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Brummer

[11] **3,778,991**

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[54] **TWIST TUBE FOR A FALSE-TWIST DEVICE**

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Feb. 10, 1971 Switzerland 1941/71

[52] **U.S. Cl.** **57/77.3**

[51] **Int. Cl.** **D02g 1/06**, D02g 1/04

[58] **Field of Search** ..... 57/51, 34 R, 77.3, 57/77.45

[56] **References Cited**

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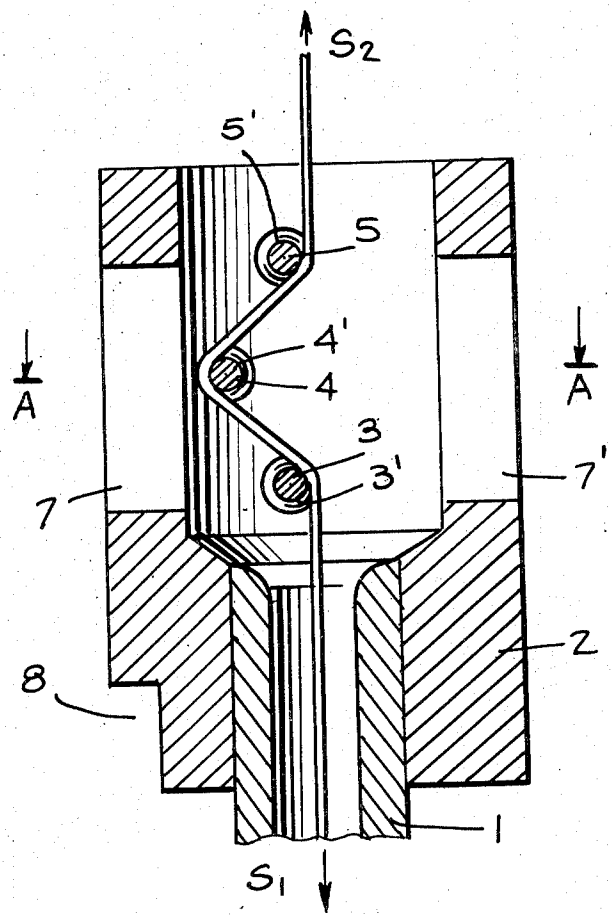
Primary Examiner—Donald E. Watkins

Attorney—Joseph M. Fitzpatrick et al.

[57] **ABSTRACT**

A twist tube for a false-twist device for texturing textile yarns wherein the ratio of tension of yarn being drawn from the tube to tension of yarn entering the tube is substantially reduced by providing at least three yarn deviation elements in the tube over which the yarn may pass, the elements being spaced in the direction of the longitudinal axis of the tube.

6 Claims, 7 Drawing Figures



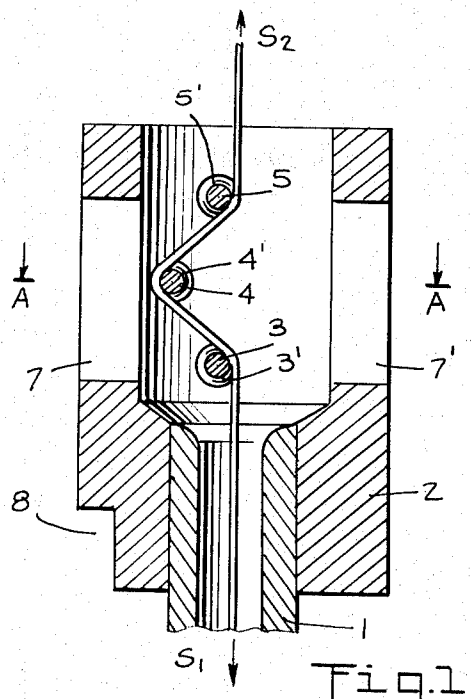


Fig. 1.

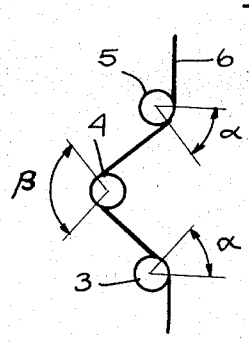


Fig. 4.

