

Jan. 20, 1953

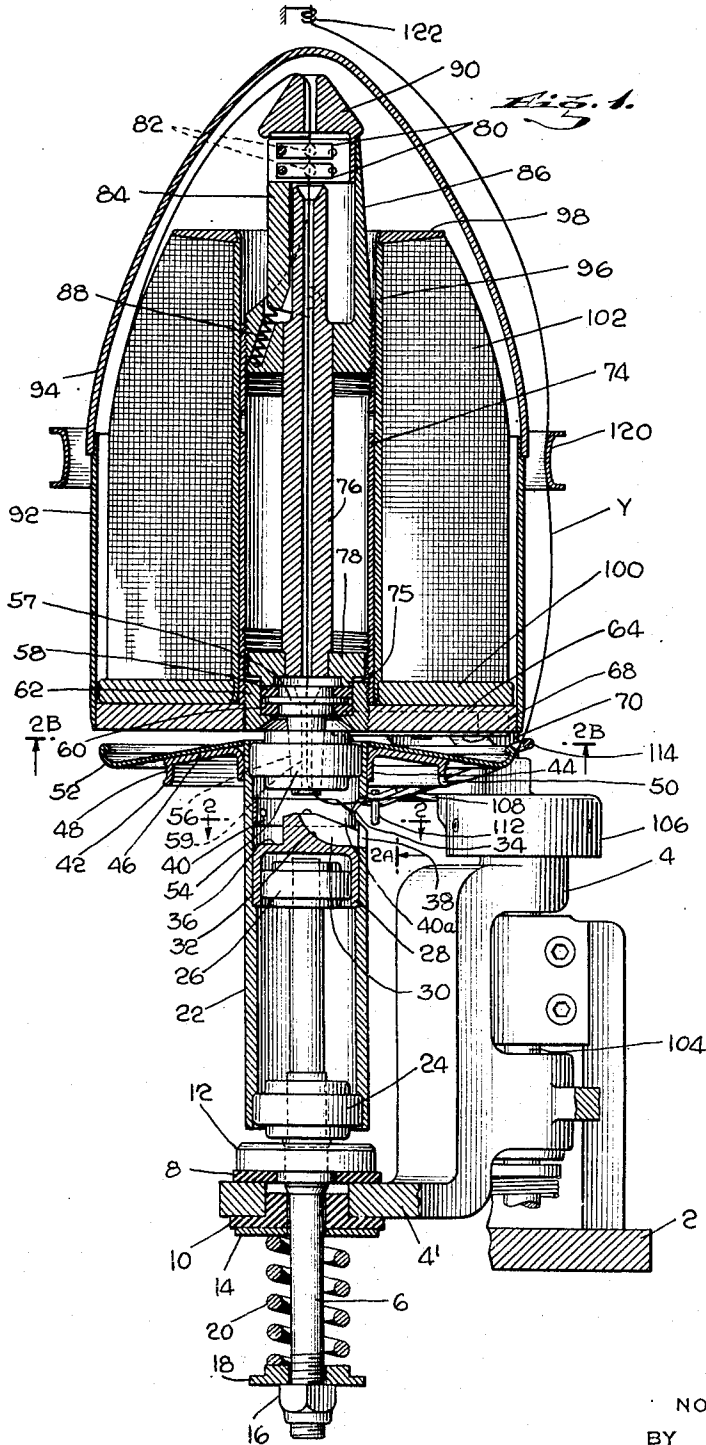
N. E. KLEIN

2,625,786

TWISTING DEVICE FOR TEXTILE STRANDS

Filed Aug. 12, 1950

4 Sheets-Sheet 1



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Jan. 20, 1953

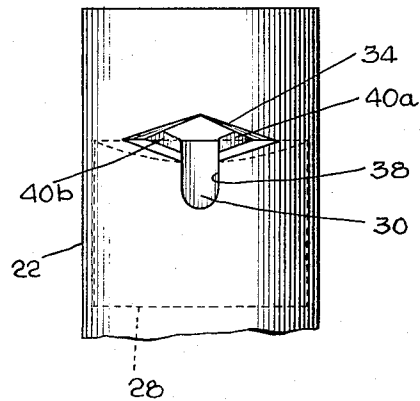
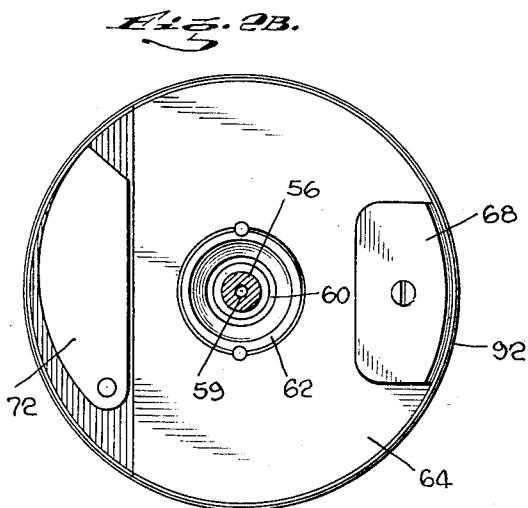
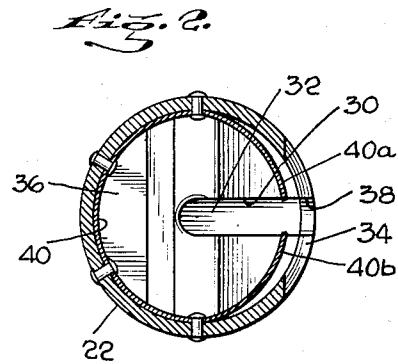
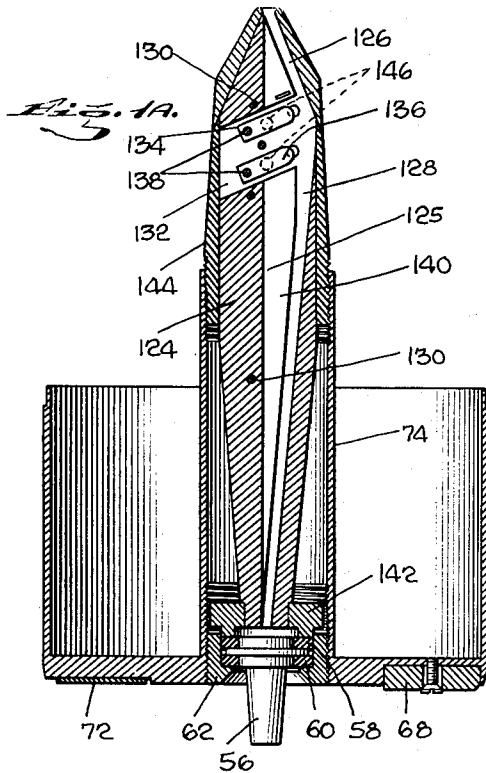
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4 Sheets-Sheet 2



