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Fig. 1.

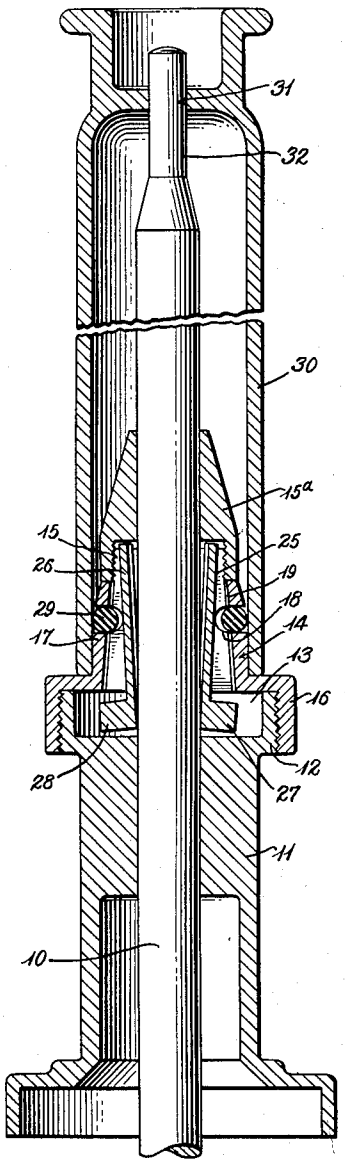

Fig. 2.

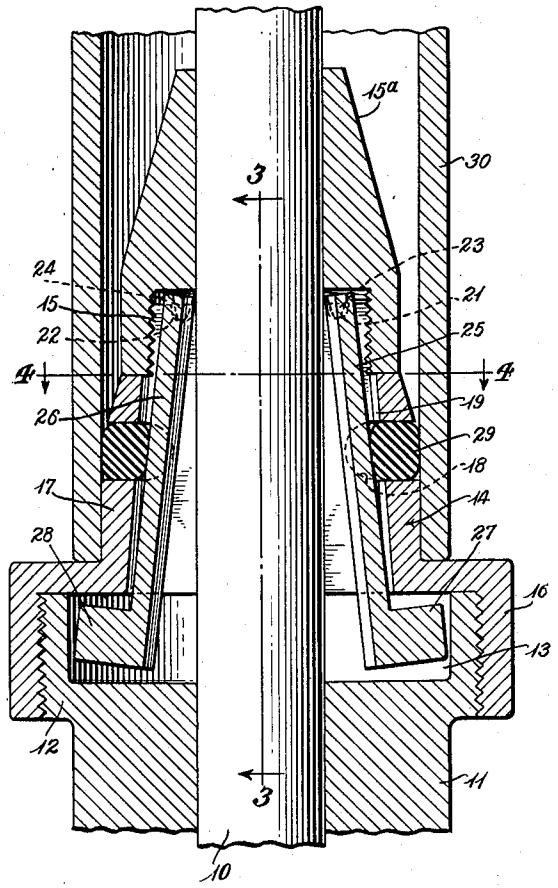

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Fig. 3.

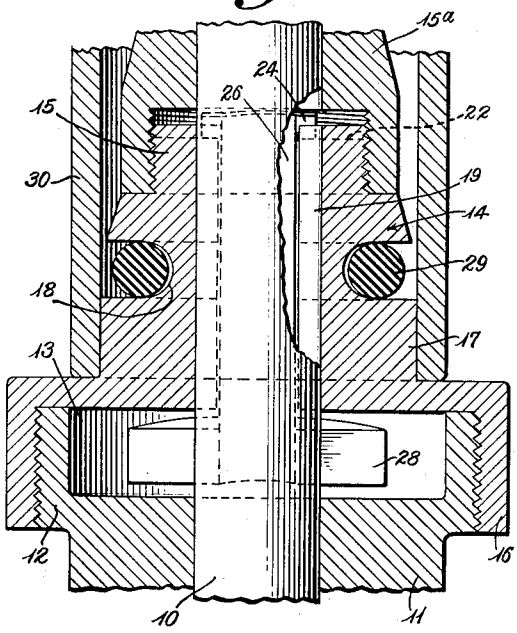

Fig. 5.

