March 25, 1958 W. D. KELLOGG ET AL 2,827,756

TENSION DEVICE FOR MULTIPLE TWIST TYPE OF TWISTER

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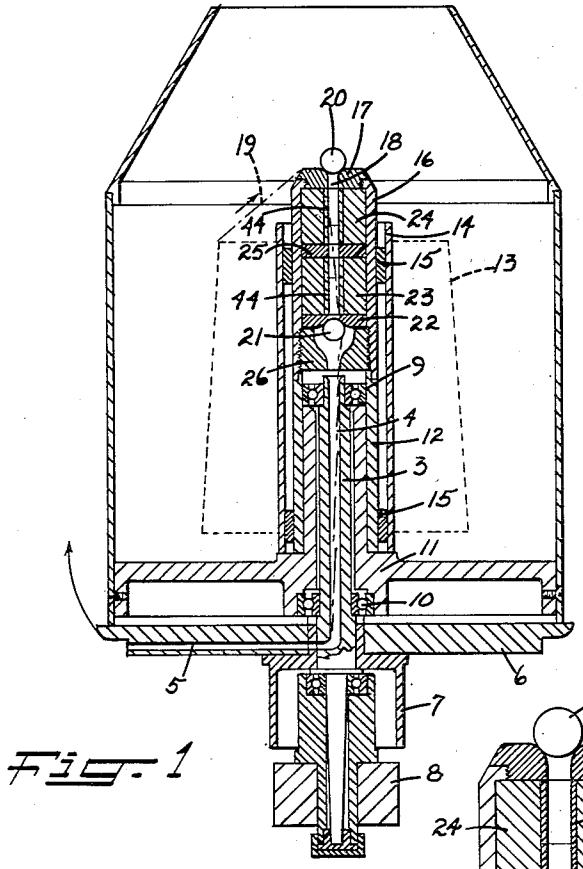


Fig. 1

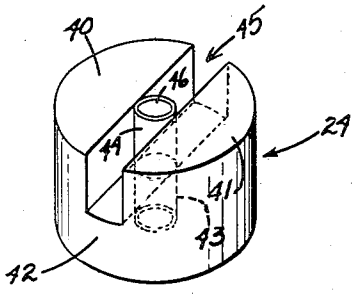


Fig. 5

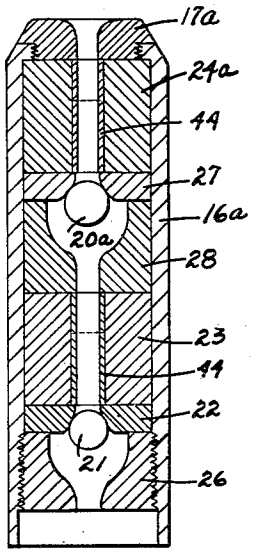


Fig. 2

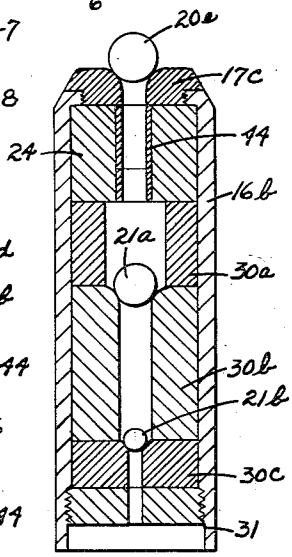


Fig. 4

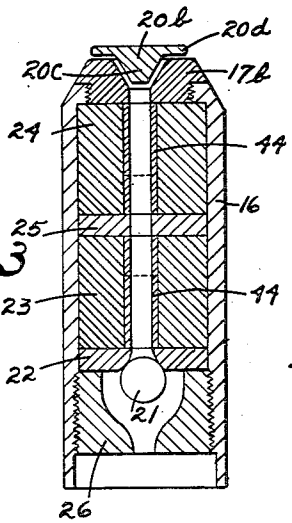


Fig. 3

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TENSION DEVICE FOR MULTIPLE TWIST TYPE OF TWISTER

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This invention relates to tension devices for multiple twist types of twisters, particularly for two-for-one uptwisters adapted to tension the thread or yarn proceeding from the stationary package on such twisters into the top or head end of the hollow core of the package on its way to the hollow spindle aligned therewith.

