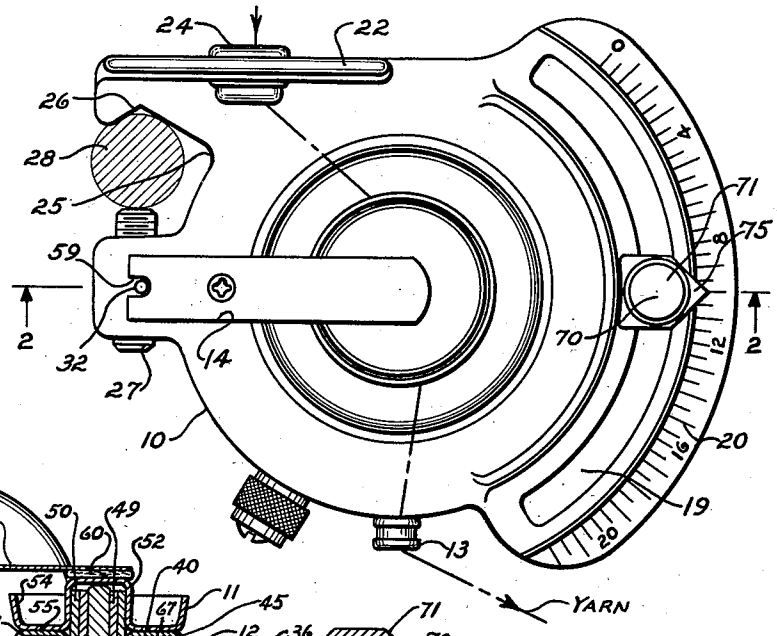
May 20, 1952 J. WARWICK 2,597,044

YARN TENSION CONTROL DEVICE

Filed March 28, 1950

Fig. 1



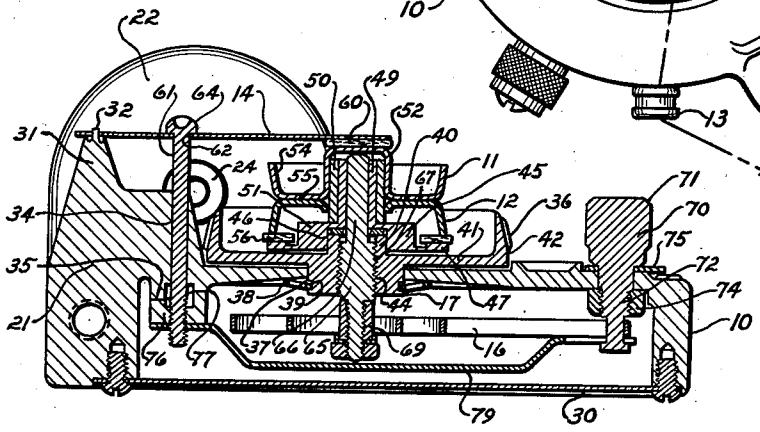


Fig. 2

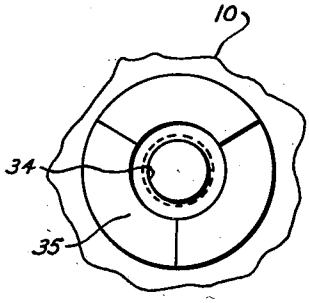


Fig. 4

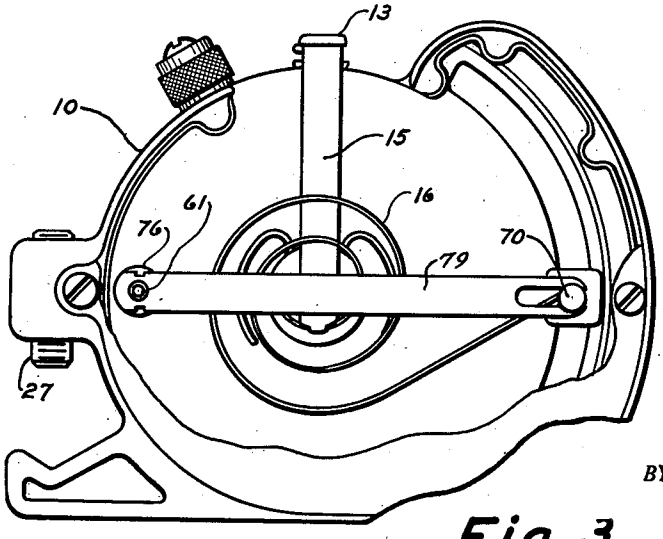


Fig. 3

INVENTOR.
JOHN WARWICK

BY Ernest A. Joerren

ATTORNEY

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YARN TENSION CONTROL DEVICE

John Warwick, Belleville, N. J., assignor to Specialties Development Corporation, Belleville, N. J., a corporation of New Jersey

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21 Claims. (Cl. 242—150)

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The present invention relates generally to yarn tension control devices, and, more particularly, relates to such devices adapted to control tension in the warping of yarn on beams or the like.

In preparing yarn for weaving or certain types of knitting, a warp is provided which comprises a long spool-like device, known as the beam, upon which long lengths of many threads or ends of yarn are wound in parallel relation. In order that the fabric manufactured from the warp has a uniform texture, it is desirable that the ends are uniformly tensioned while being wound on the beam to facilitate supplying uniformly tensioned warp threads to the frame of the weaving or knitting machine.

Heretofore, attempts have been made to uniformly warp the beams by applying a uniform fixed force on each of the threads or ends to tension the same. However, the results attained by this method were not entirely successful, because of variations in the input tension or back-drag of the yarn prior to being tensioned and because of variations in the coefficient of friction of the yarn, due to slight differences in the manner of preparing, finishing and handling the yarn. Such variations in the yarn resulted in the warping of ends at tensions which varied sufficiently to cause difficulties both in the warping and weaving or knitting operations. In order to allow for these differences in tension, the average tension of the ends was approximated and the beam was rotated at speeds for properly warping yarn at such average tension. As a result, the warper was operated considerably slower than would normally be possible, thus sacrificing its efficiency.

Accordingly, an object of the present invention is to provide a simple, economical tension control device which overcomes the foregoing difficulties.

