Jan. 5, 1971 H. P. STAUFERT 3,552,113

SPINNING AND TWISTING SPINDLE

Filed Sept. 20, 1968 3 Sheets-Sheet 1

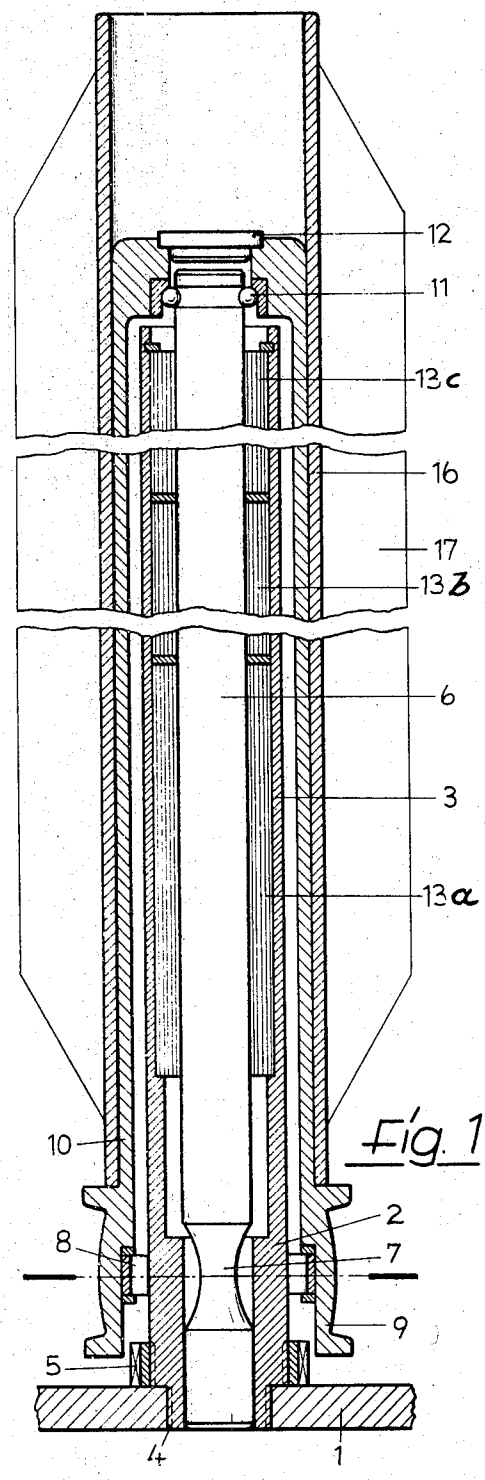