In twisters of the type mentioned, it is already known to provide between the rotating flier and the tension device associated with the package holder, a twist barrier which may also be a tension device for the purpose of preventing insertion of twist directly and immediately into the yarn as it leaves the first tension device. Because the yarn or thread proceeding to the tension device shifts continually about the axis of the tension device, it is possible for the fibers or the filaments to become somewhat disarranged from their normal disposition within the yarn or thread at the point of entry of the yarn into the tension device and this disarrangement, which may involve the looping of one filament or fiber about another in irregular fashion, may be trapped in the yarn at its discharge point from the tension device as the twist imparted by the flier therebeneath is allowed to go back to that first tension device. The result is the production of an irregular yarn which has either an irregularity in twist at various points along its length or even sometimes small tangles or slubs at points along the yarn. These defects tend to become more pronounced and more frequent when operating with a low twist yarn of two or three turns per inch or a so-called "flat" yarn, i. e., a yarn having no twist, such as an untwisted continuous filament yarn of rayon or other material.

Various systems have heretofore been proposed to avoid these difficulties but the types of devices that can be employed satisfactorily are extremely limited primarily because of the difficulty of lacing such systems which involve a twist barrier or tension device disposed beneath or behind the normal twisting device and because most twist barriers heretofore known cause broken filaments in the twisted yarn or cord even when low speeds of 5000 R. P. M. are used.

According to the present invention, an improved system is provided for preventing the twist from backing up to the first tension device which is not only simple in construction and highly effective in operation, but is quite easy to lace-up.

Generally, the invention comprises the provision of a tension device comprising a freely movable element controlled gravitationally or magnetically and a freely movable spherical element disposed between the tension device and a twisting flier for preventing the backing up of twist to the tension device. The spherical element of the twist barrier is also controlled gravitationally or magnetically.

In the drawing, which illustrates several embodiments of the invention,

Figure 1 is an axial section through a preferred embodiment in its normal position on a two-for-one type of uptwister, the twister being more or less diagrammatically shown,

Figures 2, 3 and 4 show similar views in section of three modifications, and

Figure 5 is a perspective view of a magnet.

In Figure 1, the uptwister comprises a hollow spindle 3 and a hollow passage 4 which communicates with the radial passage 5 in a flier 6 secured rigidly to the spindle for rotation therewith which rotation may be effected by the whorl 7. The spindle is rotatably mounted in suitable bearings in a fixed support 8. Spaced bearings 9 and 10 are mounted upon the spindle 3 and support a package holder system comprising a platform 11 and sleeve 12 fitting around the upwardly-extending hub thereof. Any conventional means may be employed for holding the package holder 11 stationary while the spindle and flier are rotated. Such means may involve the provision of an eccentric weight carried by the platform 11 when the axis of the spindle is inclined from the vertical or it may involve cooperating magnets or magnetic means, comprising magnetic elements such as magnets on the platform 11 and fixed magnetic element, such as magnets just outside the orbit of the thread balloon. The magnetic system may be used whether the axis of the spindle is vertical or inclined to it. These systems as well as others that are known may be used and because of their conventional character, they are not shown in the drawing.

The package 13 shown in dotted outline may be supported on the holder by slipping its core 14 around the annular projections 15, the latter of which may be formed integrally with the sleeve 12. The upper annular projection 15 may be formed integrally on a sleeve 16 the lower end of which is grooved internally to receive a complementary inner annular portion of the sleeve 12.

The tension device is supported at the upper end of the sleeve 16 in substantial alignment with the passage 4 of the hollow spindle. It comprises a cap 17 having a central bore 18 through which the thread or yarn indicated at 19 may pass. The juncture of the bore 18 with the top of the cap 17 is formed as a portion of a spherical surface to provide a seat for the spherical element or ball 20. This ball rests gravitationally or is pulled magnetically against the seat on the cap 17 and provides the first tensioning of the thread proceeding from the package 13 into the passage 18 on its way to the passage 4 of the spindle.

Between the spindle and the tension device, there is provided a twist barrier in the form of a spherical element or ball 21 which bears against a spherical seat formed about a central bore through the non-magnetic ring member 22. The ball 21 is, in this specific embodiment shown, formed of a magnetic material, such as soft iron or steel. It is urged upwardly magnetically by the magnet 23. While the ball 20 may be urged downwardly against its seat by gravitation, particularly when the twister is mounted on a vertical axis, it may also be urged against its seat by a magnet shown at 24, particularly when the twister is mounted upon an axis inclined to the vertical. The yarn is tensioned as it passes between the balls 20 and 21.

