

Oct. 11, 1955

W. S. BROWN
YARN TENSIONING DEVICE

2,720,366

Filed Sept. 15, 1953

FIG. 1.

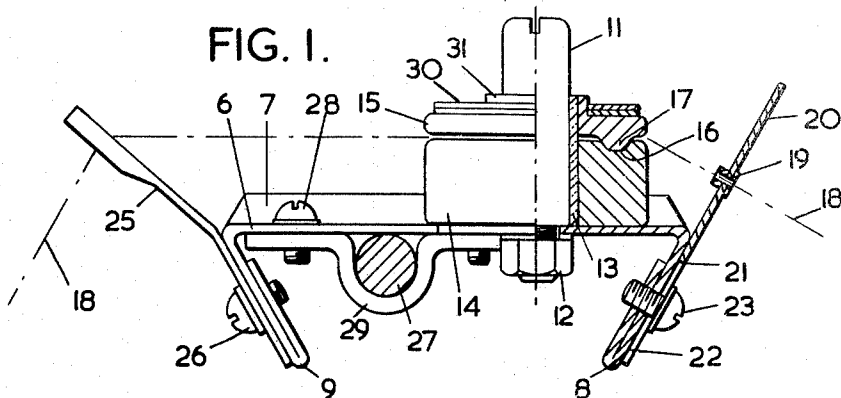


FIG. 2.

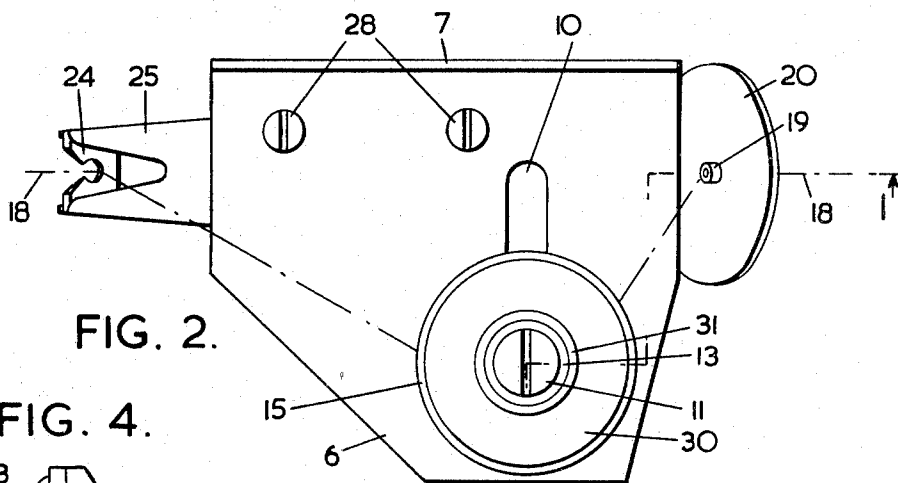


FIG. 4.

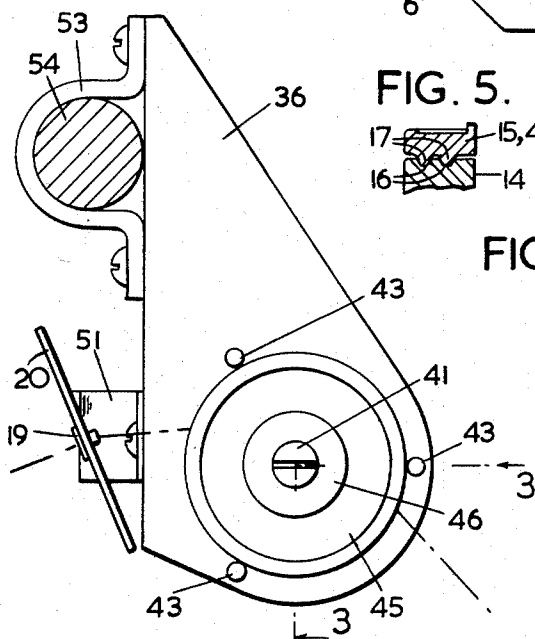


FIG. 5.

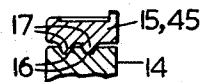
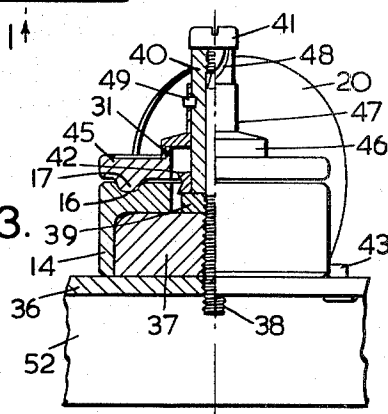


FIG. 3.