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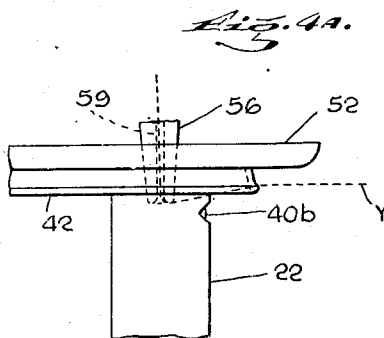
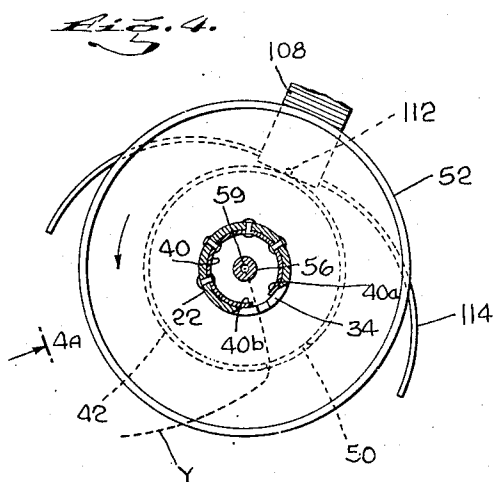
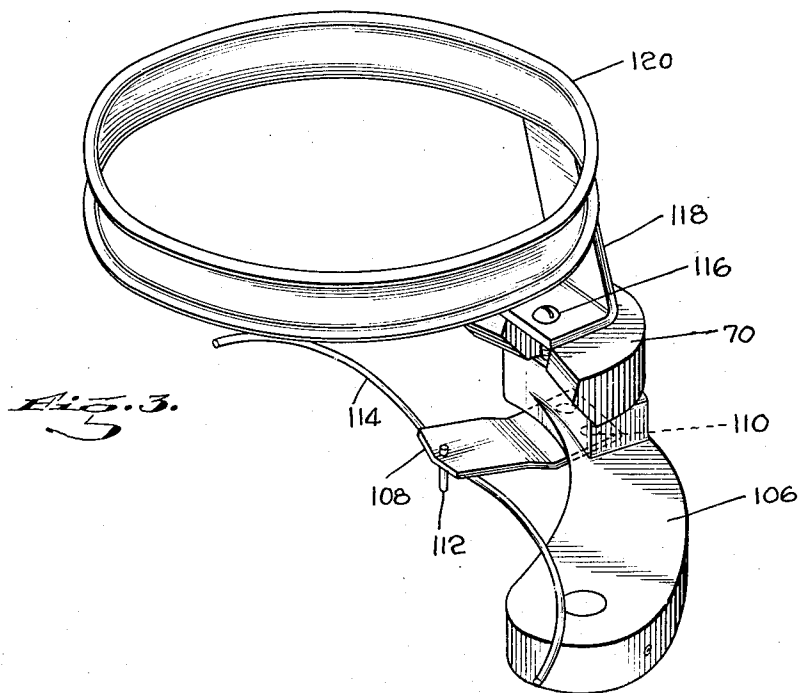
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Filed Aug. 12, 1950

4 Sheets-Sheet 3



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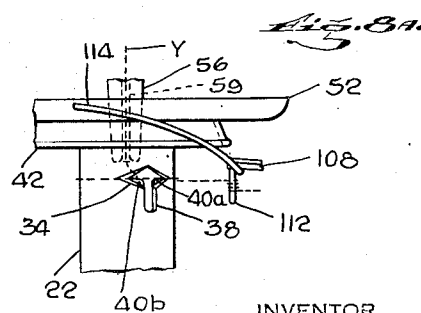
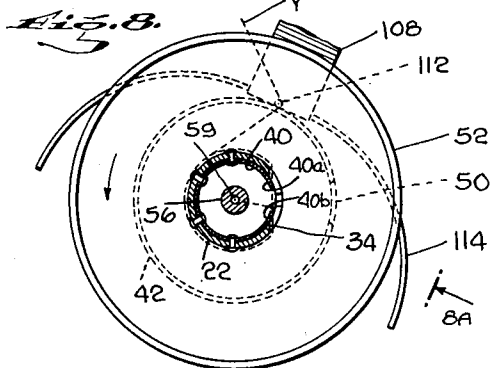
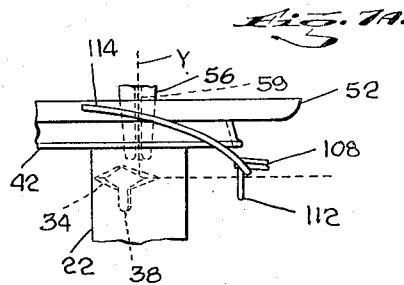
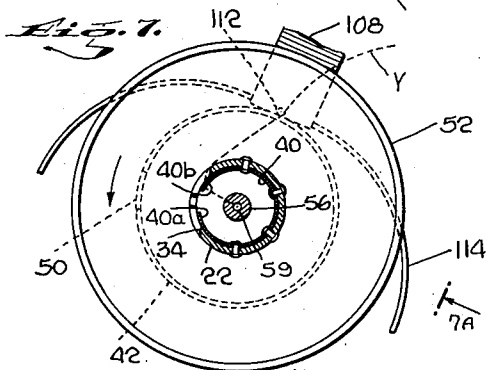
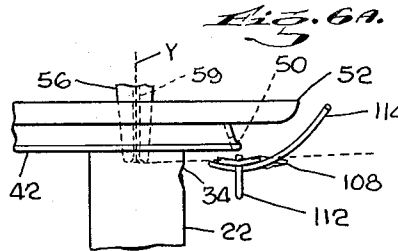
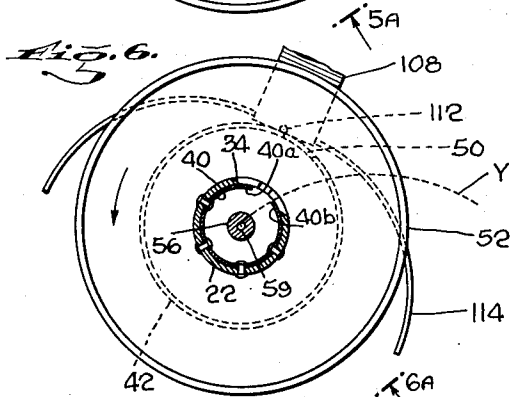
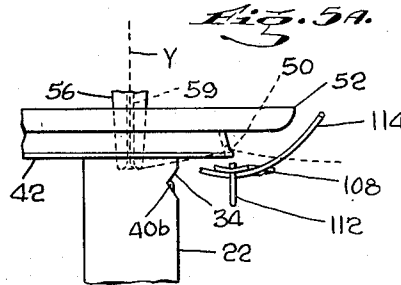
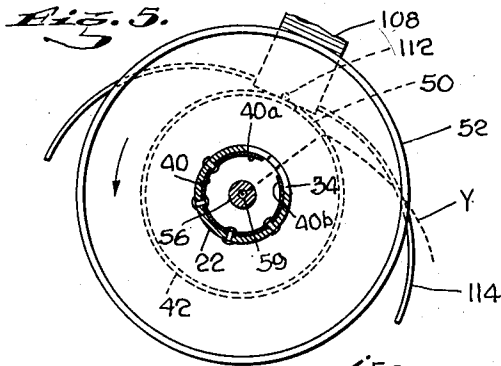
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,625,786