The magnets 23 and 24 are held in fixed position within the sleeve 16 and may be spaced apart by a non-magnetic element 25 if desired. An annular fastening element 26 whose outer periphery may be threaded to engage internal threads within the lower end of sleeve 16 serves to retain the ring 22, magnets 23 and 24 and the spacer 25 when used. The element 26 has a central passage or bore which is gently flared to greater diameter in the zone about the ball 21. The inside diameter of the cavity or recess formed by the enlarged portion of the bore is sufficient to allow the ball to be displaced later-

ally from its normal central position against the seat under the ring **22** sufficiently to permit the passage of a lacing wire for threading the yarn through the system. The member **26** is so shaped that in lacing, the ball **21** moves laterally just sufficiently to permit passage of the flexible lacing wire but not enough to permit the ball to drop away from the influence of the magnet **23**. The magnets **23** and **24** are provided with central bores and preferably the bores through all of the elements **17**, **24**, **25**, **23**, and **22** are of the same diameter so as to provide a uniform diameter passage from the ball **20** to the ball **21**. When magnets **23** and/or **24** are used, the sleeve **16** and ring **15** should be of a non-magnetic material.

The balls **20** and **21** may be of the same diameter but, as shown, it is preferred that the ball **21** be substantially smaller in diameter than the ball **20**. In operation, the yarn is drawn off the package **13** and proceeds around the cap **17** under the ball **20** into the aligned passages within the elements from **17** to **26** and between the ball **21** and its seat into the passage **4**, through passage **5** of the flier and then upwardly to the usual centrally located axially aligned guide on its way to a suitable take-up or other operating procedure. The ball **21** acts as a twist barrier and to a certain extent applies tension to the thread or yarn so that any irregularities introduced by the swinging of the yarn **19** about the axis of the spindle as it proceeds under the ball **20** is allowed to disappear in the passage from ball **20** to ball **21** before any appreciable twist is inserted by the rotation of the flier **6**. The resulting product is highly uniform in twist characteristics throughout its length.

Figure 2 shows a modification which differs from Figure 1 in that the first tension device is placed partway within the sleeve **16** wherein it bears upwardly against a spherically-shaped seat underneath the ring **27** which is clamped in place between a magnet **24***a* supported above the ring and a fitting **28** which is supported above the magnet **23**, the ring **22** and the fitting **26**. The member **28** is bored to form a cup-like receptacle similar to that within the fitting **26** so that the ball **20***a* may be pushed aside by a lacing device such as a wire. While the balls **20***a* and **21** may be of the same size, it is preferred that the ball **21** be smaller in diameter than the upper ball **20***a*.

The tension and twist barrier unit of Figure 2 is adapted to be inserted upon the sleeve **12** in Figure 1 in place of the tension and twist barrier unit shown therein. Operation of the twister with the unit of Figure 2 in place is similar to that of the unit of Figure 1. However, the unit of Figure 2 has somewhat less tendency to trap and retain foreign particles, such as dirt or lint because of the disposition of the ball **20***a* beneath its seat. On the other hand, the unit of Figure 1 has the advantage that in case of vibrations, any tendency of ball **20** to lift from its seat is compensated by an increased tendency of the ball **21** to stay upon its seat whereas in Figure 2, when vibrations occur, both balls may possibly be unseated momentarily at the same time.

In the embodiment of Figure 3, a modification is shown which is identical with that in Figure 1 except that the ball **20** is replaced with a different type of freely movable element, shown particularly as a button-like member **20***b* having a lower frusto-conical section **20***c* depending from a round plate section **20***d*. The annular surfaces between the cap **17***b* and the button member are all smoothly contoured so as to prevent any sharp angles abrading the yarn. The conical portion **20***c* extends into a substantially complementarily shaped recess formed concentrically within the cap **17***b*. The element **20***b* is adapted to nutate within the recess in cap **17***b* as the yarn passes under its surfaces into the bores of the elements **17***b*, **24**, **25**, **23**, **22**, and **26**. While gravitation may be relied upon to hold the button **20***b* in place, the magnet **24** is preferably used, especially when

the spindle axis is inclined from the vertical. As in Figures 1 and 2, when magnets are used, the ball **21** and button **20***b* are of magnetic material and the other parts are of non-magnetic material.