W. S. BROWN
INVENTOR

J. H. Brown
ATTORNEYS

1

2,720,366

YARN TENSIONING DEVICE

William Saville Brown, Spondon, near Derby, England,
assignor to British Celanese Limited, a British company

Application September 15, 1953, Serial No. 380,299

Claims priority, application Great Britain
September 30, 1952

4 Claims. (Cl. 242—150)

This invention relates to yarn tensioning devices, and particularly to devices of the kind in which tension is developed in a yarn by the engagement of the yarn with frictional surfaces in contact with which the yarn runs.

According to the present invention a yarn tensioning device comprises a pair of friction elements disposed face-to-face, one provided with a projecting ridge and the other with a groove matching and registering with said ridge, said elements being pressed together (preferably by the weight of one of them) upon a yarn extending between them and being adapted to nip said yarn when the tension therein is low and to be moved apart by said tension when it increases. Most conveniently the two elements are of circular form and are mounted for rotation about a central axis so that one or both can be rotated slowly by the passage of the yarn as is usual in the conventional type of disc tension device. The projecting ridge and the matching groove will then be circular, and concentric with the axis of rotation of the friction elements, and will be engaged twice by the yarn as it passes into and out of engagement with the friction elements. Two or more ridges, and corresponding matching grooves may be employed if desired.

The tension device of the present invention is particularly useful as a creel tension device in warping operations, or in other situations in which it is desirable that tension should be maintained on the output side of the device even after the running of the yarn through the device has been stopped. During the running of the yarn the yarn is not nipped between the friction elements, the pressure of the yarn against the friction elements being derived wholly from the tension in the yarn. When the yarn is stopped, however, so that the tension on the output side of the device may fall away to zero, the friction elements are pressed together so as to nip the yarn and to maintain a pressure thereon independent of the tension in the yarn, whereby tension can still be maintained on the output side of the device. This is particularly useful in warping operations. The tension device, however, is not limited to such operations but may be employed generally in situations in which tension devices of the disc type can be used.

In the operation of the device, the separation of the friction elements by the tension in the yarn reduces the factor by which the tension in the yarn is multiplied in passing through the device, by reducing the angle of contact made by the yarn with the friction elements. According to a further feature of the invention, however, provision may be made to reduce the tension ratio still further, independently of the action of the yarn tension in separating the friction elements. Where the friction elements are circular, and are arranged to rotate, this rotation (which takes place only while the yarn is in motion) may be employed directly or indirectly to increase separation of the elements. Thus, between a fixed central spindle and the upper friction element there may be interposed a sleeve, freely mounted on the spindle, and

2

provided with a helical groove engaged by a pin or other inward projection from the upper friction element. The sleeve can then be provided with a pulley adapted to be engaged by the yarn as it passes between the friction elements, and to impart to the sleeve a tendency to rotate faster than the upper friction element, whereby the helical groove formed in the sleeve and engaged by the upper friction element tends to lift the upper friction element from the lower. Alternatively, the sleeve may be frictionally retarded (e. g. by its engagement with the central spindle) so that the upper friction element is lifted by its tendency to rotate faster than the sleeve, the helical groove being formed, in this case, in the opposite direction to that used when the sleeve is yarn-driven.

By way of example, two forms of tension device in accordance with the present invention will now be described in greater detail with reference to the accompanying drawing in which,

Figure 1 is an elevation, partly in section on the lines 1—1 of Figure 2, of one form of tension device,

Figure 2 is a plan of the same tension device,

Figures 3 and 4 are similar views of a second form of tension device, and

Figure 5 is a fragmentary sectional view showing a variation in detail of the tension devices of Figures 1—4.

Referring to Figures 1 and 2, the tension device shown therein comprises a sheet metal base plate 6 having an up-turned stiffening flange 7 and two obliquely descending flanges 8, 9, folded upon themselves. The plate 6 is slotted at 10 for the attachment of a fixed spindle 11 which is adjustably secured by means of a nut 12 beneath the plate 6. Surrounding the spindle 11 is a sleeve 13 of wear-resisting ceramic material, round which are fitted two friction elements 14, 15. The lower friction element 14 is an inverted cup-shaped member, the skirt of which rests on the base plate 6, while the upper friction element 15 is in the form of a disc of the same diameter as the lower friction element 14, on which it rests. Both friction elements are centred by their engagement with the sleeve 13 which passes through a central hole in each of the elements.

