

May 20, 1952

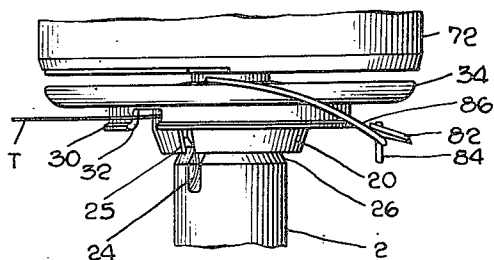
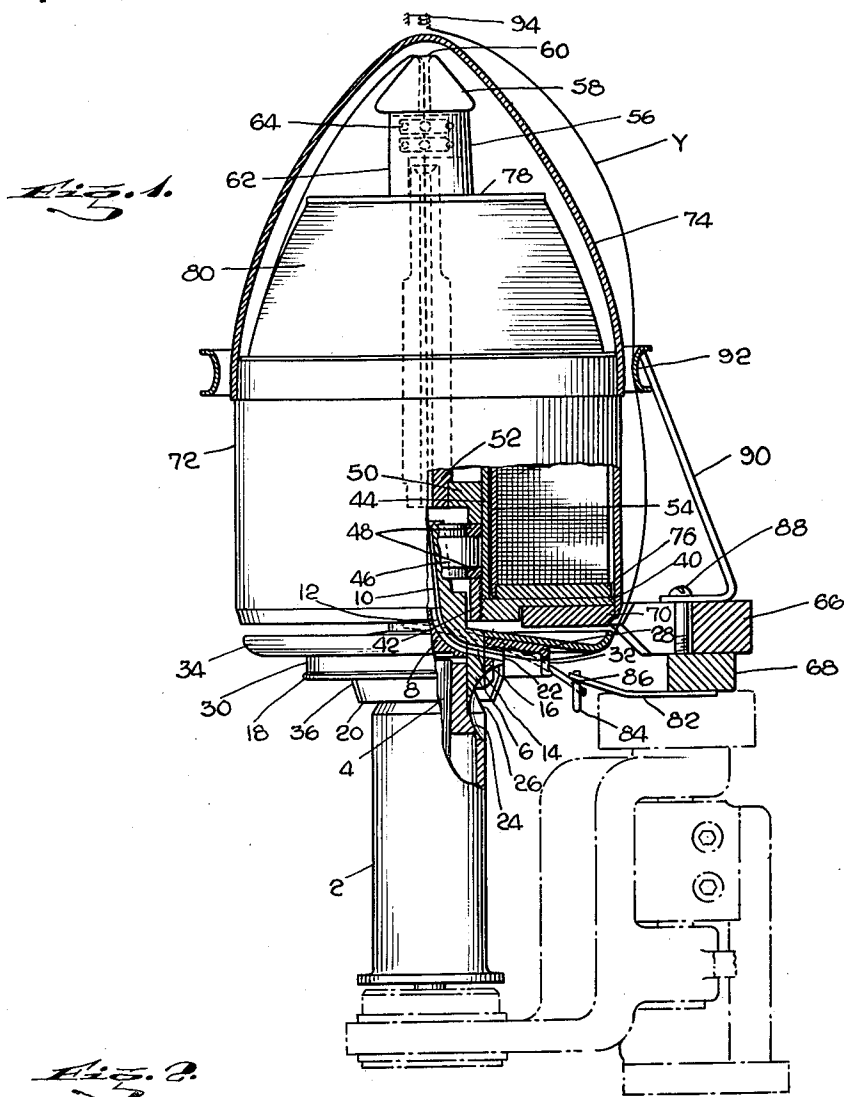
J. W. MAY

2,597,015

SPINDLE

Filed Sept. 13, 1950

2 SHEETS—SHEET 1



INVENTOR
JOHN W. MAY
BY
Louisa E. Norton
ATTORNEY

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J. W. MAY

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2 SHEETS—SHEET 2

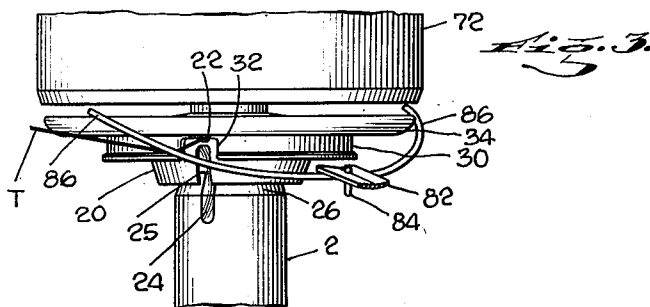


Fig. 4.