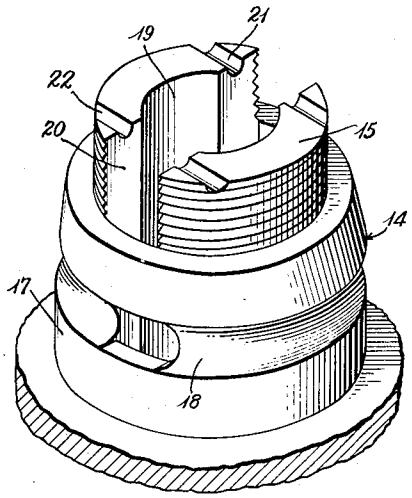

Fig. 4.

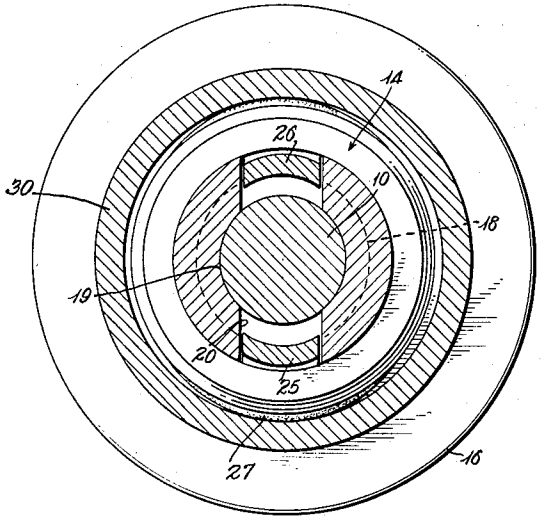

Fig. 6.

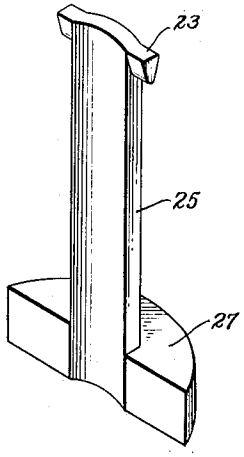

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Fig. 7.

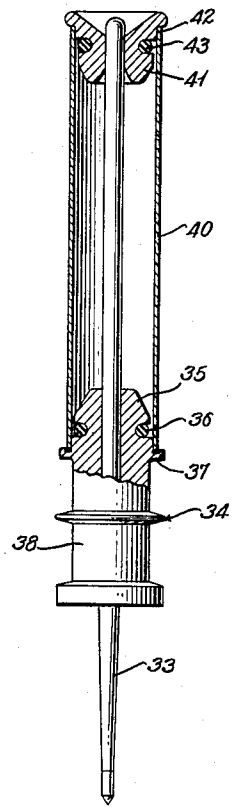

Fig. 8.

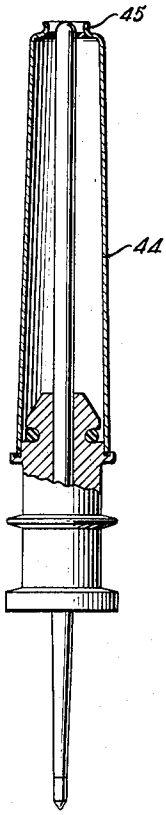

Fig. 9.

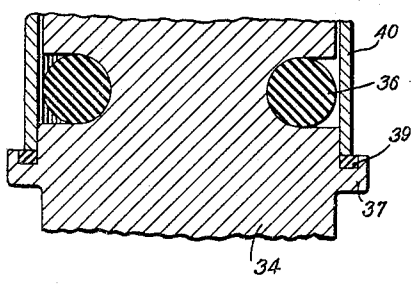

Fig. 10.