Another object is to provide such a device which is particularly adapted for controlling the tension in yarn during the warping thereof.

Another object is to provide such devices which are compact in construction and are adaptable for use with the creel from which the yarn is supplied to the warper.

Another object is to provide such a device which accurately establishes a desired tension in the yarn without being influenced materially by back-drag, input tension or inherent variations in the coefficient of friction of the yarn.

A further object is to provide such devices which enable the warper to be operated at higher speeds than heretofore made possible to thereby increase the efficiency and output of the warper without sacrifice in quality.

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Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the invention, the foregoing objects are accomplished by providing a yarn tension control device generally comprising a pair of members for receiving yarn therebetween, a support for one of the members having an aperture provided with screw means such as a screw thread, cam or the like, means such as a spring for urging the other member towards the supported member, a screw member cooperating with the screw means for engaging the other member and moving the same away from the supported member in opposition to the means for urging the members together, a control arm for rotating the screw member, and means such as a spring for resisting operation of the control arm. In a preferred embodiment of the invention about to be described, the supported member is cushioned to prevent chattering; the screw means are adjustable for positioning the member for reception of yarn of various diameters; and the springs are adjustable, preferably simultaneously, to vary their effectiveness.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

Figure 1 is a top plan view of a device in accordance with the invention.

Figure 2 is a sectional view taken along the line 2—2 on Figure 1.

Figure 3 is a fragmentary plan view taken from the underside of the device.

Figure 4 is a plan view illustrating a detail of the device.

Referring to the drawing in detail, there is shown a yarn tension control device generally comprising a base 10, upper and lower yarn tensioning discs 11 and 12, a leaf spring 14 for urging the discs together, and mechanism for moving the discs apart including a control arm 15 responsive to the tension in the yarn and having a yarn guide 13 at its outer end, and a spiral spring 16 for opposing movement of the arm.