TWISTING DEVICE FOR TEXTILE STRANDS

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Application August 12, 1950, Serial No. 179,069

29 Claims. (Cl. 57—58)

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The present invention relates to twisting machines for filamentary material and more particularly to machines of the type adapted to impart two twists to the material for each revolution of a spindle and comprises an improved twister of this general type which operates efficiently at high spindle speeds and accommodates relatively large supply packages while requiring no greater floor space than twisters which impart but one twist to the yarn for each rotation of the spindle.

While the general principles of operation of two-for-one twisters have long been known and descriptions of such twisters abound in the literature and in the patent art, it is a fact that the only devices of this character, until applicant's invention, which have been found sufficiently practical to be adopted by the industry are those which operate at relatively low spindle speeds and which are only suitable for twisting yarns of high denier such as tire cord. The reasons why the prior art devices have not been practicable are not hard to find. A two-for-one twister, as compared to a conventional one-for-one twister, will twist a given length of yarn in half the time, assuming both spindles operate at the same rate. However, if the two-for-one spindle requires twice the floor space of the one-for-one spindle, no advantage is gained by the two-for-one operation and as the expense of constructing the two-for-one spindle is ordinarily greater than that for the one-for-one, there is a disadvantage rather than an advantage in changing to two-for-one operation. If the two-for-one spindles cannot operate at the high spindle speeds of the one-for-one twisters, and that has been true in the case of the prior art two-for-one twisters, the theoretical advantage of the two-for-one twister is further reduced. Another important factor to be considered in comparing the two types of operation is "down time," that is the time during which the twister is not operating, either because of an "end down" or because the twister is being doffed. The prior art two-for-one twisters using the same gage or floor space could not accommodate as large a supply package as one-for-one twisters and hence doffing time was greater and, because of the more complicated operation of the two-for-one twisters, ends down were more frequent and more time was required for rethreading after breakage of the yarn. It will be apparent from the foregoing brief comparison of two-for-one and one-for-one operations why the textile industry has not, prior to applicant's invention,

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found an acceptable two-for-one twister of general application.

The first two-for-one twister, so far as applicant is aware, that has been found in mill operation to be so constructed as to effectuate the savings theoretically expected in two-for-one operation is that disclosed and claimed in applicant's copending application Serial No. 133,047 filed December 15, 1949, to which reference may be had. The twister of that application is so dimensioned that its gage is no greater than that of conventional one-for-one twisters and, in fact, was proportioned for substitution for the one-for-one spindles in a well known twister frame, the Atwood Model M-100 of the Universal Winding Company of Providence, Rhode Island. The two-for-one twister of the prior application accommodates a supply package as large as, if not larger than, that of the conventional one-for-one twisters and operates at speeds substantially higher than those of the one-for-one twisters. Also, because of the various constructional features thereof influencing the yarn flow path, the twister operates with a minimum of ends down and rethreading although necessarily somewhat more time consuming than in one-for-one operation, is nevertheless simpler than in prior art two-for-one twisters.

In the operation at high spindle speeds of the twister of the above mentioned application, or in fact of any twister of the type wherein yarn is emitted from a passage in a rapidly rotating spindle, when yarn breaks, the end or tail extending from the spindle whips against adjacent parts of the mechanism and the yarn, when the spindle rotation is not stopped, continues to be fed through the spindle opening by centrifugal force developed at such high spindle speeds. This whipping of the tail and continued feeding of yarn causes lint to be blown about and short lengths of yarn to be broken from the tail. These short lengths are blown over into adjacent units of the frame, catch on the balloons thereof and cause yarn breaks in such units. This problem is serious only at high spindle speeds and only when no means are provided on the twisting frame for stopping rotation of the spindle when an end is down. Automatic stop means for each spindle are inadvisable because of the added cost thereof while stoppage of the entire frame is uneconomical as will be readily appreciated.

The present invention provides a solution for this problem of yarn feed-through and thus insures efficient operation of the new two-for-one twister at high spindle speeds. Briefly the solution of the problem is obtained by providing

means engageable by the tail extending from the spindle after yarn breakage that will so guide the tail as to shorten the distance which the tail extends radially from the axis of the spindle, thus reducing the centrifugal force causing feed-through and further in providing in the spindle gripping means adapted to engage the yarn end only when breakage has occurred and the path of the end has been deflected by the first mentioned means. Associated with the path deflecting means is a fixed pin or post disposed substantially parallel to the spindle axis against which the free end of the tail whips and about which the tail wraps itself.

In addition to the improvement of the two-for-one twister of the said co-pending application involved in the above briefly described construction for avoiding the difficulties engendered by yarn feed-through after breakage, the twister of the present application incorporates a number of novel features representing specific advances in yarn tension control, in capacity, in stability and in facility of operation over that of the prior application, some of which are briefly indicated below and others of which will become apparent as the description proceeds.

The changes in construction and operation of the twister of the prior application incidental to the solution of the yarn feed-through problem results in a reduction in the tension gradient in the yarn and this reduction, particularly when the twister is operating to impart a very high twist to yarn, results in the production of a yarn of unexpectedly better quality.

As compared with the twister of said prior application, the twister of the present invention, although of no greater gage, is constructed to accommodate a larger yarn supply package, thus increasing the time between doffing.