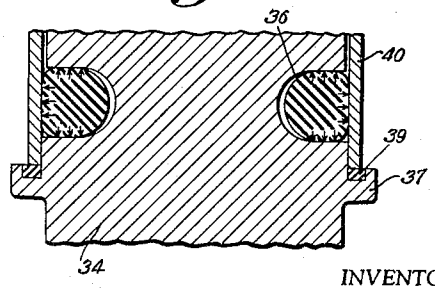

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Fig. 11.

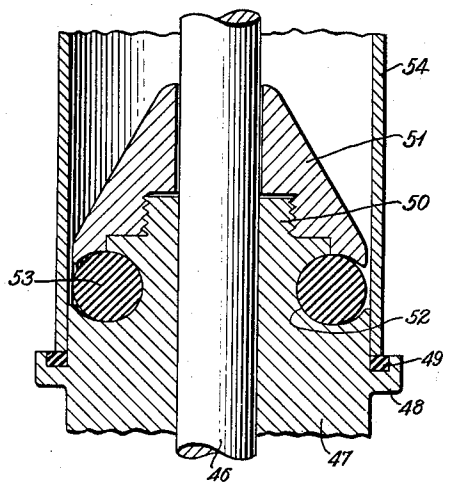

Fig. 12.

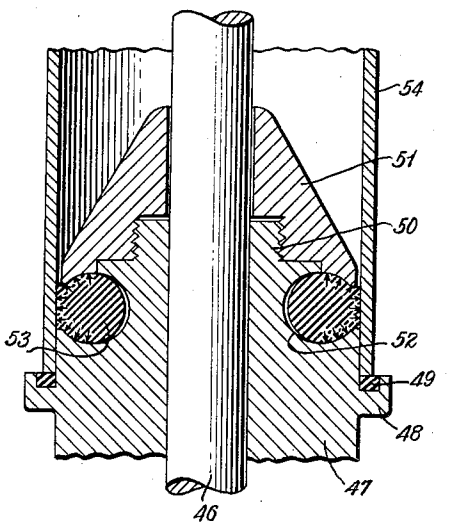

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Fig. 13.

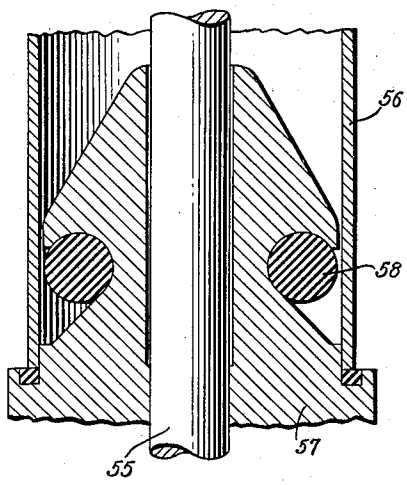


Fig. 14.

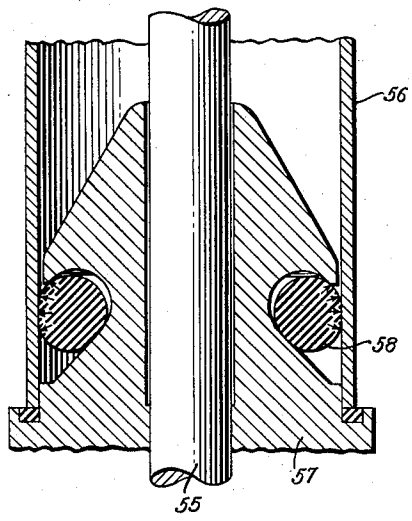
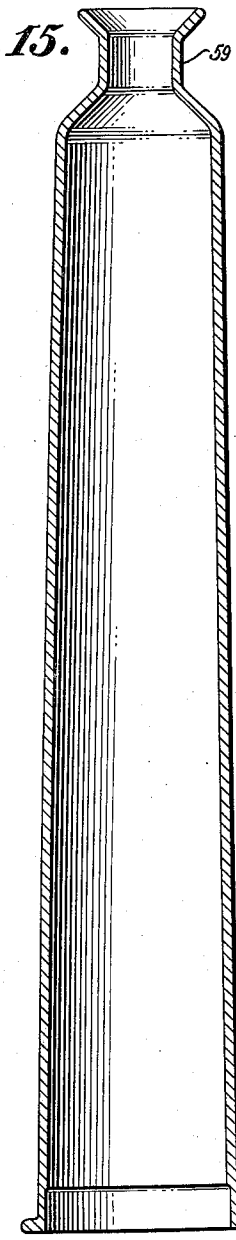