Fig. 1

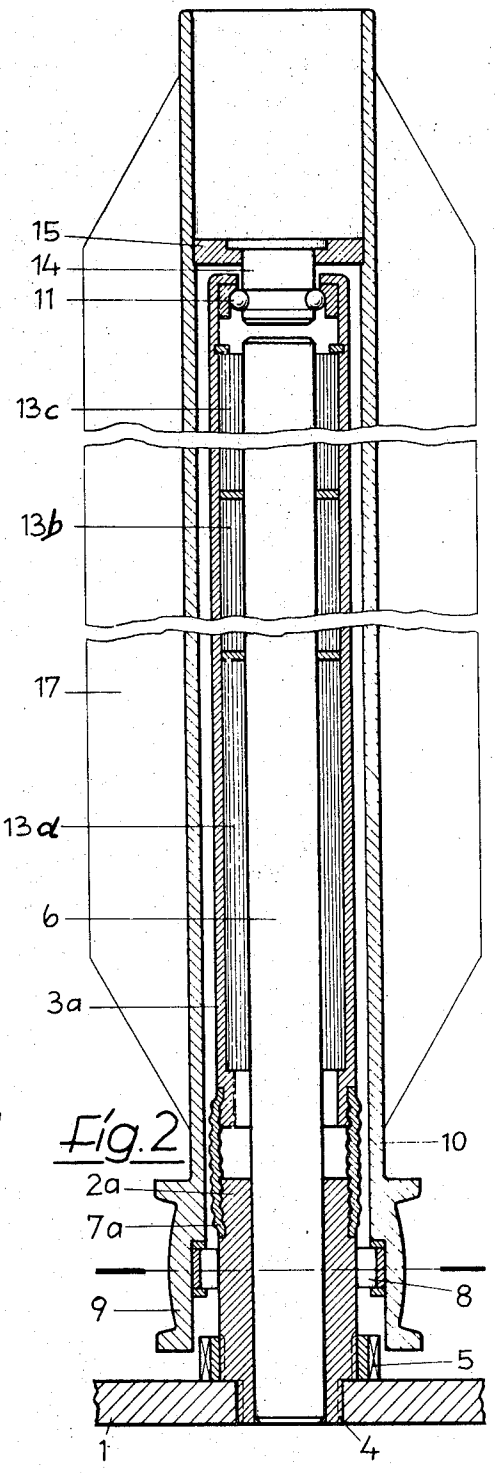

Fig. 2

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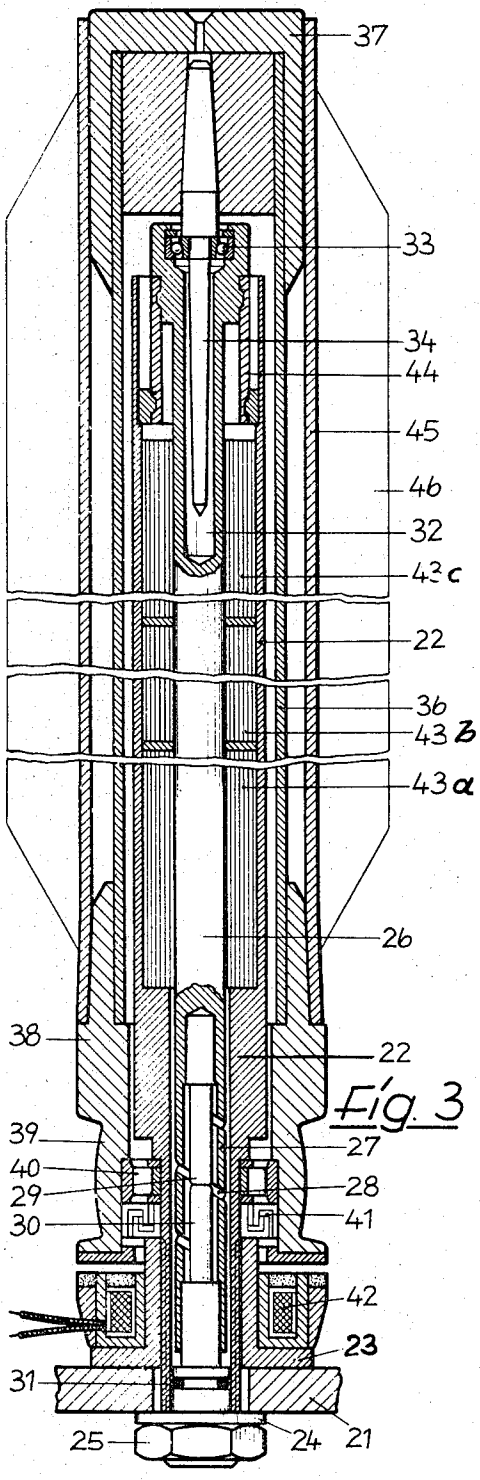