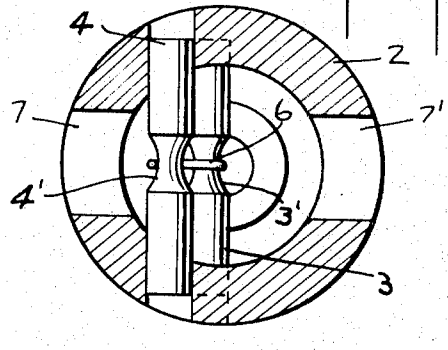


Fig. 2.

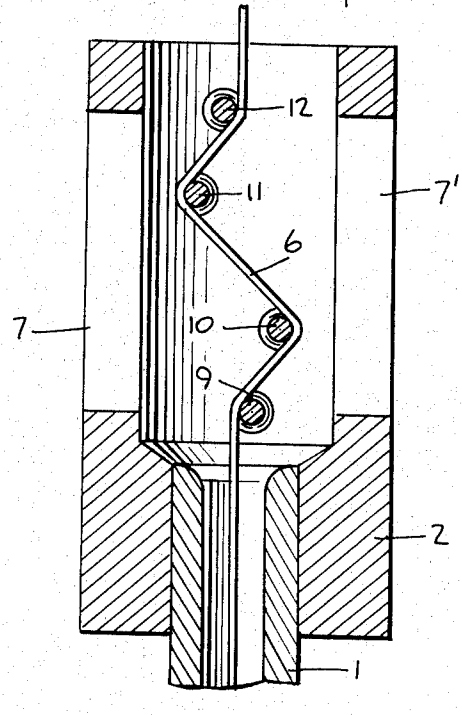


Fig. 3.

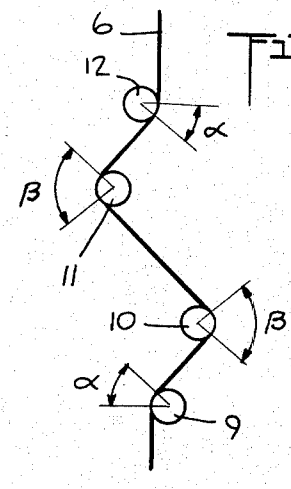


Fig. 5.

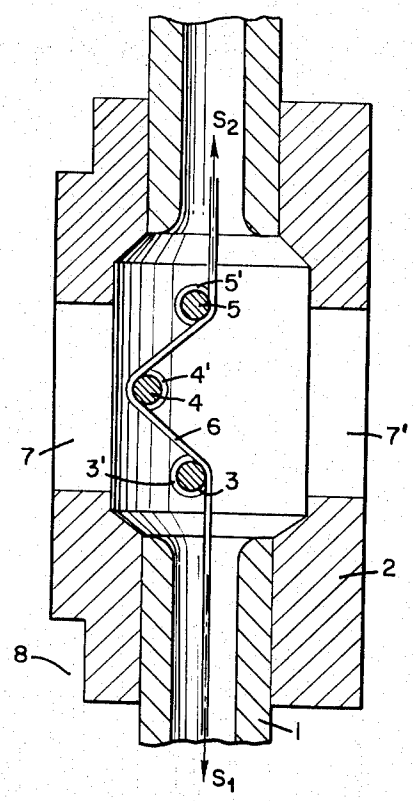
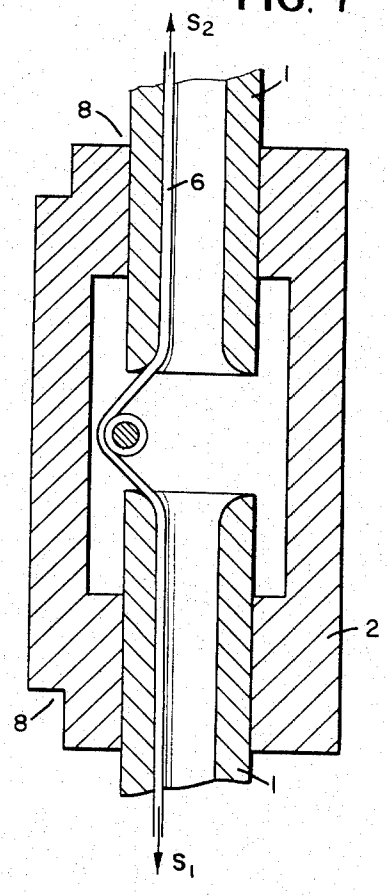


FIG. 6

FIG. 7



TWIST TUBE FOR A FALSE-TWIST DEVICE

The present invention relates to false-twist devices of the kind used for texturing yarns and more particularly, to the twist tubes which constitute part of such devices.

