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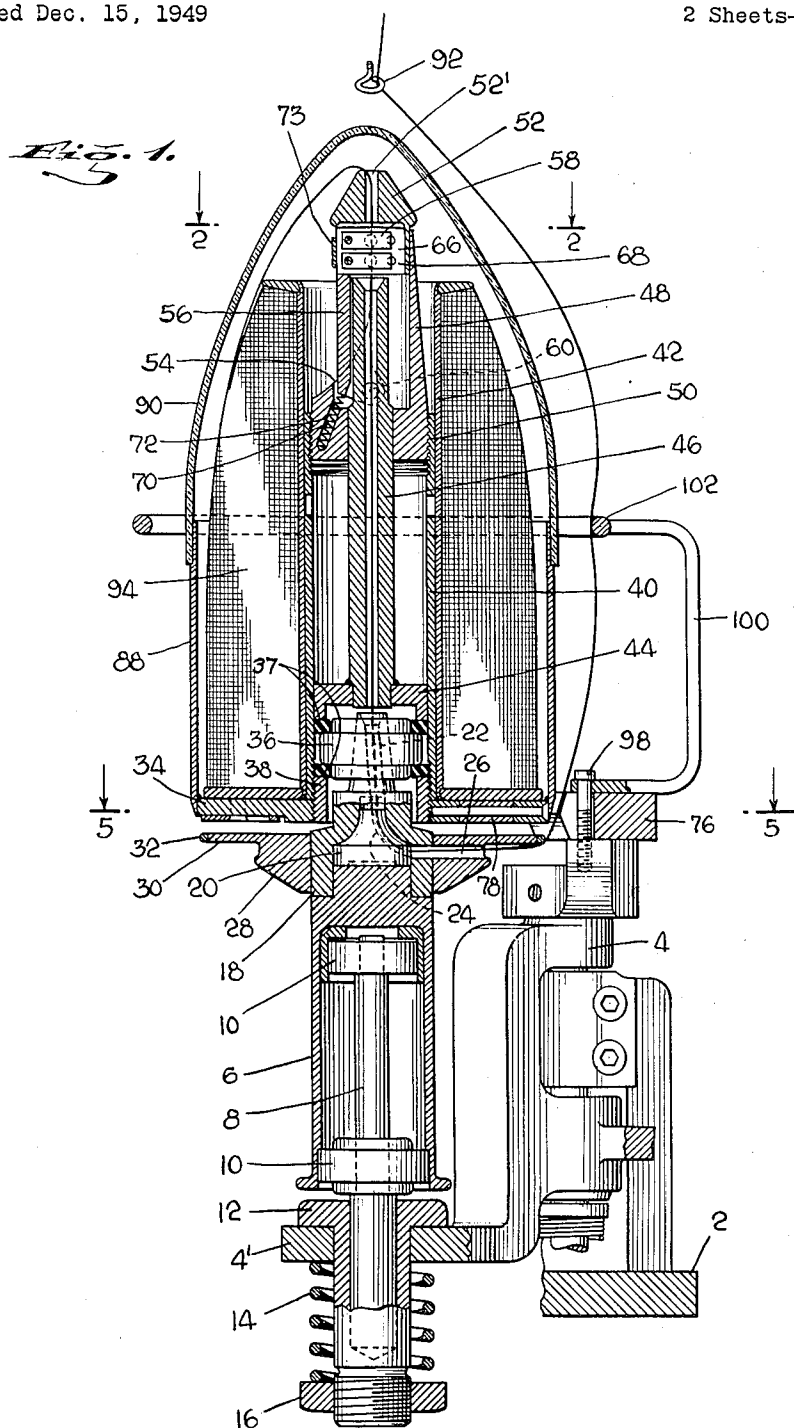
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2,731,786

TWISTER

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2.