In Figure 4, the first tension ball **20***e* is followed by two balls **21***a* and **21***b*, each of the balls being of different diameter, **21***a* being intermediate in size between the small ball **21***b* and the large ball **20***e*. While gravitation may be relied upon to hold each of the balls in place, magnets may be employed. In this embodiment, the magnet **24** is placed beneath the ball **20***e* with which it coacts so that a seat is provided in the annular member **17***c* immediately beneath ball **20***e*. Also, annular members **30***a* and **30***b* are provided one around each of the lower balls. The inside diameter of ring **30***a* is somewhat larger than the diameter of ball **21***a* to permit the ball to be moved aside sufficiently for a flexible lacing wire to pass by. The ring **30***b* has a bore whose diameter is somewhat larger than the diameter of ball **21***b* to permit the ball to be moved aside sufficiently for a flexible lacing wire to pass on through. Ring **30***b* has an annular seat of spherical curvature to receive ball **21***a* and a flared surface extends from the seat to the inside wall of the bore in ring **30***a*. This flared curvature assures that a lacing wire will not be caught at the top of ring **30***b* during lacing operations. A ring **30***c* is provided beneath ring **30***b* and has a spherical seat for ball **21***b* joined by a flared surface to the inside wall of the ring **30***b* where the latter rests upon ring **30***c*. The several parts are held in sleeve **16***b* between the cap **17***c* and an externally threaded holding ring **31**.

The embodiments of Figures 3 and 4 are adapted to replace the unit of Figure 1 and the operation and lacing-up thereof are quite similar. In all embodiments, the balls and button **20***b* may be made of any material desired when they are to be acted upon gravitationally but when reliance is placed upon a magnet to urge them toward their seats, they should be of a paramagnetic material, such as iron, soft steel, or of iron, cobalt, and nickel alloys. The other parts may be of any material when magnets are not used, but are preferably of non-magnetic materials when magnets are used.

Figure 5 shows in perspective one of the magnets such as magnet **24** comprising two almost semi-circular segments **40** and **41** integrally connected at one end by a bridging portion **42**. A central bore **43** is concentric with the cylindrical surface of the magnet and extends through the interconnecting web **42**. A sleeve **44** of non-magnetic material, such as brass, copper, or the like is fixed within the bore **43** and extends the full depth or height of the magnet. This sleeve prevents a lacing wire from being deflected laterally into the transverse slot or groove **45** and assures that the wire continues axially on through the central bore of the tension unit. The inner top edge **46** of sleeve **44** may be rounded off, if desired.

The systems of the present invention are readily laced and permit high speed operation of the twister, such as from 7,000 to 10,000 or more R. P. M., without causing broken filaments.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. A twister comprising a hollow rotatable spindle and a flier secured thereto for rotation therewith, a package holder supported on the spindle in a manner to allow relative rotation therebetween, a hollow sleeve mounted on the package holder concentrically with respect to the spindle and projecting endwise from the spindle, a plurality of annular members supported within the sleeve in fixed positions, at least three of said members having spherically surfaced seats, and a spherical element urged against the seat of each of the three members.

2. A twister as defined in claim 1 in which each of

the spherical elements is of progressively smaller diameter than the first in a direction toward the flier.

3. A twister as defined in claim 2 comprising magnetic means for urging the spherical elements against the seats in the annular members.

4. A twister as defined in claim 3 comprising additional annular members, one positioned adjacent each of the aforesaid annular members and having a recess of substantially larger volume than the associated spherical element and arranged to retain the spherical element in position while allowing the spherical element to be displaced laterally from its normal position against its seat for lacing purposes.

5. A twister comprising a hollow rotatable spindle and a flier secured thereto for rotation therewith, a package holder supported on the spindle in a manner to allow relative rotation therebetween, tension means supported on the package holder above the hollow spindle, and a twist barrier between the tension means and the hollow spindle comprising a freely movable element, an annular member having a seat of complementary shape to the element against which the element is adapted to be urged, the seat for the movable element being formed on that surface of the annular member which is closest to the flier, and magnetic means positioned on the other side of the annular member for urging the movable element against the seat.

6. A twister as defined in claim 5 in which the movable element is a spherical ball.

7. A twister as defined in claim 5 in which the tension device comprises a spherical ball and an annular member having a spherically surfaced seat against which the ball is urged, and the movable element of the twist barrier is a spherical ball of less diameter than that of the tension device.

