**. Bearing housings **26** retain bearings **25** and provide an enclosure for lubricant which is supplied through grease plugs **27** as required. Cover plates **28** secured to housings **26** by screws **29** complete the bearing enclosure, sufficient clearance being provided in the vicinity of spindle **22** to permit the free rotation of spiders **24** about **22** as an axis.

Spiders **24** are fitted with resilient cup-like skirts **30** fabricated from materials such as those used in the skirts **9** of the foregoing draw-twist and coning machine embodiments except that, in this case the skirts are preferably molded to the annular form shown in the course of manufacture. Skirts **30** are attached to spiders **24** by annular ring members **31** and recessing screws **32** spaced equidistantly at close intervals around the entire circumference. The inner spider also carries an annular seating ring **33** which may be secured to the spider member by the through-going screws **32** as shown, or by welding, or by separate bolts. Seating ring **33** provides an inner support and guide for the placement of the bobbin **21** during the re-stocking step and also serves as a braking surface for a friction brake (not shown) adapted to bear against its inside confines.

The diameter of skirts **30** is preferably such that bobbins **21** will fit over them loosely or with only a very slight frictional engagement so that doffing and re-stocking may be accomplished with a minimum of manual effort.

In operation, skirts **30** function in a manner similar to skirts 9 already described in connection with Figs. 2 and 3, the pressure of the driving roller forcing bobbin **21** slightly inwards so that the bobbin carries skirts **30** around with it and, as the rotational velocity increases, the unrestrained portions of the skirts bell out under the influence of the centrifugal forces and thus tighten in engagement with the bobbin, and the two spiders **24** rotate with the bobbin **21** without discernible slippage.

An additional advantage of the drive means of this invention is the vibration dampening effect which the resilient skirts provide. Mechanical vibrations from the main power source of the bobbin machine and adjacent machines are not transmitted through the intermediate skirts and therefore do not cause eccentric bobbin rotational effects. Furthermore, the resilient skirts appear to have a self-centering action upon the rotating spindles whereby undesirable chattering effects and bearing wear are eliminated.

While a driving means assembly has been disclosed in specific detail in the foregoing description, it will be understood that various modifications within the spirit of the invention may occur to those skilled in the art. Therefore it is intended that no limitations be placed on

the invention other than as defined by the scope of the appended claims.

What is claimed is:

1. A textile bobbin holder comprising in combination a supporting spindle, means rotatably mounted on said spindle and provided with a seating base for the bobbin, a rotatable spider element mounted on said spindle in spaced relation with the seating base, a flexible skirt supported in suspended relation with said spider element and in position to engage the bobbin intermediate its ends by centrifugal action of the skirt.

2. A textile bobbin holder means comprising in combination, a supporting spindle, means rotatably mounted on said spindle and provided with a seating base for the bobbin, a plurality of rotatable spider elements mounted on said spindle in spaced relation with the seating base, a flexible, elastic skirt supported in suspended relation with at least one of said spider elements and having a substantial surface to engage the bobbin intermediate its ends by centrifugal action.

3. A textile bobbin driving means comprising in combination with a rotatable supporting spindle, a load bearing support for the base of the bobbin secured to the spindle, a supporting means for the outer end of the bobbin secured to the spindle, and a driving means secured to the spindle intermediate the base support and the outer support, and in spaced relation from the inner surface of the bobbin, comprising a supporting head with a flexible tubular member having one edge secured to the head and the opposite edge free to flare outwardly by centrifugal action to engage the inner surface of the bobbin in driving relationship intermediate the base support and the outer support.

4. A textile bobbin holder for driving bobbins having internal uniform smooth surface comprising in combination a supporting spindle, means rotatably mounted on said spindle and provided with a seating base for the bobbin, a rotatable spider element mounted on said spindle in spaced relation with the seating base, a flexible elastomer driving skirt, means for supporting said skirt in suspended relation with said spider element, and in spaced relation from the inner surface of the bobbin, and having one edge secured to the supporting means and a free edge positioned to flare outwardly by centrifugal force to contact the inner surface of the bobbin in driving relationship.

5. A textile bobbin holder means comprising in combination, a supporting spindle, means rotatably mounted on said spindle and provided with a seating base for the bobbin, a plurality of rotatable spider elements mounted on said spindle in spaced relation with the seating base, a flexible, elastomer driving skirt supported in suspended relation with at least one of said spider elements, and in spaced relation from the inner surface of the bobbin when at rest, and having one edge secured to at least one of the spider means with a free edge positioned to flare outwardly by centrifugal force to contact the inner surface of the bobbin in driving relationship intermediate the base and outer spider when the bobbin is seated on the base.

6. A textile bobbin holder and driving combination comprising a supporting spindle, a load-bearing support for the base of the bobbin carried by the spindle, a supporting means for the outer end of the bobbin also supported by the spindle, an elastomer skirt supporting means intermediate the load-bearing support and the outer-supporting means, an elastomer driving skirt having one edge secured to the intermediate supporting means and having a continuous, cylindrical, opposite edge suspended free and in spaced relation from the inner surface of the bobbin when in non-rotating position and expansible outwardly when rotated to engage a continuous inner surface of the bobbin in rotating and driving relationship.

7. A textile bobbin driving means comprising in combination with a rotatable supporting spindle, a bobbin seating base supported by the spindle, a bobbin supporting means affixed at the outer end of the spindle independent of the seating base, a skirt supporting head secured to the spindle intermediate of and independent of the end supporting means, and a flexible, elastomer skirt having an edge secured to said head and having an opposite edge of substantial length suspended free from the supporting means and in spaced relation from the inner surface of the bobbin, and so positioned that the free edge flares outwardly by centrifugal force to contact a substantial inner surface of the bobbin in driving relationship.

8. A textile bobbin driving means comprising in combination with a rotatable spindle, rigid means secured to the spindle for supporting and seating the bobbin at its base, a support means for the outer end of the bobbin secured to the spindle, a skirt supporting head mounted on the spindle, intermediate and independent of the end supporting and seating means, and a flexible, elastomer driving means having an edge secured to the skirt supporting head and having a continuous, cylindrical portion of substantial length suspended free and in spaced relation from the inner surface of said bobbin, and in position to flare outwardly by centrifugal force to contact a continuous inner surface of the bobbin in driving relationship.

9. In a textile bobbin driving means, the combination comprising a bobbin and a rotatable supporting spindle, means secured to the spindle for centering the bobbin at its ends, a supporting head mounted on the spindle, a tubular, elastomer driving means having an edge supported on said head, and having a continuous, cylindrical skirt portion of substantial length suspended therefrom in spaced relation from the inner surface of the bobbin and within the bore of the bobbin intermediate the centering means so that said suspended skirt portion is positioned to expand outwardly by centrifugal force to engage a continuous inner, intermediate surface of the bobbin in driving relationship.

10. A textile bobbin holder comprising in combination with a bobbin and a supporting spindle, a seating base for the bobbin, means carried by the spindle for centering the ends of the bobbin, and a flexible, elastomer driving skirt supported by the spindle within the bore of the bobbin, intermediate the end centering means, and in spaced relation from the inner surface thereof when at rest, with one edge of said skirt secured to the supporting means and a continuous, tubular portion of substantial length extending to an outer free edge of said skirt positioned to flare outwardly by centrifugal force to contact a continuous, inner surface of the bobbin in driving relationship with the bobbin when seated on the base.

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