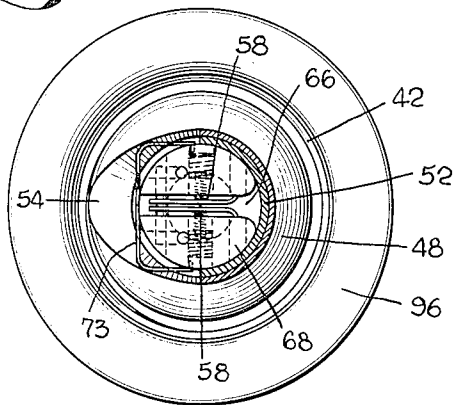


Fig. 4.

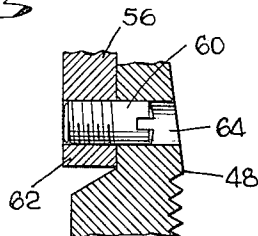


Fig. 3.

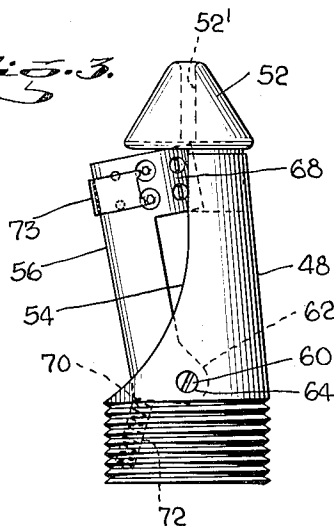
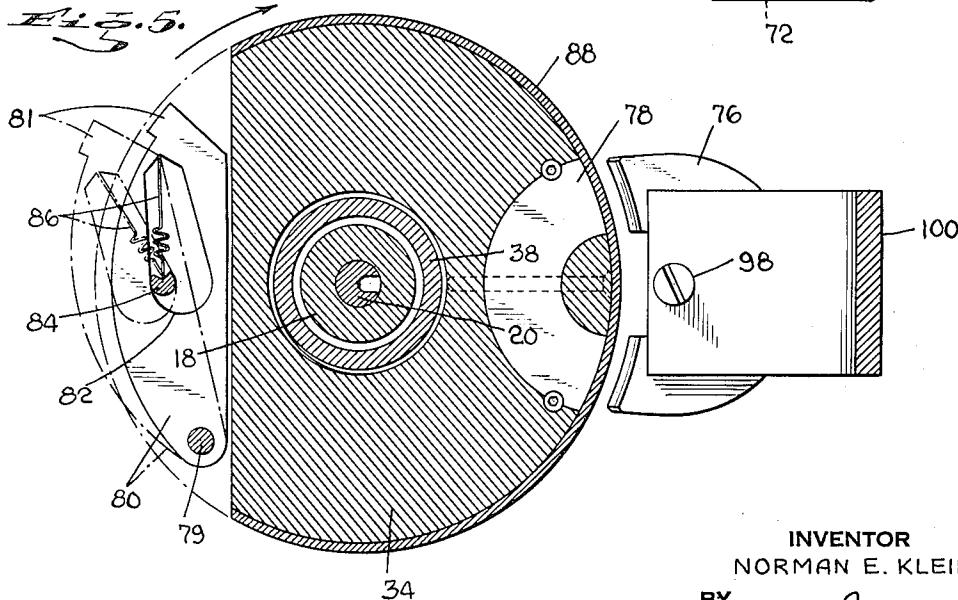


Fig. 5.



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2,731,786

TWISTER

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13 Claims. (Cl. 57—58.83)

The present invention relates to twisting devices for use in the textile industry and more particularly to devices which impart two twists for each revolution of a spindle and comprises a novel device of this character which is compact in form, may be operated at relatively high speeds to give a large production rate and which is convenient to use and economical of construction.

A feature of the invention is the improved construction permitting rapid and simple rethreading of the device.

Another feature of the invention is the compact size thereof permitting it to be employed without increase in gage in standard commercial upright twisting frames, thereby increasing the rate of yarn production of such frames by at least 100 percent.