Fig. 15.



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United States Patent Office 2,918,781 Patented Dec. 29, 1959

2,918,781

TWISTER

Willem Bakker, Arnhem, Netherlands, assignor, by mesne assignments, to American Enka Corporation, Enka, N.C., a corporation of Delaware

Application November 2, 1955, Serial No. 544,528

Claims priority, application Netherlands November 8, 1954

3 Claims. (Cl. 57—130)

This invention relates to twisting apparatus and more particularly to improved twisting spindles intended to be used to drive hollow thread supporting tubes.

In the ring twisting art it is known to use hollow tubes to support the thread that is being processed. These tubes are detachably supported over a rotating spindle and the ring and traveler assembly is mounted to reciprocate over a part of the length of the spindle. The twisted thread is laid up by this traveler on the tube, which when full is removed from the spindle.

In an arrangement of the foregoing character, it is of economical advantage to make the tubes as thin as possible. On the other hand, if the tube is very thin some compression is brought about by the winding thereon of the twisted thread and difficulty is encountered in doffing the tube from the spindle. If the tube is made to fit over the spindle loosely enough so that small compression does not create doffing difficulties, then the drive between the spindle and the tube is not adequate during the early stages of the winding of a twisted thread body.

It is an object of this invention to overcome the foregoing difficulties and to provide a driving coupling between a thread supporting tube and a twisting spindle that is self-releasing when the spindle is stationary but which will provide a firm and positive drive when the spindle is rotated.

It is a further object of the present invention to provide a driving arrangement that is characterized by prevention of slip at very low speeds and yet the avoidance of equipment damage at very high speeds in order that the versatility of the equipment may be enhanced.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of several embodiments theref in conjunction with the annexed drawings wherein:

Figure 1 is a view in vertical section of a twisting spindle and a thread tube showing the preferred holding arrangement of the present invention in its position of repose;

Figure 2 is a fragmentary view in vertical section similar to Figure 1 but showing the tube holder of the present invention in the operating position which it assumes when the spindle is rotated;

Figure 3 is a view in vertical section taken 90° away from the point of view of Figure 2 on the line 3—3 of that figure;

Figure 4 is a view in transverse section taken on the line 4—4 of Figure 2;

Figure 5 is a fragmentary perspective view showing the support for the centrifugally biased members which form a part of the holding mechanism of the present invention;

Figure 6 is a perspective view of one of the centrifugally biased holding members of the present invention;

Figure 7 is a view partially in vertical section and partially in elevation showing a modified type of tube holding arrangement in accordance with the present invention;

Figure 8 is a view similar to Figure 7 but showing a still further modification of the present invention;

Figure 9 is a fragmentary view in vertical section showing the repose position of the holding member of Figure 8;

Figure 10 is a view similar to Figure 9 but showing the position of the holding member under centrifugal bias;

Figure 11 is a fragmentary view in vertical section illustrating a different type of tube holding mechanism in its repose position;

Figure 12 is a view structurally corresponding to Figure 11 but showing the holding means in the position which it assumes under centrifugal bias;

Figure 13 is a fragmentary view in vertical section of still another modification of the present invention showing the holding means in its position of repose;

Figure 14 is a view structurally corresponding to Figure 13, but illustrating the position of the holding means under centrifugal bias; and

Figure 15 is a view in vertical section of a modified bell-shaped tube for use in an assembly such as that depicted in Figure 8.