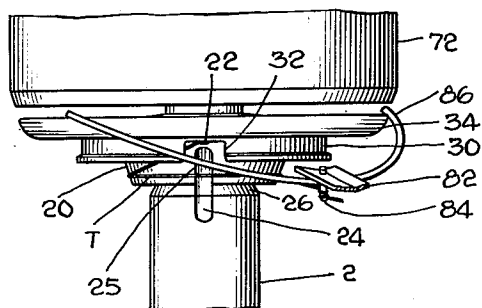


Fig. 5.

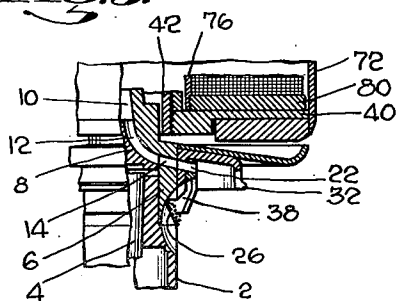
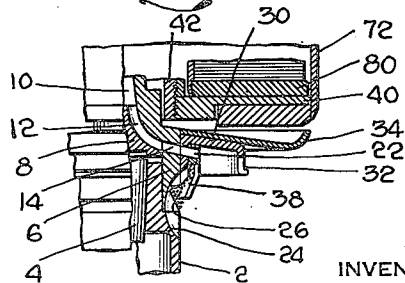


Fig. 6.



INVENTOR
JOHN W. MAY

BY
Louisa E. Norton
ATTORNEY

UNITED STATES PATENT OFFICE

2,597,015

SPINDLE

John W. May, Pendleton, S. C., assignor to Deering Milliken Research Trust, Pendleton, S. C., a nonprofit trust

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9 Claims. (Cl. 57—58)

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This invention relates to twisting machines for filamentary material and more particularly to machines of the type adapted to impart two twists of the material for each revolution of a spindle. The invention, however, is primarily concerned with improvements in the spindle whereby novel means are provided for preventing fly-off after an end comes down.

In the operation at high spindle speeds of a two-for-one twister, as for example, that shown in the co-pending application of Norman E. Klein, Ser. No. 133,047, filed December 15, 1949, and assigned to the assignee of this 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 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.

In another co-pending application of Norman E. Klein, Ser. No. 179,069, filed August 12, 1950, entitled "Twisting Device for Textile Strands," and assigned to the assignee of this application, a solution for this problem of yarn feed-through is provided. According to the last aforesaid application, 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, yarn gripping means adapted to engage the yarn end only when breakage has occurred and 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.

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The present invention provides a novel and simple solution of this problem of yarn breakage and lint fly-off. Briefly, according to the present invention, there is provided on the spindle a circumferential groove with a surface inclined upwardly and inwardly toward the spindle axis. This V-shape-like groove is partially covered by a sleeve or skirt having an outer surface sloping downwardly and inwardly toward the axis of the spindle, said skirt also providing an inner chamber. Means, such as those described in the last aforesaid Norman E. Klein application, are provided for guiding the tail extending from the spindle on breakage, as well as a post associated with such means, whereby on rotation of the spindle the end of the yarn tail traps itself around the post, and the yarn tail continuing to feed through the spindle opening winds itself around the sleeve, tightens up, slides down the inwardly sloping surface of the sleeve into the groove partially covered by the sleeve, winds itself and tightens up in the groove, and rides upwardly to the smallest diameter of the groove. Eventually after twisting off in the spindle occurs, the yarn tail is trapped in the inner chamber whereby any yarn fly-off is prevented.

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 an elevation partly in section of a two-for-one twister representing the preferred embodiment of the invention.

Fig. 2 is a fragmentary side view of the spindle and of the tail deflecting device showing a yarn tail after breakage.

Fig. 3 is a view similar to Fig. 2, but showing the yarn tail path after a partial rotation of the spindle.

Fig. 4 is a view similar to Fig. 3, but representing the tail wrapped around the tail engaging post, and around the sleeve with the inwardly sloping outer surface.