Another feature of the invention is the provision of a ring which is strategically located in the neighborhood of maximum balloon diameter for insuring against interference between neighboring units and which, in conjunction with a yarn storage device on the spindle, effects control of the tension in the yarn and stabilizes the yarn balloon.

A still further feature of the invention is a simple and positive operating automatic brake effective to stop the rotation of the yarn supply platform in the event of inadvertent rotation thereof.

Other features of the invention and details of construction of the preferred embodiment thereof will become apparent as the description proceeds.

Briefly the new two-for-one twister comprises a yarn supply support platform carried by a rotating spindle and magnetically prevented from rotating thereon, a yarn tension device supported above the core of the yarn supply package and constructed to be yieldingly movable to one side of the yarn path during threading of the yarn through the core of the package, and a yarn storage device and disk flyer fixed to the spindle beneath the yarn supply package platform.

For a better understanding of the invention 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 embodying the invention;

Fig. 2 is an enlarged horizontal sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a detail on an enlarged scale of the tension head assembly, parts being omitted for clarity;

Fig. 4 is a fragmentary sectional view showing the mounting of the movable tension plate holder; and

Fig. 5 is an enlarged horizontal sectional view taken generally on the line 5—5 of Fig. 1.

In Fig. 1 a portion of the spindle rail of a twister frame is indicated at 2 and a conventional swing gate for the spindle is indicated at 4. The twister spindle comprises a whorl 6 and a fixed rod 8 upon which the whorl is rotatably supported by means of ball bearings 10. The lower end of the rod 8 of the spindle is supported in a conventional bolster 12 mounted on the horizontal ledge 4' of the gate 4. A compression spring 14 encircling the bolster and positioned between the ledge 4' and a nut 16

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threaded to the lower end of the bolster, serves to hold the flanged upper end of the bolster flush against the surface of the ledge 4'. Press fit onto shoulders formed in the upper end of the whorl 6 is a spindle extension 18 which is cut away at its lower central part for reception of a tapered threading guide plug 20, the central portion of the extension, above the plug 20, being provided with an angularly disposed thread passage 22 and the plug 20 being channeled along its tapered edge to provide a yarn passage 24 communicating at its upper end with the passage 22 and at its lower end with a generally radial passage 26 in a yarn storage member 28 fixed to the spindle extension. The yarn storage member 28 comprises an annular element of a diameter less than that of the disk flyer 30 and having a peripheral groove formed therein, the disk flyer 30 and storage device, in the illustrated embodiment of the invention being constructed as an integral unit. The flyer 30 has a hardened ring 32 around its periphery which may be of steel plated with chromium or other wear-resistant material.

The yarn supply package platform 34 is annular in shape and is screw threadedly mounted on an externally threaded short tube 38 upon the upper end of which is threaded a sleeve 40. This assembly is rotatably supported on the upper spindle extension 18 by means of a bearing 36 and a pair of shock resisting rubber rings 37 which latter are interposed between the sleeve 40 and the outer race of the bearing to provide in effect a filter for attenuating high frequency vibrations at high spindle rate of rotation. Centrally disposed within the sleeve 40 and secured to an annular member 44, which rests on the upper ring 37, is a tubular yarn guide 46, the upper end of which terminates substantially at the level of the upper flange of the bobbin 42. The tubular guide 46 is of reduced cross-section near its upper end and press fit onto the guide just below the part of reduced diameter is a pedestal 48 which is threaded at 50 to the sleeve 40. The threads at 50 or the threads on the upper end of short tube 38 provide means for varying the distance between the opposed faces of annular member 44 and the annular abutment created by the upper end of the member 38. It will be seen, therefore, that by adjusting the distance between member 38 and annular member 44, the rubber rings 37 can be forced or clamped against the outer bearing member 36 and since both the members 44 and 38 are carried by the support platform 34, this results in the platform being resiliently supported.