Surrounding and concentric with the central hole in the upper surface of the lower friction element 14 is a groove 16 of approximately semi-circular section with rounded edges. The upper friction element 15 is formed on its under surface with a circular ridge 17 of semi-circular cross-section which fits into the groove 16. The ridge 17 is somewhat deeper than the groove 16 so that the remaining parts of the faces of the two elements 14, 15 are always spaced apart. The elements 14, 15 are moulded to the required shapes and are made of a hard ceramic material or other suitable friction material capable of being moulded.

The yarn, indicated at 18, is guided horizontally into the device by means of a porcelain eye 19 disposed at about the level of the upper surface of the lower friction element 14 and mounted in the middle of a circular balloon plate 20 of about 1½" in diameter. The balloon plate 20 has a lug or extension 21, vertically slotted at 22 and adjustably secured to the flange 8 by means of a screw 23. The yarn is guided out of the device by a porcelain V-guide 24 mounted in a bracket 25, the lower part of which is slotted similarly to the lug 21 and is secured to the flange 9 by means of a screw 26. Beneath the plate 6 is fitted a U-shaped clip 27 secured by means of screws 28 and enabling the tension device to be mounted on a horizontal rail 29 of a textile machine in which the tension device is to be used, for example a pirn winding machine.

In the operation of the device when the yarn 18 is running through the device, tension in the yarn, acting on the crown of the ridge 17 of the upper friction element

3

15, lifts that element out of contact with the lower friction element 14. The pressure of the yarn against the friction elements is thus solely due to the tension in the yarn as it passes in contact with them, and the tension in the yarn is accordingly increased by its passage through the device to a degree depending on the total angle through which the yarn is deflected by its contact with the friction surfaces. Thus, the higher the tension in the yarn the less will be the ratio in which the tension is multiplied by its passage through the device. When, for any reason, the yarn ceases to be drawn through the device, which would be liable to allow the tension in the yarn to fall to zero, the upper friction element 15 drops into engagement with the lower friction element 14, nipping the yarn 18 at two points between the ridge 17 and the groove 16 so that tension can be maintained on the output side of the tension device. In this way the device is able to maintain a substantial degree of tension on the stationary yarn which, however, does not unduly increase when the yarn is caused to run through the device or when the speed of the running yarn increases.

The increase of tension imparted by the device can be adjusted by varying the position of the spindle 11 along the slot 10, and also by varying the total weight of the upper friction element 15. This can be done by adding or removing tension weights in the form of washers indicated at 30 in Figure 1. If desired, the elements 14, 15 can be reversed, the member 14 being used as the upper and 15 as the lower friction element. This enables a larger number of tension weights 30 to be used, accommodated in the well of the inverted element 14. The element 15 rests with its projecting flange 31 in contact with the base plate 6. The adjustability of the guides 19 and 24 enables their height to be reduced so as to lead the yarn accurately through the device when the elements are inverted. The yarn entering the device may be arranged, also by the adjustment of the height of the guide eye 19, at a slight angle to the horizontal as shown in Figure 1. This enables the frictional engagement with the yarn of the upper or lower friction member to be varied so as to ensure a slow rotation of the elements during the operation of the device, by which wear on the elements is distributed round their whole periphery.

The device shown in Figures 3 and 4 comprises a sheet metal base plate 36 on which rests a cylindrical base block 37 secured thereto by means of a central spindle 38 whose lower end is screw-threaded into the base block 37 and the base plate 36, the assembly being tightened by means of a lock nut 39 lying over the base block. The upper end of the central spindle 38 terminates in a sharp conical point. Over the spindle is slipped a sleeve 40 whose upper end is closed by a screw 41 having a conical recess at its tip into which the point of the central spindle 38 enters so as to carry the weight of the sleeve 40. To the lower end of the sleeve 40 is fixed a fibre pulley 42 with a V-groove round its edge, which is suspended just clear of the lock nut 39.

Over the base block 37 is placed the lower friction element 14, similar to that of Figure 1, the skirt of the member resting on the base plate 36 and being centred by means of three short pins 43 extending upwards through the base plate and disposed symmetrically round the spindle 38. The central hole in the member 14 accommodates the lock-nut 39 and part of the pulley 42, the bottom of the pulley groove being just level with the upper surface of the element 14.