Referring now in greater detail to Figures 1 to 6 inclusive, the numeral **10** designates a twisting spindle of the type used in the ring twisting of threads. This spindle, during the twisting operation, is caused to be rotated at high speed and a ring frame which contains a ring coaxially spaced around the spindle reciprocates lengthwise of the spindle so that a traveler mounted on the ring can lay up the twisted thread on some sort of a spindle carried thread support. The foregoing description is a mere summary of an entirely conventional ring twister. The present invention relates to the support for the twisted yarn and the means by which it is held in position on the spindle.

The spindle **10** illustrated in Figure 1 is driven from a belt not shown which acts on a pulley **11**, which is keyed or otherwise arranged to rotate with the spindle **10**. The pulley **11** is provided at its upper end with an annular externally threaded flange **12** and a coaxial internal cavity **13** defined thereby. A tubular centering member **14** is supported from the flange **12** by a threaded connection.

This tubular centering member constitutes an important part of the present invention and its contours can be best understood by concurrent reference to Figures 2, 3, 5 and 6 of the patent drawings. A nut **15***a* is fit over an upper threaded boss **15** of the centering member **14**. The centering member **14** comprises a flange **16** which actually connects it to the pulley structure **11**, a main body portion **17** and the boss **15**. An annular groove **18** is cut in the body portion **17** and, centrally, the member **14** is provided with a round hole at **19** through which the spindle **10** passes. In addition to that there is a diametrical slot at **20** which intersects the bore at **19** and which extends for the full diameter of the centering member in the zone of the threaded boss **15** over which the nut **15***a* fits and at the zone of the bottom of the groove **18**. Note in Figure 5 how the slot at **20** intersects the bottom of the groove **18**. This is also apparent in Figure 2. On the upper surface of the boss **15** there are cut chordwise grooves **21** and **22**. These grooves function to receive therein knife edges **23** and **24** of biasing members **25** and **26**. At the lower end of the biasing members **25** and **26**, remote from their knife edges **23** and **24**, these members are provided with counterweights **27** and **28** respectively.

A ring **29** of rubber or other similar resilient material occupies the groove **18** and closes off the ports in that

groove which are really a part of the diametrical slot at 20. The shanks of the biasing members 25 and 26 being mounted for limited rocking movement about the respective knife edges 23 and 24 can move from a pendant repose position, shown in Figure 1, to a position partly protruding into the bottom of the groove 18 and thereby exerting a thrust or bias on the ring 29, see comparatively Figures 1 and 2.

When the spindle 10 is stationary the biasing members 25 and 26 hang in the Figure 1 position and normal resiliency of the ring 29 causes enough circumferential shrinkage so that the ring pulls into the groove 18 and permits the insertion or removal of a thread supporting tube 30 over the centering member 14. The tube 30 on its top is provided with a centering aperture at 31 through which a portion 32 of the spindle 10 projects.

By the foregoing arrangement it can be seen that the insertion and removal of the thread supporting tube is quite easy even if the tube is somewhat compressed by the tightly wound thread thereon after the completion of the twisting operation. On the other hand, even when the spindle is rotated at relatively low speeds the mass of the counterweights 27 and 28 is such as to cause the biasing members to expand the ring 29 and to force it tightly against the inner surface of the tube 30 as can be easily seen in Figure 2.