In the twister of the prior application the pretension device within the spindle was mounted to be normally movable out of the path of the yarn during the rethreading operation. In one embodiment of the present invention, the spindle is constructed to provide a by-pass of the pretension device for accommodation of the threading "snake" during threading up, thus avoiding the necessity for pivotal mounting of the pretension device.

In the prior application a balloon confining ring is disclosed and the important function thereof in control of yarn tension is described. The balloon confining ring of the twister of the present invention is of a configuration found to result in substantially improved operation of the twister, particularly when nylon or other thermoplastic yarn is being twisted.

For a better understanding of the invention and of the novel features thereof reference may be had to the accompanying drawings of which:

Fig. 1 is a vertical sectional view partly in elevation of a two-for-one twister representing the presently preferred embodiment of the invention; Fig. 1A is a fragmentary vertical sectional view of a twister illustrating an alternative construction of a part of the twister of Fig. 1; Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1; Fig. 2A is a fragmentary side view showing the spindle orifice; Fig. 2B is a horizontal section taken on the line 2B—2B of Fig. 1; Fig. 3 is an isometric view of the balloon confining ring, yarn tail deflecting means and post about which the end wraps after breakage, the parts being shown detached from the remainder of the twister for clarity; Figs. 4

and 4A are diagrammatic horizontal sectional and side views, respectively, of the spindle in the neighborhood of the orifice through which the yarn is emitted and of the tail deflecting means showing a yarn tail after breakage, Fig. 4A being a view looking in the direction of the arrow 4A of Fig. 4; Figs. 5 and 5A are views similar to Figs. 4 and 4A, respectively, but showing the yarn tail path after a partial rotation of the spindle; Figs. 6 and 6A are views similar to Figs. 5 and 5A, respectively, but representing a subsequent position of the yarn tail; Figs. 7 and 7A are views similar to Figs. 6 and 6A, respectively, but showing the tail engaging the post; and Figs. 8 and 8A are views similar to Figs. 7 and 7A, respectively, but showing the tail held at the spindle and wrapped about the post.

In Figure 1 the spindle rail of a twister frame is indicated at 2 and a conventional swing gate at 4. A spindle support post 6 is shock mounted on the ledge 4' of the gate by means of washers 8 and 10 of synthetic rubber or the like, washer 8 being disposed between a flange 12 fixed to the post 6 and the upper surface of the ledge 4' and washer 10 being disposed between a thrust washer 14 and the lower surface of the ledge. The lower end of post 6 is threaded to receive a nut 16 the upper end of which supports a thrust washer 18. A strong spiral compression spring 20 surrounds the part of the post beneath the ledge and bears against the upper and lower thrust washers 14 and 18. This arrangement provides a vibration free but at the same time sufficiently firmly mounted axle to support vertically the twister mechanism now to be described.

The spindle comprises a whirl or sleeve 22 mounted by means of lower and upper ball bearings 24 and 26, respectively, on the post 6, the skirt of a cylindrical plug 28 being interposed between the upper bearing 26 and the sleeve 22. The plug 28, which is press fit into the sleeve 22, has an end wall which is of generally conical shape. A radial yarn threading guide slot 30 having a smoothly curved lower surface 32 is formed in the end wall of the plug and the sleeve 22 adjacent the extremity of the slot 30 is provided with an orifice 34 for emergence of yarn therefrom. A portion of the conical end of the plug 28 is cut away, as indicated at 36 to insure dynamic stability by compensating for the weight removed in forming the orifice 34 and slot 30.

Orifice 34 is V-shaped on each side (see Fig. 2A) and has a medial depending portion 38 which is rounded at its lower end and which serves, together with slot 30 in plug 28, to guide the threading "snake" during the threading up operation. The edges of orifice 34, and particularly the upper edges thereof, are smooth for substantially abrasionless passage of yarn thereover.

Within the sleeve 22 above the plug 28 is a split ring 40 of spring sheet steel or the like which is secured to the sleeve by rivets uniformly spaced over an arc of 180 degrees, equal arcs of the ring on either side of the split therein being free to move toward and away from the inner surface of the sleeve. The split in the ring 40 is of an arcuate length less than that between the apices of the V's forming the sides of the orifice 34 and the ring is so oriented that the center of the slit is in radial alignment with the center of the orifice. The upper edge of the ring 40 is cut away at each side of the slit to form generally tapering portions 40A and 40B the ends of which underlie the extremities of the V's of orifice 34. These end portions, after initial circular forming of the

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ring, are bent inwardly into the position indicated in Figure 2. During rotation of the spindle, as by a conventional belt in engagement with the whorl 22, the portions 40A and 40B move outwardly under the influence of centrifugal force into the position shown in Figure 4 and serve upon yarn breakage to grip and hold the yarn end as will be more fully described in connection with Figures 4 through 8A.

Mounted as by soldering and a press fit on the spindle sleeve 22 immediately above the orifice 34 is a yarn storage or "wrap around" device 42 which may be formed from sheet steel as by stamping. The storage device comprises a central cylindrical portion 44, a disc portion 46 the surface of which slopes slightly downward with increase in radius and a smooth annular skirt portion 48. The skirt 48 is cut away as indicated at 50 over an arc the center of which is in the same vertical plane as the center of orifice 34 and the edges of the cut away part are smoothly rounded for passage of yarn thereover. Spot welded to the disc portion 46 of the storage device 42 is a disc flyer 52 of generally saucer shape. The outer edge of the flyer is rounded upward and highly polished.

A bearing 54 having a tapering bore is mounted within the upper end of the sleeve 22 above the orifice 34 and supported within the inner race of this bearing is a creel platform support cone 56 which is made of hard, wear resistant material such as hardened steel drill rod. The upper end of the support cone is cylindrical and is formed with a centrally disposed narrow flange 57.

The cone 56 has an axial passage 59 therethrough, the upper and lower ends of which flare outwardly. The lower end of the cone is disposed slightly above the level of the orifice 34 and below that of the opening 50 in the skirt 48 of the storage device and the walls at the lower end of the passage 59 are smoothly rounded and highly polished in order that there be a minimum of frictional drag on the yarn in its passage to the orifice 34.

A pair of annular washer-like elements 58 and 60 of compressible material such as synthetic rubber are positioned on either side of the flange 57. These members act as low pass filters and are effective in suppressing high frequency vibrations. This in effect divorces the "mass" factor of the supply package and platform from the whorl-flyer array, in turn reducing the recurrent forces (at spindle frequency) to a sufficiently low value to insure stable operation and long life of the twister parts at high spindle speeds.

The assembly of filter members 58 and 60 and flange 57 fit closely within an externally threaded mounting ring 62 which has an inner lip engaging the under surface of the filter member 60.