Twist tubes of the class described are known in the interior of which a transverse pin is provided to impart a twist to yarn ends to be textured while same are advancing longitudinally through the bore of the tube, the yarn being wound once completely around the pin (see U. S. Pat. No. 3,475,895). Furthermore, a special form of twist tube of this kind is known in which, at one end of the tube, a head is enlarged with respect to the diameter of the twist tube and a pin, consisting of a hard material such as sapphire, is arranged transverse of the bore of the tube. With such twist tubes, revolution speeds of several hundred thousand revolutions per minute are possible.

In known twist tubes, the complete winding of the textile yarn around the pin has the possible consequence of a high increase of tension under which the yarn is taken off the pin; and this may cause yarn breakage, particularly in delicate yarns. For the determination of this tension, Eythelwein's rope friction equation given hereinafter may be used:

$$S_2 = S_1 \cdot e^{\mu\hat{\alpha}};$$

wherein:

S_1 is the tension of the yarn when being fed to the pin,

S_2 is the tension of the yarn being drawn off the pin,

μ is the friction constant,

$\hat{\alpha}$ is the angle by which the yarn is led round the pin expressed as an arc.

For an angle of 360° and a friction constant of 0.2 (sapphire), the following ratio of yarn tensions results:

$$S_2 / S_1 = 2.718^{0.2 \cdot 6.283} = 3.5$$

It is the purpose of the present invention to contribute a twist tube for a false-twist device in which this ratio of yarn tensions may be materially reduced and with which yarn breakages, due to excessively high tension upon takeoff from the twist imparter, may be avoided, even with very delicate yarns such as unstretched or only partially stretched synthetic filaments or filament bundles.

Thus, I have conceived a twist tube for a false-twist device for texturing textile yarns, characterized in that at least three yarn deviating elements, such as pins, are spaced from one another in the direction of the longitudinal axis of the twist tube over which elements the yarn may pass in alternate directions. The head of the tube may be enlarged to accommodate the yarn deviating elements which are preferably arranged parallel to one another.

The head may be provided at one end of the twist tube or in its central part. As yarn deviating elements, at least three pins extending transversely with respect to the longitudinal axis of the twist tube may be provided which may be laterally displaced with respect to each other. If the head is provided in the central part of the twist tube, as yarn deviating elements, the two ends of the twist tube extending into the enlarged head, as well as a pin extending transversely with respect to the axis of the twist tube between the same, may serve as yarn deviating elements.

There has thus been outlined rather broadly the the more important features of the invention in order that

the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent construction as do not depart from the spirit and scope of the invention.

A specific embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. **1** shows the head of a twist tube with three pins, the figure being a central longitudinal section taken vertically with respect to the axes of the pins;

FIG. **2** is a cross-sectional view taken along line A-A of FIG. **1**;

FIG. **3** is a view similar to FIG. **1**, but showing the head of a twist tube with four pins;

FIGS. **4** and **5** are schematic views of the yarn paths in the examples according to FIGS. **1** and **3**, respectively; and

FIG. **6** is a view similar to FIGS. **1** and **3** but illustrating another form of the invention; and

FIG. **7** is a cross-sectional view illustrating yet another embodiment of the invention.

According to FIGS. **1** and **2**, on the end of the twist tube **1**, there is a head enlarged with respect to the twist tube and in which sapphire pins **3, 4** and **5** are provided transversely to the longitudinal axis of the head and tube. The pins **3** and **5** are arranged so that the textile yarn **6**, passing over them in the concave tapered central parts **3'**, **4'**, **5'** thereof, is fed and taken off in the direction of the longitudinal axis of the twist tube. For facilitating the insertion of the yarn into the twist imparter former by the three pins, two longitudinal slots **7, 7'** are provided in the wall of the head **2** and transversely with respect to the axes of the pins.