The pedestal 48 carries at its upper end a guide cap 52 which has an axial yarn passage 52' therethrough, the entrance to the passage being smoothly rounded to minimize friction between the cap and the yarn. As shown best in Fig. 1 the pedestal is formed of tubular stock the outer wall of which is turned down above the threaded portion to provide a gradual taper and the bore of which is reamed out throughout the tapered portion to a diameter greater than that of the reduced upper end of the guide tube 46, part of the tapered wall portion of the pedestal being cut away along one side to provide an opening 54 within which is disposed a movable arm 56. The arm 56 carries at its upper end two pairs of tension pads 58 and is pivotally mounted on the pedestal 48 by means of short pins 60 which thread into ears 62 integral with the arm and are journaled in diametrically disposed holes 64 in the pedestal wall (see Fig. 4). The pads 58 are preferably of the type employed in shuttle eyes and are spring biased into engagement, screw means being provided for adjustment of the spring pressure as indicated in Figs. 2 and 3. The arm 56 is channeled along its inner side to accommodate the upper end of the guide tube 48. The tension pads 58 are mounted in opposing relation on the walls of a diametral slot 66 in the upper tubular end 68 of the arm 56 which normally overlies

the upper end of the guide tube 46, the arm 56 being biased into engagement with the guide tube by means of a small compression spring 70 carried in an angularly disposed slot 72 in the base of the pedestal 48 and engaging the arm 56. Preferably a clip 73 is mounted on the upper end of the arm 56 for ease of manipulation when the arm is to be retracted into the position shown in Fig. 3, in which position the tension pads 58 are out of the yarn path and the device may be threaded up by means of a conventional "snake." Upon removal of the snake and release of the arm 56, the spring 70 returns the tension pads to normal position, the yarn slipping between the flared ends of the groove 66 and between the curved ends of the pads 58.

The platform 34 is prevented from rotating with the spindle by means of a fixed magnet 76 which is mounted on the swing gate and which is magnetically coupled with an arcuate metal insert 78 of high magnetic permeability as for example, soft iron, which is provided in the underside of the platform 34 with its ends adjacent opposite poles of the magnet 76.

As shown in Fig. 5, a segment is cut away in the under-surface of the platform 34 and mounted within this segmental area on a pin 79 extending into the lower surface of the platform 34 is a generally arcuate lever 80 of steel or the like having a shoulder 81 formed near its free end and having an elongated opening 82 therethrough. One end of the opening 82 is V shaped and mounted in the platform and extending into the opening 82 is a peg 84 cut away in a V shape along one edge. A toggle spring 86 has one end disposed in the V of the opening 82 and its other end disposed in the V of the peg 84. With this arrangement the pivotal movement of the lever 80 is limited by the slot and the spring acts to maintain the lever in either of two positions corresponding to the full and dotted line positions shown in Fig. 5. In the full line position illustrated in the drawing in which the peg 84 engages the outer edge of the opening 82 no part of the lever 80 extends beyond the periphery of the platform and this is the normal operating position of the lever. If, however, the platform should start to rotate with the spindle, the lever 80 as it approaches the magnet 76 will be attracted thereby and will swing out into the position shown in dotted lines in Fig. 5. In this position the part of the lever extending beyond the periphery of the platform will engage the magnet 76 and prevent further rotation of the platform. Should the force of the magnet 76 on the lever be insufficient to attract the lever on the first revolution of the platform, the lever will swing out to braking position under the influence of centrifugal force. When the direction of rotation of the platform is such that the movable end of the lever leads the pivoted end as indicated by the arrow in Fig. 5, the leading end of the lever will engage the magnet when the lever is in braking position. When the direction of rotation is opposite to that indicated by the arrow, the shoulder 81 on the lever will engage the magnet and brake the platform.