A package support platform 64 is threaded on the mounting ring 62 and inset in the under surface of the platform is a small permanent magnet 68 (see Fig. 2B) which in conjunction with a magnet 70 mounted on the swing gate 4 as hereinafter more fully described serves to prevent rotation of the package platform with rotation of the spindle. Instead of a magnet 68 a piece of metal of high permeability such as soft iron, could be inset in the platform to serve as an armature for the fixed magnet 70. Also mounted on the under side of the platform in a recess provided therefor is a steel (or iron) safety latch 72 which swings out by centrifugal force and by magnetic force if the platform starts to rotate, engages the fixed magnet 70 or the support there-

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for and stops the rotation of the platform. This safety latch 72 may be and preferably is substantially like that described and claimed in Serial No. 133,047 to which reference may be had for a detailed description thereof.

Threaded on the ring 62 above the platform is a cylindrical sleeve 74 which is internally threaded for a short length adjacent its upper end. A yarn guide tube 76 having a stepped flange 78 fixed to its lower end of a diameter substantially equal to the internal diameter of the sleeve 74 is positioned within the sleeve with the step 75 of the flange bearing upon the upper surface of the filter member 58, the bore of the tube 76 being enlarged at the lower end so that the step 75 spans the upper cylindrical end of the cone support member 56.

In the particular embodiment of the invention illustrated in Fig. 1 the yarn pretensioning means are retractable from the yarn flow path to facilitate rethreading. As the construction and operation of this part of the twister of Fig. 1 departs in no substantial respect from that disclosed and claimed in Serial No. 133,047 no more than a brief description thereof will be given herein. Reference may be had to the said co-pending application for a more complete description.

The pretensioning means comprise two pairs of tension pads 80 each of which is spring biased into engagement and the bias of which may be adjusted by means of screws 82. The pads normally extend across the yarn path above the guide tube 76 and are carried by an arm 84 pivotally mounted on a pedestal 86 threadably mounted in the sleeve 74, the guide tube 76 extending through a central opening in the pedestal and fitting closely therein. A spring 88 biases the arm 84 into engagement with the upper end of the guide tube 76.

The pedestal 86 carries at its upper end a conical yarn guide cap 90 having a vertical central passage therethrough in alignment with the bore of the guide tube 76.

A protective cylindrical shield 92 of thin metal or plastic which is soldered or otherwise secured along its lower edge to the periphery of the platform 64, is cut away slightly adjacent its upper end to provide a shoulder for seating of a transparent dome 94 of plastic or other suitable material.

In Fig. 1 a supply bobbin having a barrel 96 and upper and lower flanges 98 and 100, respectively, is shown in position on the platform 64 and confined within the sleeve 92 and dome 94, the upper flange 98 of the bobbin being at a level slightly below that of the tension pads 80. This length of bobbin permits adjustment of the tension screws without removal of the bobbin and insures adequate space for retraction of the tension pad supporting arm 84. The upper flange 98 of the bobbin is of lesser diameter than the lower flange to conform with the tapering shape of the dome 94 and to facilitate over end unwinding of the yarn therefrom and the bobbin is preferably so wound as to yield a package 102 that is cylindrical for a major part of its length and gradually tapering to the diameter of the upper flange for the remainder of its length. The proportions and construction of the bobbin shown herein, the method of winding of a package thereon and the package itself are not claimed herein as they form the subject matter of co-pending applications of applicant to which reference may be had, the bobbin being disclosed and claimed in my copending application Serial No. 186,783, filed September 26,

1950, and the package and method of forming the same in Serial No. 131,538, filed September 7, 1949.

Fixedly mounted as by set screws on the pivot post 104 of the swing gate is an arcuate support bracket 106 for the fixed magnet 70, yarn tail deflector and balloon confining ring (see Figure 3). The tail deflector includes a plate 108 one end of which is secured to the under surface of the end of the bracket 106 by means of screws 110 and the other end of which extends radially toward the axis of the spindle at a level slightly below that of the storage device, the end of the plate being at substantially the same radial distance from the axis of the spindle as the skirt of the storage device. A pin or post 112 is soldered in an aperture in the inner end of the plate and extends vertically downward therefrom. The tail deflector comprises a wire or rod 114 which is soldered at its mid section to the pin 112 and plate 108. The free parts of the wire 114 are curved upwardly and outwardly to form portions of spirals of opposite pitch and terminate substantially at the level of the periphery of the disc flyer and at a radial distance from the axis of the spindle slightly greater than the radius of the flyer.

The functioning of the yarn deflector wire 114, of the post 112 and of the spring 40 within the spindle upon yarn breakage will now be described with reference to Figures 4 through 8A. In Figures 4 and 4A breakage of yarn is assumed to have just occurred. The tail indicated at Y issuing from the orifice 34 has not yet engaged the deflecting wire 114 and consequently still rides in the upper part of orifice 34 and still passes through the opening 50 in the skirt of the storage device. Rotation of the spindle in the direction of the arrow brings the end of the tail Y under the end of the wire 114 as shown in Figures 5 and 5A and as the tail rides the under surface of the wire its path is deflected downwardly until, as shown in Figures 6 and 6A, the tail passes out of the opening 50 and the exit point of the yarn from orifice 34 likewise moves downward toward the apex of the V forming the side wall of the orifice. With further rotation of the spindle the tail engages the post and is pulled between the end portion 40B of spring 40 and the spindle wall adjacent the apex of the V at the side of orifice 34 as shown in Figures 7 and 7A. The yarn end beating against the post lashes and wraps around it, as shown in Figures 8 and 8A and the end at the spindle, being firmly gripped by the spring, will eventually break between the post and spindle.

It will be understood that if the spindle rotates in the opposite direction the yarn tail is engaged by the other end of wire 114 and, at the spindle, is eventually gripped between the part 40A of spring 40 and the spindle wall.

With the reduction in radius of the yarn tail path to one half of the inner diameter of the whorl and consequent reduction of centrifugal force acting in the yarn, feed-through of yarn ceases particularly when the bias of the pretensioning means is set to introduce a relatively high tension into the yarn at entrance to the spindle. It will also be apparent that the portion of the yarn tail between the tensioning means 80 and the spring gripping means 40 following severance of the yarn tail outside the spindle will be subjected to a continuing twisting operation until the yarn breaks. Thus, the breaking of the tail portion of the yarn within the spindle assures that no further feed of yarn from the orifice 34

will take place until the twister is again re-threaded and put into normal operation.

