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YARN TENSIONING DEVICE

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In the operation of many textile machines the maintenance of an even tension or drag on the yarn or thread is highly important to the production of a uniform product. Moreover, it is very desirable, also, to be able to adjust that tension by extremely small increments in order to suit the requirements of different yarns varying in tensile strength, character of fiber, softness, degree of twist, and the like. The present invention relates to yarn tensioning devices and it is especially concerned with the requirements of those devices of this character intended for use in twisters of the so-called "2 for 1" type, in which two turns of twist are inserted for each revolution of the spindle although its utility is not limited to machines of this character.

In such machines both uniformity of tension and a slow gradient of adjustment are extremely important because in them the yarn is not positively fed to the twisting instrumentalities, as it is in the other types of twisters, but, on the contrary, it is drawn from a stationary supply package by the pull of the take-off mechanism. Consequently, such factors as the tensile strain imposed on the yarn during the twisting operation and control of ballooning, must be governed by adjustment of the drag on the yarn after it leaves the supply package.

To devise a tension device which will satisfy the foregoing requirements, while at the same time being reliable in operation and easy to adjust, form the chief objects of this invention.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a vertical, sectional view of a tension device embodying this invention and showing it in its operative position in a 2 for 1 twister;

Fig. 2 is a side elevation on a larger scale of the tension device shown in Fig. 1; and

Fig. 3 is a horizontal, sectional view taken substantially on the line 2—3, Fig. 2.

Referring first to Fig. 1, the 2 for 1 twisted parts there illustrated comprise a header 2 supporting a supply cop or yarn package 3, the holder including a central tubular tapered sleeve 4 and being supported in its operative position by the engagement of the sleeve with the outer races or casings of upper and lower ball bearings 5 and 6, respectively. The latter, here shown as of the enclosed type, are mounted one above the other on an upright spindle 7. A flier 8 carried by this spindle revolves with it but the yarn carrier 2 is normally held stationary by magnets, or by some other suitable means. When the machine is in operation the yarn 9 is drawn from the outer surface of the cop 3, is led into the top of the tension device which is mounted in the upper end of the sleeve 4, travels down through a bore provided for its passage in the spindle 7 and then out through a lateral opening (not shown), in the side of the spindle to one of the eyes of the flier 8. From there it runs up through a guide eye to the power-driven takeoff rolls.

As above indicated, the specific embodiment of the invention here illustrated is designed especially to meet the requirements of a twister of this type, although it is contemplated that features of the invention will be found equally useful in other thread tensions. This device comprises a body 10, usually consisting of a casting, provided at its ends with upper and lower tubular shanks or extensions indicated at a and b, respectively, which serve to guide the yarn as it passes through the device. Between these tubular sections is a recess or seat c in which the thread tensioning or gripping members are mounted. These include a bottom plate 12 resting on shoulders d—d, Fig. 3, which form parts of the bottom of the socket c, the plate being pressed into place between the walls of the recess and held there by friction. Cooperating with this member is a pressure plate 13 having a flat bottom face resting on the flat upper surface of the plate 12 and also provided with two right-angle flanges e and f, respectively. Preferably this pressure plate consists of a single piece of sheet stock with one end turned up to form the flange e and the opposite end portion folded backwardly upon itself and the tip then bent upwardly at right angles to form the second flange f.

The pressure with which the plate 13 bears against its cooperating plate 12 is applied by a spring 14 of the leaf type and, in the form shown, consisting of a length of spring wire of circular section, one end portion of which rests in two notches formed centrally in the edges of the flanges e and f. The greater portion of the length of the wire, however, lies in a groove formed lengthwise in a screw-threaded section of the tubular extension a. Threaded on to this section is an adjusting nut 15 and a check nut 16, both of which encircle the spring 14 as well as the part a. As shown in Fig. 1, the upper end of the spring is bent at right angles and enters a hole in the extension a thus holding the spring against lengthwise movement in either direction.
Between the nut and the flange e the wire is sprung outwardly in to an inclined position so that its tendency to assume its normal straight form presses the plate 19 yieldingly against the bottom plate 12. Thus the yarn 9 is subjected to a pressure, the intensity of which depends upon the size of the spring, its resiliency characteristics, and the length of that portion between the adjusting nut 18 and the points at which it bears on the flange e and f of the plate 12. Obviously by adjusting the nut 18 toward the latter plate, this pressure will be increased, because the active length of the spring is shortened, and an opposite adjustment will decrease the pressure. However, because the adjustment can be made very gradually, and also because the spring pressure is exerted laterally, the gradient of tension on the yarn can be made in extremely small increments.

The entire thread tension device is removably supported in the sleeve 4 by means of a collar 17, releasably secured to the part a of the tension body 10 by a snap ring 18, the collar merely resting on the upper end of said sleeve and supporting the main body of the tension device in a suspended position. A collar, brush, or other cushioning material, which rests in a circumferential groove formed in the body 10, centers the device in said sleeve and prevents any radial movement of it.

One of the factors responsible for some of the variation in the tension or drag maintained on a yarn or thread is due to small bodies of fiber or lint which become attached to the yarn and are carried along by it. When they strike the thread gripping members, they are stripped off the thread but in time they may accumulate and become wedged between the plates sufficiently to relieve the pressure of the latter on the yarn. In order to avoid this difficulty, the upper end of the tube section a is enlarged sufficiently to receive a fibrous body 21 that may consist, for example, of a folded sheet or a sheet of felt provided with a central hole large enough to permit the yarn to pass fairly freely through it but close enough to strip from the yarn any adherent material that would be likely to lodge between the plates. It also applies sufficient drag to pull out knotted loops in the yarn and makes it follow a straight path to the center of the tension plates.