In Figure 7, there is shown a modified form of the present invention which, while not as satisfactory as the arrangement of the Figures 1 and 2, particularly for operations at low speeds, is nevertheless of importance. In this case, the spindle bears numeral 33 and it is provided with a driving pulley 34 which has a frusto-conical top 35 at the base of which there is a marginal groove containing a ring of rubber or other resilient material 36. A marginal flange 37 extends outwardly from the body of the pulley structure somewhat above the belt driving surface indicated at 38. The flange 37 has a groove in it which faces upwardly of the structure as it is depicted in the drawing and in this groove there is located a rubber or rubber-like ring 39. In Figure 7 the tube on which the twisted thread is wound bears numeral 40 and the base of this tube 40 rests on the top of the ring 39 as can be seen in Figures 7, 9 and 10. In repose the ring 36 draws itself into the groove in the pulley 34 and there is sufficient clearance so that the tube 40 may be easily withdrawn axially upwardly of the spindle 33. This clearance is sufficient to permit removal of the tube 40 even when that tube has been somewhat compressed by reason of the wound body of twisted thread laid up thereon. On the other hand, when the spindle is rotated at a sufficiently high speed the ring 36 expands and, in so doing, establishes a frictional drive against the inner wall of the tube 40 whereby the tube is driven with the spindle and is, of course, held against axial movement as well. The positions which the ring 36 occupy are shown in Figures 9 and 10. Figure 9 is the repose position of the ring 36 and Figure 10 shows the ring as it is pushed upwardly by centrifugal force incident to the rotation of the twisting spindle.

In Figure 7 there is shown, at the top of the spindle 33, a detachable cap 41 having a centering rim at 42 and a groove directly underneath the centering rim. Within the groove there is disposed a ring 43 of rubber or rubber-like material. The diameter of the ring is so chosen that when the cap and spindle are stationary the ring does not even touch the tube.

The rubber ring 39 functions to prevent damage to the tube rims when the tubes are placed over the spindle and likewise acts as a clutch to start the rotation of the tube 40 before the centrifugal force has sufficiently acted on the ring 36 so that it may become the driving element. The construction shown in Figure 8 is in all respects similar to Figure 7 except that the tube, which in this case bears numeral 44, has a bell top which provides the center bore for centering the tube on the spindle. A raised portion at 45 acts as a finger-grip for doffing the tube.

Although the arrangement of Figures 7, 8, 9 and 10 is quite satisfactory under most circumstances, if the spindle is rotated at high speed without the thread tube thereover, there is a tendency for the ring 36 to expand to such a degree that it breaks under the influence of centrifugal force and therefore has to be replaced. In Figures 11 and 12 there is shown an arrangement whereby this breakage may be prevented. Figure 11 shows the repose position of a ring generally similar in function and location to the ring 36 and Figure 12 shows the position assumed by that ring under the influence of centrifugal force. In Figures 11 and 12, the spindle bears reference numeral 46 and the fragment of the pulley which shows in the drawing bears reference numeral 47. A flange 48 is provided which corresponds in structure and in function to the flange 37 of Figures 9 and 10. Within the groove in part defined by this flange there is located a rubber or rubber-like ring 49 corresponding in structure and in function to the ring 39 of Figures 9 and 10. The upper end of the pulley 47 terminates in a threaded boss 50 over which there fits a cap 51 which is in the form of the frustum of a cone having an axial bore therethrough for the accommodation of the spindle 46. The base edge skirt or flange of the cap 51 cooperates with a groove 52 in the pulley structure 47 in order to accommodate a rubber or rubber-like ring 53. The overhang of the flange at the bottom of the cap 51 is such as to restrain the ring against extruding entirely from the groove in which it is located when the ring is heavily under the bias of centrifugal force and and no thread tube is in position. In Figure 11 a tube bearing reference numeral 54 is shown and it can be seen that the ring is in repose out of contact with the inner wall of the tube. It can also be noted that the groove 52 defined in part by the pulley 47 and in part by the base flange and the cap 51 envelopes the ring 53 for more than 180° of its cross section. It is this envelopment which prevents the emergence of the ring completely from the groove under the bias of centrifugal force. With a tube in position, the ring 53 under centrifugal force assumes the position shown in Figure 12 whereby it may establish a firm and positive driving connection between the spindle 46 and the tube 54.