The base 10 is provided with a central opening 17 (Figure 2), an arcuate slot 19 having indicia 20 adjacent thereto, an upwardly extending formation 21, an anti-ballooning target 22 inter-

mediate the slot and the formation having a yarn guide 24 mounted therein, and a recess 25 between the target and the formation having a portion 26 cooperating with a screw 27 extending through the formation for securing the base to a rod 28 or other structure of the creel, warper or other apparatus on which the device is utilized. The underside of the base is hollow and is adapted to be closed by a cover 30 detachably secured thereto in any suitable manner.

The formation 21 has a projection 31 thereon formed with a pin-like apex portion 32, and has an aperture 34 extending vertically therethrough located in a radial plane and positioned intermediate the projection 31 and the central opening 17. A cam surface 35 is formed on the underside of the base and surrounds the aperture 34 (Figure 4).

The lower disc 12 is supported on the base by means including a bushing 36 comprising a lower hub 37 rotatably mounted in the central opening and provided with an annular recess 39 adjacent its lower end for receiving a spring clip 38 adapted to resist rotation of the bushing, an upper hub or boss 40, and a flange 41 intermediate the hubs and formed with a knurled upright rim 42 adapted for manual engagement to facilitate rotating the bushing. A threaded central aperture 44 extends through the hubs. The disc supporting means further include a member 45 having a central recess 46 at the underside for receiving the upper hub 40 to support the member 45 thereon. The member 45 comprises a flange 47 surrounding the recess 46 and an upwardly extending tubular sleeve portion 49. A collar 50 surrounds the sleeve portion 49 and is supported on the member 45. In order to mount the discs 11 and 12 on the supporting means just described, the lower disc 12 has a central aperture for receiving the collar 50 and has a depending flange 51 for supporting itself on the flange 47.

The upper disc 11 has a central inverted cup-shaped portion 52 for receiving the collar 50 and has an upright flange 54. Both discs 11 and 12 have an annular surface 55 between which the yarn passes for applying tension thereto. The top of the portion 52 is conical (Figure 2).

It has been found that chattering of the discs 11 and 12 can be eliminated by interposing a felt washer 56 or the like between the flange 51 of the disc 12 and its supporting flange 47 of the member 45.

The upper disc 11 is held against the lower disc 12 by the spring 14. One end of the spring is supported on the projection 31 and has a recess 59 (Figure 1) for receiving the apex pin 32. The other end of the spring extends across the top of the cup-shaped portion 52 of the upper disc and has a felt disc 60 on the underside thereof which acts as a brake on the conical top to control rotation of the discs. The spring is urged downwardly to seat its ends on the projection 31 and the upper disc 11, respectively, by a rod 61 extending through an aperture 62 in the spring between its ends and having a head 64 for engaging the upper surface of the spring. The rod 61 is mounted for sliding movement in the aperture 34 of the base formation 21 and such movement is effected by means described hereinafter.

The upper disc 11 is adapted to be raised in opposition to the spring 14 by mechanism which includes a screw member 65 comprising a rod-like upper section 66 extending through the sleeve 49 for engaging the underside of the cup-shaped portion 52 of the upper disc, an intermediate

threaded section 67 which extends through the aperture 44 of the bushing 36 and cooperates with the threads therein, and a lower section having a collar 69 secured thereto.

The inner end of the control arm 15 is secured to the collar 69 whereby movement of the arm in response to variation of the tension in the yarn effects rotary movement of the screw member 65 which by reason of its threads and the threads of the aperture 44 is moved vertically upwardly and downwardly in small increments to control the movement of the upper disc 11.

The spiral spring 16 which resists operation of the control arm has its inner end secured to the collar 69 and has its outer end connected to a member 70 positioned in the slot 19. The effectiveness of the spring 16 may be varied by adjusting the position of the member 70 in the slot. To facilitate the latter, the member 70 comprises a knob portion 71 and a threaded shank 72 cooperating with clamping means such as a nut 74 for securing the member 70 in desired positions of adjustment. The member also carries a pointer or index member 75 which cooperates with the indicia to indicate the value of the force that the spring 16 is adapted to exert.