The upper friction element 45 is similar to the element 15 of Figures 1 and 2, but is carried by a cap 46 whose depending edges are secured to the upstanding flange 31, the middle of the cap being in the form of an upwardly extending tube 47 surrounding and closely fitting the sleeve 40. The sleeve 40 is formed externally with a helical groove 48, of about 1" pitch and $\frac{1}{16}$ " width, into which fits the inner end of a pin 49 driven through the wall of the tube 47.

4

The yarn is guided horizontally into the device by means of a porcelain eye 19 and balloon plate 20 similar to those of Figures 1 and 2 but mounted in a vertical plane. A lug 51 extending downwards from the lower edge of the plate 20 is bent laterally and upwards, and is bolted to a downwardly extending flange 52 formed by bending down one edge of the base plate 36. The downwardly extending flange 52 also has bolted to it a U-shaped clip 53 for securing the tension device to a vertical pillar 54 of the machine in which the tension device is to be used, e. g. a warping creel. The balloon plate 20 can be twisted about a vertical axis to face the direction from which the yarn is to reach the tension device. The yarn, after passing through the porcelain eye 19 enters horizontally between the lower and upper friction elements 14, 45, crosses the line of the ridge 17 and groove 16 in those elements, passes into driving contact with the bottom of the V-groove in the fibre pulley 42, and again crosses the line of the ridge 17 and groove 16 to proceed to the point where the yarn is to be used. As in Figures 1 and 2, the higher the tension in the yarn, the less will be the degree to which the tension is increased by its passage through the device. In addition, however, the yarn engaging the fibre pulley 42 tends to rotate the sleeve 40 on which the fibre pulley is mounted at a greater angular speed than the upper friction member 45. This tendency, acting through the helical groove 48 formed in the sleeve, and through the pin 49 engaging that groove, tends to lift the upper friction element 45 still further out of engagement with the lower friction element 14 and still further reduces the degree by which the yarn tension is increased by its passage through the device.

While in Figures 1 and 3, the element 14 is shown with a single groove 16, and the elements 14, 45 with a single matching ridge 17, a plurality of grooves 16 may be provided if desired, as shown in Figure 5.

Having described my invention, what I desire to secure by Letters Patent is:

1. A yarn tension device comprising a central spindle, a pair of friction elements disposed face-to-face and mounted for the rotation of at least one of said elements about said spindle by the passage of a yarn between said elements, means for pressing said elements together upon said yarn and means actuated by the rotation of one of said elements to urge said elements apart against the action of said pressing means, so as to reduce the pressure on said yarn.

2. A yarn tension device comprising a central spindle, a pair of friction elements disposed face-to-face and mounted for the rotation of at least one of said elements about said spindle by the passage of a yarn between said elements, means for pressing said elements together upon said yarn, and a rotatable sleeve interposed between said spindle and said rotatable element, said sleeve and said rotatable element being furnished one with a helical groove and the other with a projection engaging said groove, said sleeve and said rotatable element being adapted to rotate to different extents so that said rotatable element is urged by the engagement between said helical groove and said projection against the action of said pressing means, so as to reduce the pressure upon said yarn.

3. A yarn tension device comprising a central spindle, a pair of friction elements disposed face-to-face and mounted for the rotation of at least one of said elements about said spindle by the passage of a yarn between said elements, means for pressing said elements together upon said yarn, a rotatable sleeve interposed between said spindle and said rotatable element, and a pulley mounted on said sleeve and adapted to be engaged by said yarn in passing between said friction elements, said sleeve and said rotatable element being furnished one with a helical groove and the other with a projection engaging said groove, said sleeve and said rotatable element being adapted to rotate to different extents so that said rotatable element is urged by the engagement between said helical groove and said

5

projection against the action of said pressing means, so as to reduce the pressure upon said yarn.

4. A yarn tension device comprising a central spindle, a pair of friction elements disposed face-to-face and mounted for the rotation of at least one of said elements about said spindle by the passage of yarn between them, one of said elements being provided with at least one projecting annular ridge and the other with at least one groove matching and registering therewith, pressing means for pressing said elements together upon said yarn and

5

10

6

means actuated by the rotation of one of said elements to urge said elements apart against the action of said pressing means, so as to reduce the pressure on said yarn.

References Cited in the file of this patent

UNITED STATES PATENTS

849,295	Wardwell	Apr. 2, 1907
1,630,426	Hasbrouck	May 31, 1927
2,124,422	Klein	July 19, 1938
2,624,527	Von Kohorn	Jan. 6, 1953