In Figures 13 and 14 there is shown a further modification of the mounting and the driving ring in order to prevent the ring from running out of its groove when there is no tube in position on the spindle. In Figures 13 and 14 the spindle bears reference numeral 55, the tube is designated by numeral 56 and it rests on a flange exactly in the manner of the tube 54 previously described. Near the top of the pulley structure 57 there is cut an annular groove which in cross-section extends obliquely inwardly with both a radial and upward axial component. Within the groove there is a rubber or rubber-like ring 58. When the spindle is stationary as depicted in Figure 13 the resilience of the ring draws it into the bottom of the groove. This causes the ring to move axially away from the mouth of the groove into a sort of re-entrant recess. Under the influence of centrifugal force the ring is drawn downwardly and outwardly as depicted in Figure 14 so that it may act against an inner wall of the tube 56 to drive the same. The expedient shown in Figures 13 and 14 has the advantage that the ring is restrained against moving directly outwardly under the influence of centrifugal force and this has been found to prevent the ring from breaking when the spindle is driven at high speed without any tube in position.

In Figure 15 there is shown a modified type of bell-shaped tube which may be used on a spindle as depicted in Figure 8. It is to be noted that this tube is provided with a deep rim at 59 for centering, for attaching to the spindle or for the noting of data regarding the thread

wound on the tube. The base of the tube of Figure 15 has a thin wall portion at its base designated by reference numeral 60.

It can be seen that by the use of detachable caps of the type shown in Figure 7 and locking and driving arrangements involving resilient rings, the machining of the tube may be greatly reduced, it being necessary only to machine a relatively small area, for example, in the vicinity of reference numeral 59 in Figure 15. Since compression of the tube as a result of thread wound thereon is immaterial when releasing the tube from the spindle at the doff, it is possible to make the tube exceedingly thin without interfering with its utility.

In the various figures of drawing depicting the rings 29, 36, 53 and 58 in their repose positions it is to be understood that there is either no contact with the tube or else it is so slight that doffing even of a fully wound tube is not impeded.

What is claimed is:

1. A twisting assembly comprising a spindle adapted for rotation, a driving pulley for rotating said spindle, a hollow thread receiving tube mounted coaxially over the spindle with a portion extending over said pulley, means defining a peripheral groove in said pulley, a resilient ring mounted within said groove and adapted to be urged outwardly by centrifugal force into contact with the inner surface of said hollow tube when the spindle is rotated, and means at the mouth of said groove for restraining the ring against complete extrusion from said groove under the bias of centrifugal force.

2. A twisting assembly comprising a spindle adapted for rotation, a driving pulley for rotating said spindle, a hollow thread receiving tube mounted coaxially over the spindle with a portion extending over said pulley, means defining a peripheral groove in said pulley, a first resilient ring of circular cross-section mounted within said peripheral groove and adapted to be urged outwardly by centrifugal force into contact with the inner surface of said hollow tube when the spindle is rotated, a flange projecting from said spindle and defining a marginal groove and a second resilient ring mounted within said marginal groove for supporting said hollow tube, the mouth of said peripheral groove being narrower than the diameter of said first ring.

3. A twisting assembly comprising a spindle mounted for rotation, means defining a peripheral groove in said spindle, a hollow thread receiving tube mounted coaxially over the spindle with a portion thereof extending over said peripheral groove, a resilient ring of circular cross-section mounted within said peripheral groove and movable outwardly into contact with the inner surface of said hollow tube by centrifugal force when the spindle is rotated, and means at the mouth of said groove permitting limited outward movement of said ring against said tube upon rotation of said spindle but restraining the ring against complete separation from said groove under the bias of centrifugal force in the event said spindle is rotated without a tube positioned thereover.

References Cited in the file of this patent

UNITED STATES PATENTS

284,429	Jaquith	Sept. 4, 1883
2,136,073	Cooper	Nov. 8, 1938
2,481,000	Brunner	Sept. 6, 1949
2,668,020	Dunlap	Feb. 2, 1954

FOREIGN PATENTS

6,500	Great Britain	of 1913
1,043,340	France	Nov. 9, 1953