In order to avoid eccentricity in rapid rotation because of asymmetric arrangement of the pins **3, 4, 5** with respect to the longitudinal axis of the twist tube, the central pin **4**, being laterally displaced with respect to pins **3** and **5**, the wall of the head **2** is provided with a compensating recess **8**.

As appears from FIG. **4**, the yarn is led, in all, by twice the angle α, and the angle β, around the pins **3, 4** and **5**. The mutual arrangement of the pins is chosen so that the angle α is 50°, the angle β 100° and the total angle thus is 200°. If the arc of 200° is used in Eythelwein's equation, the result is:

$$S_1 / S_2 = 2.718^{0.25 \cdot 3.465} \approx 2.0$$

i.e., the ratio of yarn tensions S_2 / S_1 is essentially reduced when compared with an angle of 360°.

According to FIG. **3**, in the head **2** provided on the end **1** of the twist tube, four sapphire pins **9, 10, 11, 12** are arranged transversely with respect to the longitudinal axis of the twist tube and symmetrically with respect to the same in lateral displacement. The yarn passes over the pins in their tapered central parts, and the feeding to pin **9** and the taking off from pin **12** is effected along the longitudinal axis of the twist tube.

This symmetrical arrangement of the pins presents the advantage that, during rapid rotation of the twist tube, no eccentricity occurs, and compensation by a corresponding recess in the wall of head **2** is not necessary.

As appears from FIG. **5**, in this arrangement, the yarn **6** is led totally by twice the angle α and twice the angle β around the pins **9, 10, 11, 12.** The mutual arrangement of the pin is chosen so that the angle α is 40° and the angle β 85° so that the total angle will be 250°. If the arc of 250° is used in Eythelwein's equation, the result is:

$$S_2 / S_1 = 2.718^{0.2 \cdot 4.36} \approx 2.4$$

Advantageous results have been achieved using a total angle up to 300°.

As has already been mentioned, and as shown in FIG. **6**, the head may be provided in the central part of the tube. Then too, in an additional embodiment, where the head is provided in the central part of the tube, the ends of the tube may extend into the head to serve, along with a transverse pin, as yarn deviation elements, as shown in FIG. **7**.

From the foregoing description, it will be seen that I have contributed a novel twist tube, for use in connection with false-twist devices, according to which I am able materially to reduce the ratio of tensions of yarn as drawn from the tube and of yarn as fed to the tube, thus in turn to reduce yarn breakage.

I believe that the construction and operation of my novel twist tube will be understood, and that its advantages will be fully appreciated by those persons skilled in the art.

I claim:

1. A twist tube for use in a flase-twist device for texturing textile yarns, characterized in that the tube is provided with an enlarged head arranged at one end of the tube and at least three yarn deviating elements are positioned transversely of the head and are spaced from one another along the direction of the longitudinal axis of the tube, two such elements presenting respective surfaces for engagement by a yarn end advancing along the longitudinal axis of the tube and at least one such element being disposed laterally of such axis.

2. A twist tube according to claim **1**, characterized in that a portion of said tube is reduced dimensionally to compensate for weight unbalance due to the positions of the deviation elements.

3. A twist tube for use in a false-twist device for texturing textile yarns, characterized in that the tube is provided with an enlarged head in the central portion of the twist tube and at least three yarn deviation elements are positioned transversely of the head and are spaced from one another in the direction of the longitudinal axis of the tube at least one yarn deviating element being disposed laterally of such axis.

4. A twist tube for use in a false-twist device for texturing textile yarns, characterized in that the tube is provided with an enlarged head between its ends and that the two ends of the twist tube extending into the enlarged head and at least one pin extending across the head transversely with respect to the longitudinal axis of the twist tube serve as yarn deviation elements.

5. A twist tube for use in a false-twist device for texturing textile yarns, characterized in that four yarn deviating elements are positioned transversely of the bore of the tube and are spaced from one another along the direction of the longitudinal axis of the tube, two such elements presenting respective surfaces for engagement by a yarn end advancing along the longitudinal axis of the tube, and two such elements being disposed laterally of such axis.

6. Twist tube according to claim **5**, characterized in that the pins are arranged symmetrically with respect to the longitudinal axis of the twist tube.

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