This tension device has been found in practice to be exceptionally satisfactory. Its flat surfaces between which the yarn passes, and by which the tensioning drag is applied to it, together with the unique means for applying that pressure to the plates, produces an exceptionally uniform drag on the yarn. At the same time the parts are so sturdy and substantial in construction that the device is thoroughly reliable. It is easily threaded up with the aid of the usual threading wire, and it can be taken out of the sleeve 4, and the tension changed without breaking the thread. This offers a very important operating advantage.

Preferably a rubber ring or washer 22 is secured to the top of the sleeve 4 so that the collar 17 will rest instead of on the metal of the sleeve itself. This ring or washer cooperates with the rubber bushing 20 to prevent any direct metal to metal contact of the tension device with the sleeve or, in other words, to isolate these two members and prevent the transmission of chatter or vibration from one to the other.

Further advantages reside in the fact that by the simple matter of using springs of different sizes, cross-sectional forms, or different compositions, the device may be used satisfactorily on an exceptionally wide variety of sizes of yarn or other stranded material. And the fact that some of fiber adhering to the yarn are removed by the preliminary tensioning member 21 contributes to the maintenance of the desirable even tension. For convenience the terms "yarn" and "thread" are used interchangeably to denote any material in strand form to which this invention is applicable.

While we have herein shown and described a preferred embodiment of our invention, it will be evident that it may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described our invention, what we desire to claim as new is:

1. A yarn tension device comprising an elongated body provided with a tubular yarn guiding shank and with a seat, a pressure plate located in said seat in position to bear on the yarn, a leaf spring, one end portion of which bears on said plate and presses it against the yarn, and a nut threaded on said shank and bearing on said spring whereby adjustment of said nut changes the active length of the spring.

2. A tension ring 18 of wire comprising an elongated body provided with a tubular yarn guiding shank and with a seat, a pressure plate located in said seat in position to bear on said yarn, a leaf spring, one end portion of which bears on said plate and presses it against the yarn, and a nut threaded on said shank being externally screw-threaded and grooved longitudinally to receive said spring, and a nut enregistering said shank and said spring and having threads engaging the threads on said shank, whereby the active length of the spring may be changed by advancing or retreating.

3. A yarn tension device comprising a body having parts for guiding a yarn therethrough, thread-gripping members in said body and in contact with which the yarn passes, a spring for pressing said parts together, and a second and engaging part carried by said body and through which the yarn is guided on its way to said thread-gripping parts, said second part serving to remove from said yarn loose fibrous material clinging thereto.

4. A yarn tension device according to preceding claim 1, in combination with a fibrous member in said tubular shank, through which member the yarn passes on its way to said plate.

5. A yarn tension device comprising a supporting body through which the yarn is guided for travel lengthwise of said body, thread-gripping plates supported on said body between and in contact with which the yarn passes, a leaf spring pressing said parts together, said body having a screw-threaded portion and said spring having a part extending along said portion, and a nut bearing on that part of the spring extending along said threaded portion, said nut being threaded on said body portion and encircling said spring, the nut being movable along the spring by its rotary engagement with the screw threads on said body, whereby it is operable to adjust the pressure exerted by said spring on said thread-gripping parts.

6. A yarn tension device according to preceding claim 5, in which said spring is so supported on said body and on one of said thread gripping parts that the length of the spring on which said nut acts is held in a position inclined away from the axis of the nut.

7. A yarn tension device comprising a supporting body, parts on said body between and in contact with which the yarn passes, a leaf spring
pressing said parts together, and means for adjusting the pressure so exerted on the yarn comprising a device encircling said spring and mounted on said body for screw-threaded adjustment lengthwise of the spring.

5. A yarn tension device of the character described, comprising a body provided with a lateral open-sided recess and with a tubular yarn guiding shank, two opposed yarn gripping members in said recess with their yarn-engaging surfaces substantially in line with the bores of said tubular shank, a spring pressing one of said yarn-gripping members toward the other to cause them to pinch the yarn yieldingly between them, and means mounted on said shank for adjusting the pressure so applied by said spring to the yarn-gripping member on which it acts.

9. A yarn tension device of the character described, comprising a body provided with a lateral open-sided recess and with a tubular yarn guiding shank, two opposed yarn gripping plates positioned in said recess and bearing, one on the other, with their yarn-engaging faces substantially in line with the bore of said tubular shank, a leaf spring extending along said shank and across a portion of said recess and bearing on the outer of said plates where it presses the latter plate against its companion plate and causes them to grip the yarn yieldingly, and means mounted on said shank and adjustable lengthwise thereof to adjust the effective length of said spring and thereby to vary the pressure with which said plates grip the yarn.

10. A yarn tension device of the character described, comprising a body provided with a lateral open-sided recess and with tubular yarn guiding shanks extending from opposite ends of said recess, two opposed yarn-gripping plates in said recess with their yarn-engaging surfaces substantially in line with the bores of both of said shanks, a leaf spring pressing one of said plates toward the other to cause them to pinch the yarn yieldingly between them, said spring having a portion thereof extending along one of said shanks, and a device mounted on the latter shank and cooperating with it to clamp the spring to the shank, said device being adjustable lengthwise of said shank to change the length of said spring effective in producing said yarn-gripping action of the plates.

11. A yarn tension device of the character described, comprising a supporting body through which the yarn is guided for travel lengthwise of said body, said body having a lateral open-sided recess, two opposed yarn-gripping plates positioned in said recess between and in contact with which the yarn passes, a leaf spring pressing said plates together and including a part extending lengthwise of said body, and means for adjusting the pressure exerted on the yarn by said plates comprising a member encircling said spring and a portion of said body and mounted on the body for adjustment lengthwise of the spring, and screw-threaded means cooperating with said member to lock it in its adjusted position.

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