The providing of an initial high tension at the pretensioning device does not require excessively high output tension in the yarn as the construction of the twister within the whorl sleeve in the neighborhood of the outlet orifice is such as to introduce a minimum of tension into the yarn. The lower end of the support cone 56 is rounded and polished as heretofore indicated and the upper edge of the orifice 34 against which the yarn normally bears is likewise smoothed to prevent abrasion. As compared with the twister of Serial No. 133,047 the output tension characteristics are substantially the same in the twister of the present application but the tension gradient is substantially reduced. This reduction in tension gradient has been found beneficial, particularly when high twist is being inserted in the yarn at lower spindle speeds (as required in nylon or other thermoplastic yarn to reduce overheating of the yarn). The twisted yarn is more uniform and of higher strength, this being believed to be due to the fact that in the new twister the yarn in the first twist area experiences tension values more like those in the end twist or balloon area. Specific values of tension characteristic of the new twister are given hereinafter.

The magnet 70 as heretofore indicated is mounted on the bracket 106 above the plate 108 and mounted on the magnet as by a screw 116 which also serves to support the magnet on the bracket is a support arm 118 of nonmagnetic material which extends upwardly and slightly inwardly toward the spindle axis and has brazed or welded to its upper end the balloon confining ring 120. The ring 120 is in the form of a band curved to present toward the dome a slightly convex surface. Such shaped ring insures substantial length of contact of the yarn with the ring without introducing an abrupt turn in the yarn path. The diameter of the ring is only slightly greater than that of the sleeve 92 insuring that the yarn will ride the ring at all times. A fixed pigtail guide 122 forming part of the twister frame is positioned a short distance above the dome 94 on the extended axis of the spindle and the ring 120 is preferably positioned substantially at the level of the maximum free balloon diameter as in the twister of Serial No. 133,047. The ring 120 functions in conjunction with the wrap-around device 42 and pretensioning means to control the balloon shape and the output tension of the yarn as described in said co-pending application, the tension introduced by the ring increasing when the balloon tends to expand due to reduction in angle of wrap-around the device 42 and conversely decreasing with contraction of the balloon due to increase of angle of wrap on the storage device.

In order to demonstrate the factual basis for the statements previously made herein to the effect that applicant's twister is one having the actual advantages over one-for-one twisters that have not heretofore been realized in a practical twister the following table showing output tension of yarn at different spindle speeds for different yarns is presented. These tension values were measured above the output guide. The twister was constructed and proportioned substantially as shown in Figure 1. The bobbin held initially one and one quarter pounds of yarn and the gage of the frame was five and eleven sixteenth inches per spindle position which is the

average gage of the Atwood M-100 one-for-one twist-ers.

Table of tension.—Spindle R. P. M. characteristics

Whorl R. P. M.	Output Tension in Grams		
	75 Denier	100 Denier	150 Denier
10,200.....	7	9	14
13,700.....	13	17	23
15,500.....	19	23	29
17,700.....	22	28	36
18,800.....	24	31	38

The pretension device was set to introduce from one fourth to one half of the output tension, depending upon the type of yarn and the amount of twist being inserted. The adjustment of the pretension device should be such as to keep the angle of wrap on the storage device below a full turn and preferably more than a half turn.

In threading-up the twister of Fig. 1, the dome 94 is lifted off, the end of the yarn from the cake 102 is wrapped around the end of a threading "snake" (a long tightly coiled small diameter spring), arm 84 is retracted to move the tension pads away from the axis and the end of the snake is inserted through the cap guide 90 and pushed down through the bore of guide tube 76, through the passage 59 in the support cone 56 and into the slot 30 of the plug 28. The curved base 32 of the slot 30 deflects the forward end of the snake and guides it out through the lower extension of orifice 34, permitting the operator to grasp the snake and pull it out from the twister. The dome 94 is then replaced and the snake with the yarn end secured thereto is brought up between the ring 120 and the sleeve 92 to complete the threading of the device. After breaking the yarn from the snake, the yarn is passed through the fixed "pigtail" guide 122 and connected to the appropriate take-up device of the twister frame in conventional manner. The above described operation requires but little skill and can be effected with rapidity by mill operatives.

If it is desired to dispense with the necessity for moving the tension pads out of the way of the threading snake, the alternative construction shown in Figure 1A may be employed. In this embodiment of the invention the guide tube 76 is replaced by an upright member 124 having an axial yarn passage 125 and oppositely inclined passages 126 and 128 therein, passages 126 and 128 being of a diameter sufficient to accommodate the threading snake. The member 124 may be formed of two parts firmly secured together as by screws 130 or may be a single casting. When of two parts, as shown in the drawing, one part is cut away as indicated at 132 and the pairs 134 and 136 of tension pads are mounted, as by pins 138, within this cut out portion, the pads being oriented at an angle to the horizontal with their free ends uppermost. Above the cut away portion 132 the sides of the member 124 converge to a point substantially at the axis of the twister and the passage 126 extends from this point to the recess 132 along one edge of the member, being open sided along its length. The passage 128, which is in effect a continuation of passage 126, extends from the side of the recess 132 beneath the terminus of passage 126, to the lower end of the member 124 where it terminates at the axis. One of the parts forming the member 124 is relieved

throughout its length from the passages 126 and 128 to the axial passage 125 to provide a yarn slot 140.

The lower end of member 124 is provided with a stepped flange 142 corresponding to flange 78 of Figure 1 for mounting on the filter 58.

A cover member 144 tapered and centrally apertured to provide a yarn guide passage at its upper end and having an externally threaded cylindrical lower end fits snugly over the upper half of the member 124. The cover member is mounted like pedestal 86 on the upper end of sleeve 74 and is provided with suitable holes, (not shown) for access to the tension adjusting screws 146 of the tension pads.

With the above described construction the passages 126 and 128 provide a by-pass of the tension pads for the threading snake and the slot 140 provides means for guiding the yarn from the by-pass to the axial passage of the spindle upon removal of the snake, the angular disposition of the tension pads insuring that the yarn in moving to the axial passage of the twister will pass between the pads into operating position. Thus in this embodiment of the invention no retraction of the pretensioning means from the yarn path is necessary during the threading operation.

In the particular embodiment of the invention illustrated in Fig. 1A, the package platform, outer tubular shield and inner cylindrical sleeve are of plastic material and form a unitary structure of relatively light weight. It will be understood that this construction could be incorporated in the embodiment of the invention illustrated in Fig. 1.

The invention has now been described with reference to the preferred embodiment thereof and to an alternative construction for a part thereof. Obviously various changes might be made in the illustrated constructions and parts might be omitted or added without departing from the spirit of the invention as defined in the appended claims.