Fig. 3

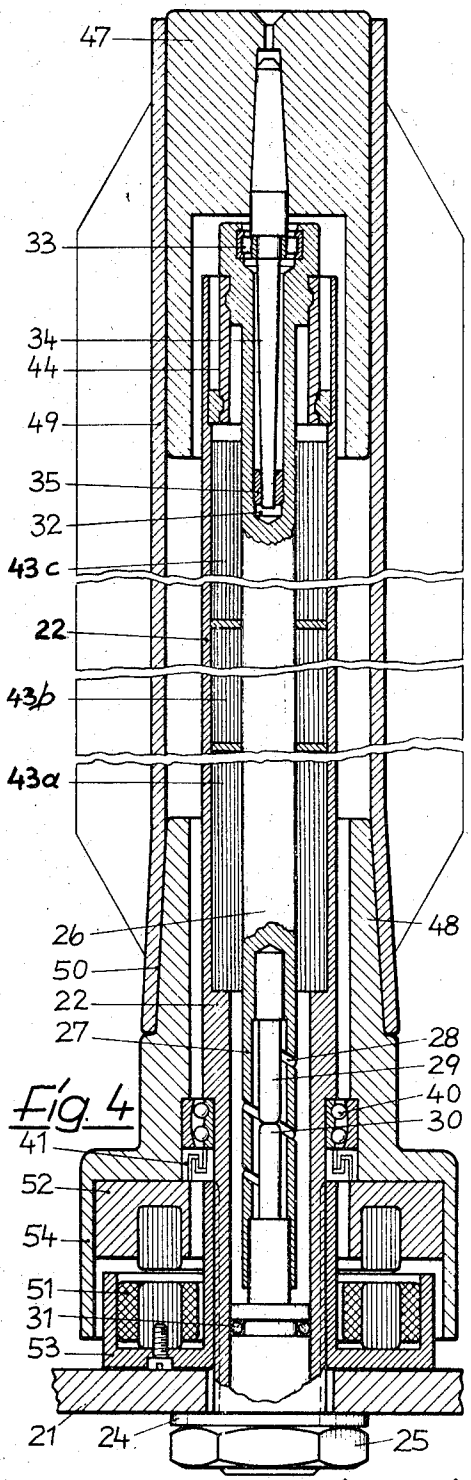

Fig. 4

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SPINNING AND TWISTING SPINDLE

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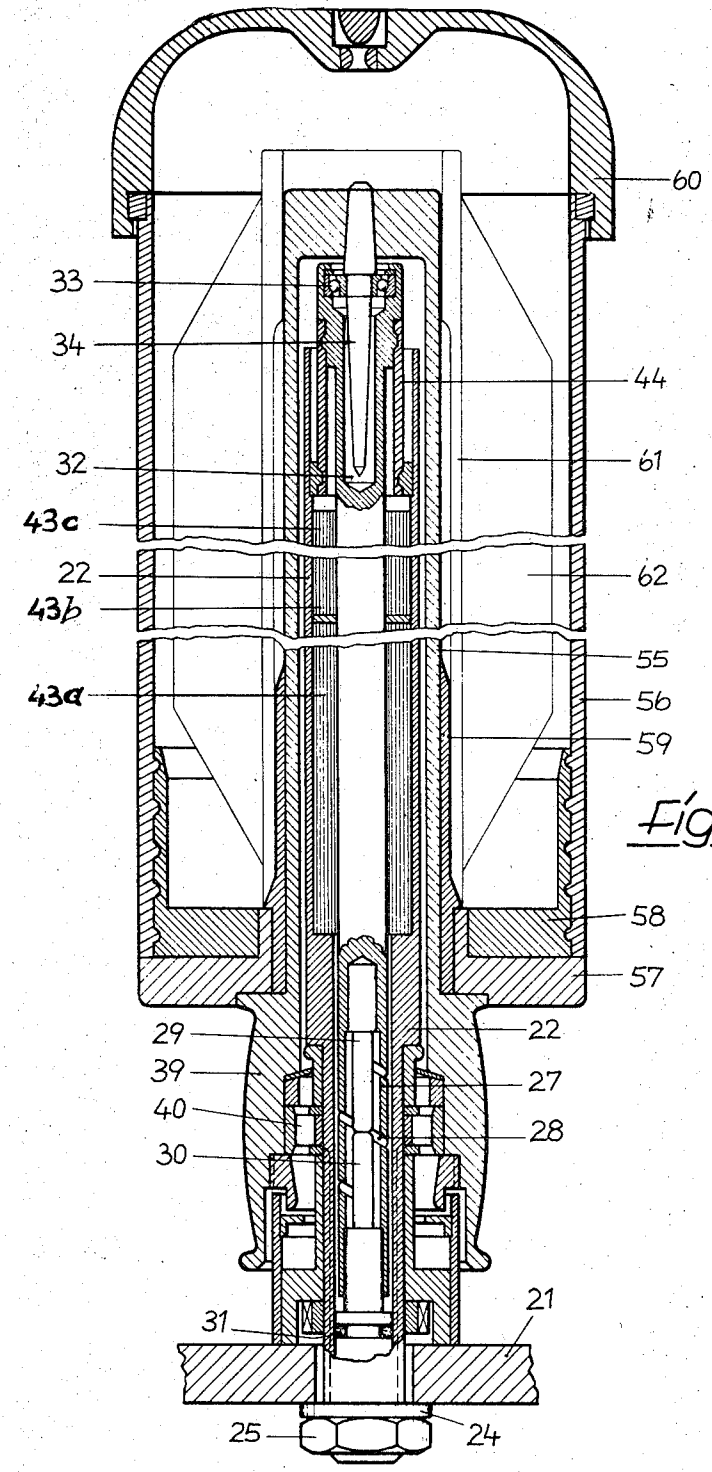