8. A twister comprising a hollow rotatable spindle and a flier secured thereto for rotation therewith, a package holder supported on the spindle in a manner to allow relative rotation therebetween, tension means supported on the package holder above the hollow spindle and comprising a spherical ball and an annular member provided with a spherically shaped seat for the ball, and a twist barrier between the tension means and the hollow spindle, said twist barrier comprising a ball and an annular member having a spherically shaped seat for the ball, each of the balls being disposed between the flier and its respective annular member, and magnetic means for urging the balls against the seats in the annular members.

9. A twister as defined in claim 8 in which the magnetic means comprise magnets having a cylindrical periphery mounted concentrically with respect to the axis of the spindle and said magnets have a central bore concentric with the axis of the spindle.

10. A twister as defined in claim 9 in which the ball of the twist barrier is smaller in diameter than that of the tension device.

11. A twister comprising a hollow rotatable spindle and a flier secured thereto for rotation therewith, a package holder supported on the spindle in a manner to allow relative rotation therebetween, a tensioning device supported on the package holder above the hollow spindle comprising an annular member and a movable element adjacent said annular member, a seating surface on said annular member, and a twist barrier between the tensioning device and the hollow spindle comprising a second annular member and a movable element adjacent said second annular member, a seating surface on said second annular member, the first of the movable elements having a frusto-conical surface adapted to engage with its seating surface and the other of said movable elements being a spherical ball, and means for urging each movable element against its respective seating surface, the seating surface of the second annular member being on the side opposite to the side of the first annular member occupied by its seating surface.

12. In a double twist spindle having a rotatable shaft with an axial bore through which the yarn passes and a yarn package support journaled on said shaft in a manner to allow relative rotation therebetween, a multi-stage yarn tensioning and twist arresting mechanism comprising a series of balls adapted to seat in any position and cooperating annular members forming seats for said balls; said annular members being disposed above and in vertical alignment with said shaft, a permanent magnet cooperating with the lowermost of said balls for magnetically holding the same against its seat, said yarn being adapted to pass in succession between the successive balls and their respective seats as it feeds from said yarn package to said rotatable shaft.

13. In a textile yarn double twister having a rotatable shaft with an axial bore through which the yarn passes and a yarn package support journaled on said shaft in a manner to allow relative rotation therebetween, the improvement which comprises a multi-stage yarn tensioning and twist arresting mechanism having a series of balls, cooperating annular seats for said balls, said seats being disposed above and in vertical alignment with said shaft, a magnet positioned to attract the lowermost of said balls against its seat, said yarn being adapted to pass between the successive balls and their respective seats in feeding from the yarn package through the rotatable shaft.

14. In a textile yarn double twister having a rotatable shaft with an axial bore through which the yarn passes and a yarn package support journaled on said shaft in a manner to allow relative rotation therebetween, the improvement which comprises a multi-stage yarn tensioning and twist arresting mechanism having a series of balls, cooperating annular seats for said balls, said seats being disposed above and in vertical alignment with said shaft, a magnet positioned to attract at least one of said balls against its seat, said yarn being adapted to pass between the successive balls and their respective seats in feeding from the yarn package through the rotatable shaft.

15. In a textile yarn double twister having a rotatable shaft with an axial bore through which the yarn passes and a yarn package support journaled on said shaft in a manner to allow relative rotation therebetween, the improvement which comprises a multi-stage yarn tensioning and twist arresting mechanism having a series of movable elements, cooperating annular seats for said movable elements, said seats being disposed above and in vertical alignment with said shaft, a magnet positioned to attract the lowermost of said movable elements against its seat, said yarn being adapted to pass between the successive movable elements and their respective seats in feeding from the yarn package through the rotatable shaft.

16. In a textile yarn double twister having a rotatable shaft with an axial bore through which the yarn passes and a yarn package support journaled on said shaft in a manner to allow relative rotation therebetween, the improvement which comprises a multi-stage yarn tensioning and twist arresting mechanism having a series of movable elements, cooperating annular seats for said movable elements, said seats being disposed above and in vertical alignment with said shaft, a magnet positioned to attract at least one of said movable elements against its seat, said yarn being adapted to pass between the successive movable elements and their respective seats in feeding from the yarn package through the rotatable shaft.

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