This application is a continuation-in-part of my co-pending application Serial No. 133,047, filed December 15, 1949.

The following is claimed:

1. In a textile machine for twisting yarn the combination with a spindle mounted for rotation about its axis and provided with an orifice for withdrawal of yarn therethrough of yarn tail deflecting means positioned to be engaged, after breakage of yarn, by the tail of the yarn issuing from the spindle orifice, said deflecting means comprising a member having a yarn guiding surface extending from a first location in the neighborhood of the normal path of the yarn to a second location nearer to the axis of the spindle than the first location and means at said second location for trapping the tail to cause wind-up thereof about the spindle with consequent reduction in the centrifugal force tending to cause feed of yarn through the spindle orifice after yarn breakage.

2. The combination according to claim 1 wherein said means at said second location comprises a post disposed substantially parallel to the axis of the spindle and generally in alignment with the spindle orifice.

3. The combination according to claim 1 including yarn gripping means within the spindle operative to grip the yarn in the neighborhood of the orifice when a yarn tail has been trapped by the means at said second location.

4. The combination according to claim 3 wherein said spindle has an inner wall and said yarn gripping means comprises resilient means secured to the inner wall of the spindle at a point circumferentially spaced from the orifice and having a part extending toward the orifice and free to move under centrifugal force into a position to obstruct a part of the orifice along one side thereof, said part serving to hold the yarn against the inner wall of the spindle when the yarn emerges from that side of the orifice in winding up on the spindle.

5. The combination according to claim 4 wherein the spindle orifice is of V-shape along said side and said free part of said resilient means overlies the apex of the V during rotation of the spindle.

6. The combination according to claim 1 wherein said deflecting means has a second yarn guiding surface extending from a third location in the neighborhood of the normal path of the yarn to said second location, said third location being at substantially the same distance from the spindle axis as said first location and said first and third locations being at opposite sides of and substantially equidistant from a plane containing the axis of the spindle and passing through said second location, whereby, irrespective of the direction of rotation of the spindle the tail issuing from the spindle orifice after yarn breakage will be guided to said means at the second location.

7. In a twister of the type wherein yarn drawn from a supply package supported on a rotatable spindle passes axially through a part of the spindle out through an orifice in the side thereof and then balloons about the package in transit to a take-up device, the combination comprising a yarn tail deflector positioned out of the normal path of the yarn and engageable, after yarn breakage, by the tail of yarn issuing from the spindle orifice, said deflector having a yarn guiding and deflecting surface extending from a first location in the neighborhood of the yarn balloon to a second location nearer to the spindle axis and means at said second location for trapping the tail to cause wind-up thereof about the spindle.

8. The combination according to claim 7 including means for tensioning the yarn in its travel to the spindle orifice whereby the twist in a tail between said tensioning means and the spindle orifice, after wind-up of the tail on the spindle, will tend to break the tail within the spindle and stop the feed of yarn through the orifice.

9. The combination according to claim 7 including a member mounted on said spindle adjacent the orifice and having a cylindrical surface coaxial with the spindle for passage of yarn thereover in transit to the balloon, said surface having a yarn guide slot therein through which the yarn passes during normal operation of the twister, the guiding surface of said tail deflector being so positioned relative to said slot as to guide the tail out of the slot and to the trapping means at said second location.

10. The combination according to claim 7 including yarn gripping means within the spindle operative to grip the yarn in the neighborhood of the orifice when a yarn tail has been trapped by the means at said second location.

11. The combination according to claim 10 wherein said spindle has an inner wall and said yarn gripping means comprises resilient means secured to the inner wall of the spindle at a point circumferentially spaced from the orifice and hav-

ing a part extending toward the orifice and free to move under centrifugal force into a position to obstruct a part of the orifice along one side thereof, said part serving to hold the yarn against the inner wall of the spindle when the yarn emerges from that side of the orifice in winding up on the spindle.

12. The combination according to claim 11 wherein the spindle orifice is of V-shape along said side and said free part of said resilient means overlies the apex of the V during rotation of the spindle.

13. A two-for-one twister assembly comprising in combination a rotatable spindle, a flyer fixed to said spindle for rotation therewith, a support carried by said spindle, said spindle having a passage therein for flow of yarn therethrough, stabilizing means for preventing rotation of said support, an elongated member carried by said support and formed with a yarn guide passage communicating with said spindle passage, said member having a recess formed therein, yarn tensioning means in said recess, an annular yarn guide carried by said support in spaced relation to said recess and with the aperture thereof aligned with said yarn guide passage, said elongated member being formed with a pair of threading-up passages by-passing said tensioning means, one extending from said annular guide to said recess and the other from said recess to the spindle passage and with a yarn slot laterally connecting said threading-up passages with the yarn guide slot, whereby the twister may be threaded-up by means of an elongated flexible yarn holding tool of a cross section less than the diameter of the threading-up passages but greater than that of the yarn guide passage in said member, the yarn moving laterally from the threading-up passages to the guide passage and into the tensioning means when tensioned after withdrawal of the flexible tool from the spindle passage.

14. A twister according to claim 13 wherein said tensioning means comprises at least one pair of pads adapted to engage the yarn therebetween and resilient means urging said pads into engagement with the yarn.

15. The twister according to claim 14 including means accessible externally of said elongated member for adjusting said resilient means to adjust the tension introduced into the yarn by said tensioning means.

16. The twister according to claim 13 including a fixed yarn guide spaced from said annular guide and a housing mounted on said support enclosing the parts carried thereby and defining an inner limit for the yarn balloon formed between said flyer and fixed guide during rotation of the spindle.

17. The twister according to claim 16 including deflecting means engageable, upon breakage of yarn, by the yarn tail issuing from the spindle, said deflecting means having a yarn guiding and deflecting surface extending from a first location in the neighborhood of the flyer to a said location nearer to the spindle axis and means at said second location for trapping the tail to cause wind-up thereof about the spindle.

18. The twister according to claim 17 wherein said flyer is a disc flyer and has associated therewith a wrap-around device of lesser diameter, said wrap-around device having a yarn guide slot therein through which the yarn passes during normal operation of the twister, the guiding surface of said tail deflecting means being so posi-

tioned relative to said yarn guide slot as to guide the tail out of the slot and to the trapping means at said second location.