The yarn supply package is entirely enclosed within a protective housing comprising a lower cylindrical sheath 88 of thin sheet metal or the like which is welded at its lower end to the platform 34 and an upper plastic bullet shaped enclosure 90 seated on and frictionally held by the sheath 88. It has been determined that the shape of the envelope of a stable yarn balloon is substantially that of a sine wave. Accordingly, as the yarn in its passage from the flyer 30 to and through a guide such as that indicated at 92 forms a balloon about the package and the housing, it is advantageous, for adequate clearance of the plastic cover 90 by the yarn in the section of the balloon above ring 102, that the curve defined by a vertical section of the cover be substantially that of a quarter cycle of a sine wave. The particular shape of the yarn supply package 94 with its roundly tapering upper end shown in Fig. 1 is such as to permit the plastic cover to have the desired configuration while allowing adequate

clearance between the inner wall of the cover and the surface of the package for the flow of yarn from the outer surface of the package to the top of the guide 52.

The yarn supply package 94 shown in Fig. 1 may be built on the vertical redraw frame disclosed and claimed in applicant's co-pending application Ser. No. 131,538, filed December 7, 1949, now Patent Number 2,668,671, issued February 9, 1954, and the bobbin 42 upon which the yarn is wound to form such package may be, and preferably is, that disclosed and claimed in applicant's co-pending application Ser. No. 122,626, filed October 21, 1949, and now abandoned.

Mounted above the magnets 76 on the swing gate 4 as by means of a bolt 98 is a generally U-shaped bracket 100 which supports at its upper end a ring 102. The ring surrounds the lower end of the plastic cover 90 and also the yarn balloon and is made of wear resistant material, smoothly polished to prevent abrasion of the yarn. The ring 102 in conjunction with the storage device 28 has an important function to perform. In the absence of the ring, relatively large excursions of the balloon diameter are required before the wrap around action of the yarn on the storage device responds sufficiently to the available air drag counter-component for necessary tension regulation. The ring 102 provides a positive counter-drag supplementing the air drag and responsive to balloon tendency to expand. This additional drag easily overrides the tangential friction between flyer and yarn and gives the new twister spindle the required balloon shape-tension control. The resultant effect of the addition of the ring at the level of maximum free balloon diameter is to halve the tension at the apex of the balloon for any particular spindle speed or, conversely, to permit a speed increase of over thirty percent without increase in tension. In actual practice, due to the stability of the yarn tension achieved by the combination of ring 102 with the storage device and disk flyer, speeds up to fifty percent above those practicable without the ring have been found to be within the range of efficient operation. A further marked advantage which has been found to result from this combination is that the normally exacting requirements for the pretensioning unit, that is, the tension device which prevents the twist from running back to the supply package, are much relaxed.

In operation of the above described two-for-one twister the whorl 6 is rotated, as by a conventional belt, not shown, while the platform and package carried thereby is maintained stationary by the magnetic attraction between the magnet 76 and metal insert 78. Yarn under the influence of the take-up device (not shown) on the frame is drawn upwardly from the surface of the package, downwardly through the yarn guide 52 and between the tension pads 58, through the tubular yarn guide 46, through the passage 22 in the rapidly rotating spindle extension 18 and the passages in the plug 20 and the storage disk 26, then upwardly over the hardened ring 32 of the disk flyer 30, between the platform 34 and magnet 76 forming a balloon between the package housing and the ring 102 in passage to and through the fixed guide 92. For each turn of the spindle, two twists are inserted in the yarn as will be well understood in the art. To thread up the device, the operator after removing the plastic cover 90, grasps the clip 73 in his fingers and swings the tension plate holder arm 56 about its pivot 60 to the position indicated in Fig. 3 and then inserts an end of the yarn from the package into the passage in the guide cap 52 by means of a threading snake. The snake is pushed down through the tubular guide and into the communicating passages in the spindle extension, plug and storage disk until the end of yarn can be seized by the operator and drawn upwardly within the ring 102 and through the guide 92 to the takeup device. Release of the tension plate holder by the operator permits the spring 70 to return the holder to normal position wherein

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the tension pads engage the yarn and apply the proper degree of pretension thereto.