Fig. 5 is a fragmentary sectional view of the spindle showing the tail wrapped around the inwardly inclined groove in the spindle.

Fig. 6 is a view similar to Fig. 5, but showing the tail after twist off trapped in the chamber in the spindle, which prevents fly-off.

Referring to Fig. 1 of the drawings, the novel twister spindle comprises a whorl 2, and a support rod 4, mounted in the whorl. The spindle is mounted by means of support rod 4 for rotation in any conventional manner on a conventional swing gate of the spindle rail of a twister frame, as for example, the Atwood Model M-100 of the

Universal Winding Company of Providence, Rhode Island. The whorl or spindle may also be mounted for rotation as shown in the aforesaid Norman E. Klein applications.

In the upper end of the whorl 2 there is a spindle extension 6 which is cut away at its lower central part for reception of a tapered threading guide plug 8, the central portion of the extension above the plug 8, being provided with an angularly disposed thread passage 10. The plug 8 is channelled along its tapered edge to provide a yarn passage 12, communicating at its upper end with the passage 10 and at its lower end with a generally radial passage 14 which extends through the spindle extension, the cylindrical portion or collar 16 of a yarn storage or "wrap around device" 18, and the sleeve or skirt 20, the latter two elements being fixed on the spindle extension. The passage 14 communicates with an orifice 22 in the upper end of sleeve 20. Beneath the orifice 22 is an arcuate medial groove 24 and in alignment therewith in sleeve 20, a slot 25. The purpose of the groove and slot will hereinafter be described.

In the upper part of the whorl 2, below orifice 22, there is formed a circumferential groove 26, one surface of which slopes upwardly and inwardly and the other surface extends laterally, so that in cross-section the groove appears substantially V-shaped. Mounted as by soldering and press fit above and adjacent the groove on the whorl, through its collar 16, is the yarn storage device 18, which may be formed from sheet steel as by stamping. The storage device comprises a central cylindrical portion or collar 16, a disc portion 28, the surface of which slopes slightly downward with increase in radius, and a smooth annular skirt portion 30.

The skirt 30 is cut away as indicated at 32 over an arc the center of which is in the same vertical plane as the center of orifice 22 and the edges of the cut away part are smoothly rounded for passage of yarn thereover. Spot welded to the disc portion 28 of the storage device 18 is a disc flyer 34 of generally saucer shape. The outer edge of the flyer is rounded upwardly and highly polished.

Mounted as by soldering and press fit on the collar 16 of the yarn storage device is a sleeve or skirt 20, which has an outer surface 36 sloping downwardly and inwardly toward the groove 26. The sleeve 20 partially overhangs or covers the groove 26 and provides an inner annular chamber or reentrant groove 38 (see Fig. 5) adjacent the circumferential groove 26.

The yarn supply package platform 40 is annular in shape and is screw threadedly mounted on an externally threaded short tube 42 upon the upper end of which is threaded a sleeve 44. This assembly is rotatably supported on the upper spindle extension 6 by means of a bearing 46, and a pair of shock resisting rubber rings 48, which are interposed between the sleeve 44, 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 44 and secured to an annular member 50, which rests on the upper ring 48, is a tubular guide 52, the upper end of which terminates above the upper flange of the supply bobbin 54. The tubular yarn guide, 52 is provided with a pedestal 56, which carries at its upper end a guide cap 58 which has an axial yarn passage 60 therethrough. The pedestal is provided with a movable arm 62, which carries at

its upper end two pairs of tension pads 64. The structure of the platform 40, tubular yarn guide, pedestal and tension pads are the same as that described in the aforesaid application of Norman E. Klein, Ser. No. 133,047, and per se are not my invention.

The platform 40 is prevented from rotating with the spindle by means of a fixed magnet 66 which is mounted on a support bracket 68 which in turn is fixedly mounted on the pivot post of the conventional swing gate. Such a bracket and its mounting is shown and described in the last aforesaid application of Norman E. Klein. The magnet 66 is magnetically coupled with a small permanent magnet 70 (or piece of metal of high permeability such as soft iron to serve as an armature for the fixed magnet 66) inset in the under surface of the platform 40. The two magnets 66 and 70 are preferably like that described in the aforesaid Klein patent applications and functions in the same manner as therein described to prevent rotation of the package platform with rotation of the spindle.