Fig. 5

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3,552,113

SPINNING AND TWISTING SPINDLE

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Int. Cl. D01h 7/04
U.S. Cl. 57—130 10 Claims

ABSTRACT OF THE DISCLOSURE

A spinning and twisting spindle in which the bobbin receiving member rotates about a bearing housing comprising two coaxially arranged parts connected at the lower end thereof, of which one part is movable in the manner of a pendulum from the lower end and at the upper end receives a guiding bearing for the rotating spindle parts, whereas the other part is entirely nonmovable and connected to the spindle rail and supports the members between the two parts for absorbing oscillations and also supports the lower guiding bearing for the rotating spindle parts.

The present invention relates to spinning and twisting spindles. The requirement of the textile industry for ever larger bobbins in diameter and length and for further increase in the spindle speed, cannot be met by the heretofore known spindle constructions.

Rotating spindle parts and the bodies protruding from the spindle for receiving bearings and devices to cushion or damp oscillations have assumed weights and dimensons which are in misrelationship to the obtained effect, viz to the wound-up quantity of yarn. The forces for driving the spindles, particularly when starting and braking are, therefore, correspondingly high.

The conditions with regard to the necessary means for permitting an oscillation-free rotation are even less favorable when these spindles have to absorb additional forces, as is the case, for instance, when spinning without balloon or when spinning with suppressed balloon.

Similar remarks apply when it is intended to exploit recent spinning technological possibilities of producing yarn bodies of almost any desired length. Customary spindles become uneconomical because they have to have increasingly unproductive lengths and measurements in spite of the fact that efforts are made to maintain the same within limits.

Attempts have been made simply to increase the damping means in order to obtain a compensation for the longer and heavier upper portion. The result of these efforts, however, consists in a still poorer passage through the critical speed, higher sensitivity, and intolerable oscillations during short overload, and faulty centering. The above-outlined drawbacks, however, have by no means been eliminated by the last-mentioned steps.

It is, therefore, an object of the present invention to provide a spinning and twisting spindle which will overcome the above-mentioned drawbacks.

It is another object of this invention to provide a spinning and twisting spindle which will bring into a satisfactory relationship the relation of the overall spindle length to the length of the cop.

It is a further object of this invention to provide a spinning and twisting spindle in which the weight of the rotating parts will be in a satisfactory relationship to the weight of the cop.

Still another object of the present invention consists in the provision of a spindle as set forth in the preceding pargraphs which will result in a better centering even at high driving pressure and strong thread pull.

A further object of the present invention consists in the provision of a spinning and twisting spindle which will be less sensitive to oscillations, especially when subjected to overload or frequently changing thread tension.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 diagrammatically illustrates a longitudinal section through a spindle according to the present invention;

FIG. 2 is a section similar to that of FIGURE 1 but illustrating a modification thereover;

FIG. 3 represents a longitudinal section through a spinning and twisting spindle according to the invention which has proved particularly successful in practice;

FIG. 4 shows a section through a different sleeve receiving member; and

FIG. 5 is a section through a further modification of a spindle according to the present invention as applied to a pot spindle.