With a package platform diameter of four inches the above described unit may be substituted for a spindle on a frame that is now in use in mills and known as the Atwood M-100 uptwister. The spindle rate of rotation of that frame is ordinarily about 9,000 R. P. M., each turn of the spindle inserting one twist in the yarn. By replacing each spindle of such frame by the two-for-one twister of the present invention, assuming the same rate of operation of the spindle, the production rate of such frame is doubled as two twists are inserted with each revolution of the spindle. Actually, however, the spindle of the new two-for-one twister operates efficiently at 19,000 R. P. M., a rate more than twice that of the spindle of the M-100 frame, thus more than a four-fold production rate is obtained. As indicative of the operation of the new twister the following table of apex tension measurements at different spindle speeds is given for the case of 100/60/3.5 S twist viscose rayon, the rate of yarn flow, in each case, being such as to insert 55 turns per inch:

Tension (grams):	Spindle speed (R. P. M.)
10	10,000
17.5	13,000
25	14,400
30	16,500
38	19,000

From the above description of one specific embodiment of the invention it will be apparent that the new two-for-one twister is an efficient operating mechanism. The construction whereby the package platform and parts carried thereby are supported on the spindle by means of a single ball bearing through the intermediary of resilient shock absorbing rings permits operation of the spindle at rates of rotation substantially higher than heretofore practicable with twistors of this type, the rings absorbing or damping vibrations at the high spindle speeds and permitting slight angular movement of the support platforms relative to the spindle. The retractible pretensioning means insures ease of threading of the device and the ring 102 in addition to its functioning with the storage device in stabilizing the balloon insures against interference with neighboring units of the frame. Obviously, various changes in the details of the described construction, could be made without departing from the spirit of the invention or the scope of the appended claims. For example, a second magnet coupled with a separate metal insert in the package platform could be provided if desired although the single magnetic coupling disclosed in the drawing has been found in practice to be sufficient for stable operation. Also, although the ring 102 has been shown as supported by a bracket mounted on the magnet, other support means could be provided therefor.

The following is claimed:

1. A two-for-one twister assembly comprising in combination a rotatable spindle, a flyer and yarn storage device fixed to said spindle for rotation therewith, said spindle and storage device being formed for delivery of yarn therethrough, a supply package support carried by said spindle above said flyer, stabilizing means preventing rotation of said support with said spindle, pretensioning means carried by said support, and means surrounding said support and spaced therefrom acting in conjunction with said storage device to provide tension-shape control of the yarn balloon formed during rotation of the spindle when yarn is drawn from a yarn supply package on said support through said pretensioning means, through the spindle and storage device, upwardly from said flyer and between said last mentioned means and said support, said flyer being a disk flyer and being provided with a ring of wear resisting material about the periphery thereof for passage of yarn thereover.

2. In a two-for-one twister assembly of the type where-

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in a package support platform is mounted on a rotatable spindle and means are provided for stabilizing the support platform against rotation with the spindle, the combination comprising a mount for said spindle having a projection adjacent said support, and movable means carried on the under side of said support and adapted upon rotation of the support with the spindle to project beyond the periphery of the support and engage said projection on said mount.

3. In a two-for-one twister assembly of the type wherein a package support platform is mounted on a rotatable spindle and means are provided for stabilizing the support platform against rotation with the spindle, the combination comprising a mount for said spindle, a lever pivotally mounted at one end on the under side of said support platform and having an elongated opening therein, a post secured to said support platform and extending into said opening for limiting the pivotal movement of said lever, and spring means confined between said post and the end of said opening remote therefrom for biasing said lever into either of its two limiting positions, corresponding with engagement of the post with opposite side walls of said opening, the free end of said lever in one of said limiting positions being confined within the periphery of said support platform and in the other of said limiting positions extending beyond the periphery of said support platform and engaging said mount upon rotation of said support platform, said lever being movable from one to the other of said positions under the influence of centrifugal force.

4. The two-for-one twister assembly according to claim 3 wherein said lever is of magnetically permeable material and wherein said stabilizing means comprise cooperating magnetic means carried respectively by said mount and said support platform, the magnetic means carried by said mount serving also upon rotation of the support platform to attract said lever to move it into position for engagement with said magnetic means.