19. In a textile machine for twisting yarn, the combination comprising a frame, a vertical post adapted to be mounted on the frame, bearings mounted on said post in spaced relation, a tubular whorl mounted on said bearings and provided with an orifice above said bearings for withdrawal of yarn therefrom, a bearing comprising inner and outer bearing members mounted within said whorl above said orifice with the outer bearing member fixed to said whorl, a member having an axial yarn passage therethrough carried in said inner bearing member, a yarn supply support, means for mounting said support on said member above the inner bearing member, said last mentioned means including flexible elements permitting limited angular movement of the support about axes perpendicular to the axis of the yarn passage and serving to suppress high frequency vibrations of the support, a flyer mounted on said whorl in the neighborhood of the orifice and stabilizing means preventing rotation of said support by said whorl.

20. The combination according to claim 19 wherein each side edge of said spindle orifice is V-shaped, a split ring of spring material mounted within the whorl at the level of the orifice, the parts of the ring at the sides of the split being free to move under the influence of centrifugal force into position to obstruct the V-shaped sides of the orifice and means operative upon breakage of yarn to guide the tail of the yarn issuing from the orifice toward a side of the orifice to be gripped between a part of the split ring and the inner surface of the whorl.

21. The combination according to claim 20 including means carried by said support for introducing tension into yarn before entrance into the yarn passage of said member whereby after breakage of yarn and gripping of the tail adjacent a side of the orifice, the tail will break between said tensioning means and the orifice.

22. In a twister of the type wherein yarn drawn from a supply package supported on a rotatable spindle passes axially through a part of the spindle out through an orifice in the side thereof and then balloons about the package in transit to a take-up device, the combination comprising means for directing a yarn tail after yarn breakage from the normal path of yarn in the neighborhood of the yarn balloon to a new path, and means in alignment with said new path for trapping a portion of the free end of said yarn tail to arrest the motion thereof.

23. The combination, according to claim 22, including means carried by said spindle responsive to the trapping of a portion of said tail for gripping the tail and causing it to be broken.

24. In a twister of the type wherein yarn drawn from a supply package supported on a rotatable spindle passes axially through a part of the spindle out through an orifice in the side thereof and then balloons about the package in transit to a take-up device, the combination comprising a yarn tail deflector positioned out of the normal path of the yarn and engageable, after yarn breakage, by the tail of yarn issuing from the spindle orifice, said deflector having a yarn guiding and deflecting surface extending from a first location in the neighborhood of the yarn balloon to a second location nearer to the spindle axis, means at said second location for trapping the tail to cause wind-up thereof about the spin-

dle, yarn gripping means within the spindle operative to grip the yarn in the neighborhood of the orifice when a yarn tail has been trapped by the means at said second location, and means for tensioning yarn in its travel to the spindle passage whereby the twist developed in a tail between said tensioning means and said gripping means will tend to break the tail within the spindle and stop the feed of yarn through the orifice.

25. A two-for-one twister assembly comprising in combination a rotatable spindle, a flyer fixed to said spindle for rotation therewith, a support carried by said spindle, said spindle having a passage therein for flow of yarn therethrough, stabilizing means for preventing rotation of said support, an elongated member carried by said support and formed with a yarn guide passage communicating with said spindle passage, said member having a recess formed therein, yarn tensioning means in said recess, an annular yarn guide carried by said support in spaced relation to said recess and with the aperture thereof aligned with said yarn guide passage, said elongated member being formed with a pair of threading-up passages by-passing said tensioning means, one extending from said annular guide to said recess and the other from said recess to the spindle passage and with a yarn slot laterally connecting said threading-up passages with the yarn guide slot, whereby the twister may be threaded-up by means of an elongated flexible yarn holding tool of a cross section less than the diameter of the threading-up passages but greater than that of the yarn guide passage in said member, the yarn moving laterally from the threading-up passages to the guide passage and into the tensioning means when tensioned after withdrawal of the flexible tool from the spindle passage, a fixed yarn guide spaced from said annular guide and a housing mounted on said support enclosing the parts carried thereby and defining an inner limit for the yarn balloon formed between said flyer and fixed guide during rotation of the spindle, deflecting means engageable, upon breakage of yarn, by the yarn tail issuing from the spindle, said deflecting means having a yarn guiding and deflecting surface extending from a first location in the neighborhood of the flyer to a said location nearer to the spindle axis and means at said second location for trapping the tail to cause wind-up thereof about the spindle, and yarn gripping means provided within the spindle passage operative to grip the yarn when a tail has been trapped by the means at said second location.

26. A two-for-one twister assembly comprising in combination a rotatable spindle, a flyer fixed to said spindle for rotation therewith, a support carried by said spindle, said spindle having a passage therein for flow of yarn therethrough, stabilizing means for preventing rotation of said support, an elongated member carried by said support and formed with a yarn guide passage communicating with said spindle passage, said member having a recess formed therein, yarn tensioning means in said recess, an annular yarn guide carried by said support in spaced relation to said recess and with the aperture thereof aligned with said yarn guide passage, said elongated member being formed with a pair of threading-up passages by-passing said tensioning means, one extending from said annular guide to said recess and the other from said recess to the spindle passage and with a

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yarn slot laterally connecting said threading-up passages with the yarn guide slot, whereby the twister may be threaded-up by means of an elongated flexible yarn holding tool of a cross section less than the diameter of the threading-up passages but greater than that of the yarn guide passage in said member, the yarn moving laterally from the threading-up passages to the guide passage and into the tensioning means when tensioned after withdrawal of the flexible tool from the spindle passage, a fixed yarn guide spaced from said annular guide, a housing mounted on said support enclosing the parts carried thereby and defining an inner limit for the yarn balloon formed between said flyer and fixed guide during rotation of the spindle, and a balloon confining member spaced from and surrounding said housing, said balloon confining member having an inner smooth surface over which the yarn travels in transit to said fixed guide.

27. In a twister of the type wherein yarn drawn from a supply package supported on a rotatable spindle passes axially through a part of the spindle out through an orifice in the side thereof and then balloons about the package in transit to a take-up device, the combination comprising

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means carried by the spindle responsive to yarn breakage externally of the spindle for gripping the yarn tail adjacent said orifice, and means for tensioning the yarn in its travel to the spindle orifice whereby the twist in a yarn tail between said tensioning means and said gripping means will tend to break the tail within the spindle and stop the feed of yarn through the orifice.

28. The yarn twister of claim 27 wherein the yarn tail gripping means includes a movable member normally held in non-gripping position when said spindle is at rest and free to move under the influence of centrifugal force into a gripping position.

29. The yarn twister of claim 28 wherein the yarn tail gripping means comprises a split ring of spring material mounted within the spindle at the level of said orifice, the portions of the ring on each side of the split projecting partially across said orifice and being free to be moved by centrifugal force into clamping engagement with a limited area adjacent at least two sides of said orifice.

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No references cited.