The spinning or twisting spindle according to the present invention is characterized primarily in that the bobbin-setting body rotates about a bearing housing which comprises two coaxially arranged sections connected at their lower ends, one section of which from the lower end thereof is movable in the manner of a supporting pendulum and at its upper end receives a guiding bearing for the rotating spindle parts, whereas the other section is entirely nonmovable and is connected to the spindle rail which supports members between the two sections for damping or absorbing oscillations and also supports the lower guiding bearing for the rotating spindle parts.

Referring now to the drawings in detail and FIG. 1 thereof in particular, the arrangement shown in FIG. 1 comprises a spindle rail **1** having inserted thereinto a tubular member **3** the lower thicker portion **2** of which is provided with a thread **4** threadedly connected to the spindle rail **1** and secured thereto by a nut **5**. The lower tubular section **2** has inserted thereinto a rod **6** which is reduced in thickness at **7** so that it can carry out a pendulum movement. Advantageously, this machined portion may in cross-section be of a hyperbola shape and may be located in the central plane of the lower bearing **8** or whorl **9**. The pendulum movement takes place about the narrowest portion and amounts to a fraction of 1 millimeter.

Whorl **9** has a tubular extension **10** for receiving a yarn sleeve. The said extension **10** together with said yarn sleeve **16** form the so-called creeling body which is supported by the upper bearing **11** on the upper portion of the pendulum rod **6** and therefore is able to follow all movements of said pendulum rod **6**. Between the two bearings **8** and **11** there are provided damping or cushioning means **13***a*, **13***b*, **13***c* which in the particular example shown in FIG. 1 are formed by spiral springs respectively located at different heights. These spiral springs may have the same or different thickness. In view of the relatively considerable spacing between the two bearings **8** and **11**, it is possible to mount far more mechanical and

liquid damping or cushioning means of different types than is the case with ordinary spindles. The creeling body **9**, **10** carries the yarn sleeve **16** and the yarn body **17**.

Referring now to the embodiment of FIG. 2, the latter likewise shows a spindle rail **1** having threaded thereinto a tubular section **2** by means of a thread **4** and secured to said spindle rail **1** by means of a nut **5**. The difference between the embodiment of FIGS. 1 and 2 consists primarily in that the rod **6***a* is firmly inserted in the tubular section **2***a* and that the tubular extension **3***a* which is connected to the tubular section **2***a* by means of a resilient connection **7***a* is adapted to carry out a pendulum movement. All other portions of FIG. 2 substantially correspond in structure and operation to those of FIG. 1 with the exception that the upper bearing **11** of FIG. 2 is mounted in the tubular extension **3***a* and is able, similar to FIG. 1, to follow the pendulum movements in conformity with the damping or cushioning members. The creeling body **9**, **10** is connected to the tubular extension **3***a*, which is adapted to carry out a pendulum movement by means of the stud **14** and the bottom member **15** thereon. FIG. 2 illustrates the possibility of employing the creeling body directly as yarn sleeve thereby further reducing the rotating masses. The yarn body **17** is thus wound directly upon the creeling body **9**, **10**.

The arrangement illustrated in FIG. 3 shows a spindle rail **21** supporting a tubular body **22** through the intervention of a threaded sleeve **23** and is secured to said spindle rail **21** by means of a washer **24** and a nut **25**. Within said tubular body **22** there is provided a pendulum rod **26** which within the area of the whorl **39** is journalled in the manner of a joint and more specifically, by the fact that the pendulum rod has its lower end designed as a flexible pipe **27** with a helical slot **28**. The axial support is furthermore effected by the stepped studs **29**, **30** which latter is provided with a sealing ring **31** and is firmly screwed onto the lower portion of the tubular body **22**.