A protective cylindrical shield 72 of thin metal or plastic which is soldered or otherwise secured along its lower edge to the platform 40, is cut away slightly adjacent its upper end to provide a shoulder for seating of a transparent dome 74 of plastic or other suitable material.

In Fig. 1 the supply bobbin 54 having lower and upper flanges 76 and 78, respectively, is shown in position on the platform 40 and confined within the shield 72 and dome 74. The upper flange 78 of the bobbin is of lesser diameter than the lower flange 76 to conform with the tapered shape of the dome 74 and to facilitate over-end unwinding of the yarn therefrom and the bobbin is preferably so wound as to yield a package 80 that is cylindrical for a major part of its length and then gradually tapers to the diameter of the upper flange for the remainder of its length.

The hereinbefore mentioned yarn tail deflecting device in construction and operation is the same as that disclosed and claimed in the aforesaid Klein application for a "Twisting Device for Textile Strands." The tail deflecting device includes a plate 82, one end of which is secured to the under surface of the end of the bracket 68, by any suitable means as by screws or welding, 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 30 of the storage device. A pin or post 84 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 86 which is soldered in its midsection to the pin 84 and plate 82. The free parts of the wire 86 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 magnet 66 as heretofore indicated is mounted on the support bracket 68, and mounted on the magnet as by a screw 88 which also serves to support the magnet on the bracket, is a support arm 90 of nonmagnetic material which extends upwardly and slightly inwardly toward the spindle axis and has brazed or welded to its upper end a balloon confining ring 92. The ring 92 is in the form of a band curved to present

toward the dome 74 a slightly curved 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 72 insuring that the yarn will ride the ring at all times. A fixed pigtail guide 94 forming part of the twister frame is positioned a short distance above the dome 74 on the extended axis of the spindle and the ring 92 is preferably positioned substantially at the level of the maximum free balloon diameter as in the twisters of the aforesaid applications of Norman E. Klein. The ring 92 functions in conjunction with the wrap-around device 18 and pretensioning means 64 to control the balloon shape and the output tension of the yarn as described in the said aforesaid applications of Norman E. Klein, the tension introduced by the ring increasing when the balloon tends to expand due to reduction in angle of wrap on the storage device 18 and conversely decreasing with contraction of the balloon due to increase of angle of wrap on the storage device.

In threading up the twister of Fig. 1, the dome 74 is lifted off, the end of the yarn from the yarn package 80 is wrapped around the end of the threading "snake" (a long tightly coiled small diameter spring), arm 62 is retracted to move the tension pads 64 away from the axis, and the end of the snake is inserted through the orifice 60 of cap guide 58 and pushed down through the bore of the guide 52, through the passages 10, 12 and 14 and out orifice 22, where the operator grasps the snake and pulls it out from the twister. The dome 74 is then replaced and the snake with the yarn end secured thereto is brought up between the ring 92 and the sleeve 72 to complete the threading of the device. After breaking the yarn from the snake, the yarn is passed through the fixed pigtail guide 94 and connected to the appropriate take-up device (not shown) of the twister frame, in the conventional manner.

The functioning of the yarn deflector 86, of the post 84 and of the groove 26, of the sleeve 20, and annular chamber 38 upon yarn breakage to prevent lint fly-off will now be described with reference to Figs. 2 through 6. In Fig. 2, rotation of the spindle is counter-clockwise and breakage of yarn is assumed to have just occurred. The tail indicated at T issuing from the orifice 22 has not yet engaged the deflecting wire 86 and consequently still passes through the opening 32 in the skirt of the storage device 18. Further rotation of the spindle brings the end of the tail T under the end of the wire 86 as shown in Fig. 3 and as the tail rides under the surface of the wire its path is deflected downwardly until as shown in Fig. 4, the tail passes out of the opening 32, and with further rotation of the spindle, engages the post 84. The yarn end beating against the post, lashes and wraps around it. With continued rotation of the spindle the yarn which continues to feed through the orifice 22 winds itself around the sleeve 20. The coiled yarn tightens up, slides down the inwardly sloping outer surface or skirt portion 36 of the sleeve into the groove 26, where it coils and tightens up, and slides up to the smallest diameter of the groove as shown in Fig. 5. By this time the yarn being firmly wound up in the groove will eventually break between the post and the spindle. With continued rotation of the spindle twist-off of the yarn occurs in the spindle between the tension device 64 and orifice 22. After twisting

off, the tail tends to fly-off the spindle, but any fly-off is trapped within the chamber 38. The medial groove 24 and slot 25 provides a guide for insertion of an instrument, such as a hook, to remove the tail yarn wrapped around the groove 26 and trapped in chamber 38.