5. The two-for-one twister assembly according to claim 3 wherein said mount has a blocking member adjacent the periphery of said support platform, and said lever is formed with a shoulder on the outer side thereof and near the free end for engagement with said member in one direction of rotation of the support platform, the inner side of the free end of the lever being adapted to engage the member upon rotation of the support platform in the opposite direction.

6. A two-for-one twister assembly comprising in combination a rotatable spindle, a flyer and yarn storage device fixed to said spindle for rotation therewith, said spindle and storage device being formed for delivery of yarn therethrough, a supply package support carried by said spindle above said flyer, stabilizing means preventing rotation of said support with said spindle, pretensioning means carried by said support, a housing carried by said support, and adapted to enclose said pretensioning means, said housing comprising a lower cylindrical section and an upper tapering section, said upper section being so shaped that the curve defined by a vertical section is substantially that of a quarter cycle of a sine wave, and means surrounding said support and spaced therefrom acting in conjunction with said storage device to provide tension-shape control of the yarn balloon formed during rotation of the spindle, said latter means comprising a ring positioned substantially at the level of the base of said tapering section.

7. The 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 above said flyer, said spindle having a passage therein for flow of yarn therethrough, stabilizing means for preventing rotation of said support, a tubular yarn guide coaxial with the spindle and carried thereabove by said support, a hollow member mounted on said tubular guide and carrying an annular yarn guide at its upper end, the upper end

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of said tubular guide extending into said member, yarn tensioning means positioned at a level adapted to be above a yarn supply package carried by said support, and means pivotally mounting said tensioning means as a unit within said hollow member so as to be retractible from the yarn path during threading of the twister, said hollow member having an opening in the wall thereof for accommodation of said tensioning means when retracted from yarn engaging position.

8. The twister assembly according to claim 7 including means yieldingly biasing said tensioning means into yarn engaging position.

9. The twister assembly according to claim 8 wherein said tensioning means comprise a pair of pads adapted to engage yarn passing therebetween and an arm pivotally mounted at its lower end on said hollow member and carrying said pads at its upper end, said arm having a groove along one side conforming with the wall of the upper end of the tubular guide and wherein said biasing means comprises a spring carried by said hollow member and urging said arm into engagement with the tubular guide.

10. A two-for-one twister assembly comprising a rotatable spindle, said spindle having an extension of reduced section at the upper end thereof, a bearing having inner and outer bearing members, said inner member having an opening therein through which said spindle extension extends to frictionally hold said inner member thereon, a yarn supply package support member, and means for yieldingly supporting said package support member upon said outer bearing member including a ring of resilient material on each side of said outer bearing member together with clamping means carried by said package support member for forcing said rings against said outer bearing member.

11. A two-for-one twister assembly comprising a rotatable spindle, a flyer fixed to said spindle and rotatable therewith, said spindle having an extension of reduced section at the upper end thereof, a bearing having inner and outer bearing members, said inner member having an opening therein through which said spindle extension extends to frictionally hold said inner member thereon, a yarn supply package support including a hollow cylindrical member, an annular abutment secured to said cylindrical member adjacent the lower end thereof, a ring of resilient material disposed on each side of said outer bear-

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ing member, one of said rings engaging said annular abutment, and means carried by said cylindrical member for applying pressure to the other of said rings in a direction toward said abutment to resiliently secure said bearing to said cylindrical member.

12. The twister assembly according to claim 11 wherein said last-named means provides a support for yarn tensioning and guide means disposed axially of said cylindrical member.

13. The twister assembly according to claim 11 wherein said last-named means comprises an annular member disposed within the cylindrical member and engaging the other of said rings, a tubular yarn guide carried by said annular member, yarn tensioning means carried by said tubular yarn guide, and means for adjustably positioning said yarn tensioning means, tubular guide and annular member with respect to said annular abutment so that the distance between the opposed faces of said annular member and said annular abutment can be varied to resiliently secure said bearing to the cylindrical member.

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