The upper end of the pendulum rod **26** has a hollow chamber **32** which forms a bearing and lubricating chamber. Depending on the design of said hollow chamber, either an antifriction bearing **33** with a short spindle shank **34** may be arranged in said hollow chamber as oil feeding means, or an antifriction bearing **33** with a short spindle shank **34** and a thrust bearing **35** (see FIG. 4) may, similar to a normal spindle bearing, be arranged in said hollow chamber **32**.

The bobbin carrier is designed as a cylindrical pipe **36** and at its upper end has a supporting body **37** while its lower end has a supporting body **38**. The supporting body **38** may at the same time have the whorl **39** connected thereto as an integral part. The bobbin carrier is by means of a pendulum bearing **40** supported along the radial central plane of the whorl **39**. The bearing **40** may be protected against loss of lubricant, etc. by a seal **41**. Any desired braking device as, for instance, a magnetic coupling **42**, may be employed for stopping the spindle.

The pendulum rod **26** is able to carry out all necessary pendulum movements in conformity with the pendulum movement of the bobbin carrier. These deviations from the vertical position are limited merely by the damping or cushioning devices **43** in the tubular body. Such cushioning devices may, for instance, be represented by a spiral spring with oil. In view of the length and the diameter of the tubular body, the cushioning devices may from the top toward the bottom correspond to the increase of the yarn body or the changing of the center of gravity. In this connection, the cushioning devices may be all alike or may be different and may be subdivided in steps as indicated by the reference numerals **34***a*, **34***b* and **34***c*.

An elastic sleeve **44** hermetically seals the cushioning chamber or chambers toward the top so that no changes in the damping effect will be possible by a change in the viscosity of the oil or by foreign bodies such as fibers, dust, etc., entering said cushioning chambers. The sleeve **45** with the yarn body **46** complete the arrangement shown in FIG. 3.

The embodiment of the present invention as illustrated in FIG. 4 differs from that of FIG. 1 primarily in that the long creeling body **36** of FIG. 1 has been replaced by two separate short creeling bodies **47**, **48** respectively which are each separately journalled at the upper and lower portion of the spindle. The correspondingly designed yarn sleeve **49** with, for instance a cone **50**, couples and connects the two bodies to each other thereby replacing the pipe **36** of FIG. 3.

Instead of the whorl and braking magnet of FIG. 3, advantageously a special electric motor may be provided with a disc stator **51** and a superimposed disc rotor **52**. The advantage of this design is the low structural height and the possibility to employ the disc stator **51** or the housing **51** thereof as support **53** for the tubular body, whereas the disc motor rotor **52** is inserted into the creeling body **48** and therefore does not require a bearing of its own. The rotor as well as the stator are protected toward the outside by a cap **54** forming a part of the creeling body **48**.

FIG. 5 shows the employment of a spinning or twisting spindle according to the invention with a pot. In addition to the elements described above in connection with the preceding embodiments of the invention, the arrangement of FIG. 5 has also a bobbin carrier body **55**, a pot **56**, a bottom **57**, a conecting member **58**, a receiving cone **59**, a pot cover **60**, and a bobbin pipe **61** and yarn body **62**.

The heretofore designed pot spindles have rather critical running properties because in view of the withdrawal of the thread, the center of gravity is continuously changed. The new bearing arrangement with its damping or cushioning devices subdivided over the entire length makes it possible over heretofore known spindles to function and also to increase the spindle speed.

With regard to the pendulum movement of the whorl with the yarn receiving body carried thereby, this movement may briefly be summarized as follows:

In FIG. 1, the pendulum movement of whorl **9** with tubular extension **10** is effected through the intervention of the cushioning means **13***a*, **13***b*, **13***c* and rod **6**. Since rod **6** has the reduction in diameter at **7**, and since this reduction is located in the central transverse plane of the roller bearings **8**, rod **6** will at the said reduction in diameter be able to bend at said reduced area by a fraction of a millimeter and will simultaneously permit a corresponding tilting movement of the parts **9** and **10** through the intervention of the roller bearing **8**. Inasmuch as only a very slight tilting or pendulum movement is involved, the play of the roller bearing **8** will suffice to permit this movement.