It will be understood that if the spindle is rotated in the opposite direction the yarn tail is engaged by the other end of the wire 86, and fly-off is prevented in the same manner as described.

The invention has been described with reference to the preferred embodiment thereof. It will be understood that various obvious changes might be made in the illustrated constructions and parts may be omitted or added without departing from the spirit of the invention as defined in the appended claims.

The following is claimed:

1. In a yarn twisting device comprising a spindle provided with an orifice for withdrawal of yarn therefrom and a yarn deflecting device to lead a broken end or tail down to wrap itself around the spindle, the combination of a circumferential groove in the spindle, in which the yarn tail winds up and contains itself upon breakage of the yarn.

2. The combination according to claim 1, wherein the circumferential groove has a surface inclined upwardly toward the spindle axis, and includes a skirt partially overhanging the groove, said skirt having an outer surface sloping inwardly toward the groove and the axis of the spindle to cause the yarn tail to slide into the groove.

3. The combination according to claim 2, including an inner annular chamber provided by said skirt for trapping fly-off from said spindle.

4. In a yarn twisting machine comprising a spindle provided with an orifice for withdrawal of yarn therefrom, a 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, the improvement which comprises the combination of a circumferential groove having a surface inclined upwardly toward the spindle axis, a skirt on the spindle partially overhanging the groove and having an outer surface sloping inwardly toward the groove, and an annular chamber adjacent said groove; said yarn deflecting means, circumferential groove, skirt and chamber being positioned in cooperative relationship so that on breakage of the yarn, lint fly-off is prevented by confinement of the yarn in the chamber.

5. The combination according to claim 4, wherein the annular chamber is in the overhanging portion of the skirt.

6. 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, and which twister comprises 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

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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, the improvement which comprises the combination of a circumferential groove having a surface inclined upwardly toward the spindle axis, a skirt on the spindle partially overhanging the groove and having an outer surface sloping inwardly toward the groove, and an annular chamber adjacent said groove, said yarn deflecting means, circumferential groove, skirt and chamber being so positioned in cooperative relationship that on breakage of the yarn, lint fly-off is prevented by confinement of the yarn in the chamber.

7. In a two-for-one twister of the type wherein yarn drawn from a supply package enclosed in a housing and supported on a rotatable spindle passes axially through a part of the spindle out through an orifice in the side thereof and through a yarn guide slot in a wrap around device of a disc flyer fixed to said spindle for rotation therewith and then balloons about the housing in transit to a take-up device, and which comprises a means for tensioning the yarn in its travel to the spindle orifice, a balloon confining ring spaced from and surrounding said housing over which the yarn travels in transit to the take-up device, yarn tail deflecting means having a yarn guiding and deflecting surface extending from a first location 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, the guiding surface of said tail deflect-

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ing means being so positioned relative to said yarn guide slot as to guide the tail out of the slot and to the trapping means at a second location, the improvement which comprises the combination of a circumferential groove having a surface inclined upwardly toward the spindle axis, a skirt on the spindle partially overhanging the groove and having an outer surface sloping inwardly toward the groove, and an annular chamber adjacent said groove, said yarn deflecting means, circumferential groove, skirt and chamber being positioned in cooperative relationship so that on breakage of the yarn, lint fly-off is prevented by confinement of the yarn in the chamber.

8. In a yarn twisting machine a spindle having an orifice through which yarn is adapted to be drawn, yarn deflecting means for moving a broken end or tail away from the normal path of yarn and causing said tail to wrap itself around said spindle and yarn retaining means circumferentially disposed about said spindle for holding the yarn end thereon upon breakage of the yarn.

9. The combination, according to claim 8, wherein the yarn retaining means includes a sleeve circumferentially disposed about the spindle and spaced therefrom to provide an annular chamber in which the yarn end on breakage of the yarn is confined.

JOHN W. MAY.

No references cited.