According to FIG. 2, rod **6** is fixed, and the tubular extension **10** carries out its pendulum movement through the cushioning means **13***a*, **13***b*, **13***c*. This is made possible by the elastic sleeve **7***a* interconnecting the members **2***a* and **3***a*. The outer movement of whorl **9** and extension **10** is likewise made possible by the play of the roller bearing **8**.

The principle of the pendulum movement just described in connection with FIGS. 1 and 2 is also present with the embodiments of FIGS. 3, 4, and 5. The end portion **29** of rod **26** in combination with the spirally slotted sleeve **27** has the same effect as the diameter restriction at **7** of rod **6** of FIG. 1. According to FIGS. 3–5, the tilting or pendulum movement of whorl **39** and yarn body supported by its extension is made possible by the play of the bearings **40** in the same manner as described in connection with the bearings **8** of FIGS. 1 and 2.

The spinning and twisting spindle according to the invention as described above makes it possible to a far better extent than could heretofore have been realized

to solve all spindle dimensions and problems associated therewith.

As will be evident from the above, the present invention results in the following advantages:

(a) The ratio of the total length of the spindle to the length of the cop is approximately 1:1, and with protruding sleeve is even more favorable.

(b) Inasmuch as the rotating spindle parts are guided by bearings at both ends, the said spindle parts may have thin walls and will therefore be of low weight. The weight of the bobbin creeling body may be even further reduced by subdividing said body into two sections journalled separately and the connection of said body sections may be effected only by the yarn sleeve. In special instances, the bobbin creeling body itself may function as yarn sleeve or yarn receiving body.

(c) The driving pressure acts directly upon the lower bearing which to a major extent is mounted within the area of the central plane of the drive or whorl and therefore does not affect the centering of the upper portion of the spindle. The centering is anyhow considerably better with heretofore customary spindles because the centering means are arranged where the thread pull acts most strongly upon the spindle.

(d) The possibility of maintaining damping or cushioning means over the entire length of the spindle between the two guiding bearings considerably reduces the oscillation sensitivity of the spindle because great quantities of oscillating means of different types and of mechanical or liquid nature, may be mounted.

It is, of course, to be understood that the present invention is not limited to the specific embodiments shown in the drawings, but also permits further modifications, the invention being determined by the scope of the disclosure.

What I claim is:

1. A spinning and twisting spindle, which includes: tubular means having a lower end portion for fixed connection to a spindle rail and also having an upper end portion, bobbin receiving means surrounding said tubular means in radially spaced relationship thereto and extending in the longitudinal direction of said tubular means, first and second bearing means spaced from each other in the axial direction of said bobbin receiving means and respectively located near said upper and lower end portions of said tubular means for rotatably journalling said bobbin receiving means relative to said tubular means, and cushioning means interposed between said first and second bearing means for absorbing oscillations of said bobbin receiving means.

2. A spindle according to claim **1**, in which said bobbin receiving means extends upwardly beyond said first bearing means.

3. A spindle according to claim **1**, which includes: whorl means forming the lower part of said bobbin receiving means, and in which said bearing means near the lower end portion of said tubular means is designed as pendulum bearings, said pendulum bearing being located in the area of the radial central transverse plane of said whorl means.

4. A spindle according to claim **1**, which includes: a whorl near the lower portion of said tubular means, and in which said tubular means is supported for a limited pendulum movement near the central horizontal plane of said whorl.

5. A spindle according to claim **1**, in which said cushioning means extend over the major distance between said first and said second bearing means.

6. A spindle according to claim **5**, in which said cushioning means include a mechanical and liquid cushioning means.

7. A spindle according to claim **1**, which includes: lubricant containing chamber means adjacent said cushioning means.

8. A spindle according to claim **7**, which includes: elastic means hermetically sealing said lubricant containing chamber means with regard to said cushioning means.

9. A spindle according to claim **1**, in which said bobbin receiving means comprises two sections journalled separately and individually and in which sleeve means are provided interconnecting said last-mentioned two sections.

10. A spindle according to claim **9**, in which said sleeve means together with said two sections form said bobbin receiving means.

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JOHN PETRAKES, Primary Examiner