The force exerted by the spring 14 may be adjusted simultaneously with the adjustment of the spring 16. Such mechanism, as shown, includes a cam member 76 secured to the lower end of the rod 61 and having a cam surface 77 identical to and adapted to cooperate with the cam surface 35 (Fig. 4), whereby upon rotation of the cam member 76, the rod is raised and lowered by adjusting the spring 14. To effect such rotation of the cam member 76, an arm 79 has one end secured to the cam member and has its other end pivotally connected to the adjusting member 70 (Figures 2 and 3).

In order to adjust the device described herein, the bushing 36 is rotated to raise or lower the screw member 65 which spaces the upper disc 11 with respect to the lower disc to accommodate yarn of a given diameter. The yarn is then passed through the guide 24, between the discs 11 and 12 and through the guide 13, as shown in Figure 1. The member 70 is next positioned to adjust the resistance of the spring 16 to movement of the control arm 15 and to adjust the force of the spring 14 holding the discs together, thereby determining the tension to be put into the yarn.

As the yarn passes through the device, the control arm 15 will respond to variations in the tension thereof to operate the screw member 65 which in turn varies the relative positions of the yarn discs 11 and 12 to compensate for such variations in tension, whereby the output tension of the yarn is maintained substantially uniform.

From the foregoing description, it will be seen that the present invention provides a tension control device particularly adapted for warping, which has numerous advantages. The device maintains uniform tension on every end in the warp, while the yarn passes therethrough at a rate as high as about 900 yards per minute without subjecting the beam to high strains or buckling due to excessive tension. The device eliminates stressed yarn or "shiners" and minimizes the "down time" due to high tension breakage or loose end stoppage. The device is simple, compact and sturdy in construction, is economical to manufacture, and is easy to adjust and thread.

As various changes may be made in the form,

construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. A yarn tension control device comprising a pair of members for receiving the yarn therebetween, a support for one of said members having an aperture provided with screw means, means for urging said other member towards said supported member, a screw member cooperating with said screw means and extending through said support and said supported member for engaging said other member, a control arm operable by the yarn passing between said members for rotating said screw member and causing said other member to be moved away from said supported member, and means for resisting operation of said arm.

2. A yarn tension control device comprising a base having an aperture extending upwardly therethrough provided with a screw means, a friction disc supported on said base having a central aperture in registry with said base aperture, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw means and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause said screw to raise said second disc, and a spring for resisting operation of said arm.

3. A yarn tension control device comprising a base having an aperture extending upwardly therethrough, a bushing rotatably mounted in said aperture provided with a screw means, a friction disc supported on said base having a central aperture in registry with said bushing, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw means and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause said screw to raise said second disc, and a spring for resisting operation of said arm.

4. A yarn tension control device comprising a base having an aperture extending upwardly therethrough, a bushing rotatably mounted in said aperture provided with a screw means, a friction disc supported on said base having a central aperture in registry with said bushing, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw means and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause said screw to raise said second disc, a spring for resisting operation of said arm, and means associated with said bushing for restraining rotation thereof.

5. A yarn tension control device comprising a base, a friction disc supported on said base, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a leaf spring secured to said base for urging said second disc towards said first disc, a control arm mounted on said base operable by the yarn passing between said discs, means connected to said arm for raising said second disc, and a spring for resisting operation of said arm.

6. A yarn tension control device comprising a base having an aperture extending upwardly therethrough and provided with a screw means and having a circumferential slot, a friction disc supported on said base having a central aperture in registry with said base aperture, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw thread and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause the screw to raise said second disc, a spring for resisting operation of said arm having one end secured to said arm, and means movably mounted in said slot having the other end of said last mentioned spring secured thereto for varying the effectiveness thereof.

7. A yarn tension control device comprising a base, a cushion member mounted on said base, a friction disc supported on said cushion member, a second friction disc superimposed on said first friction disc for cooperation therewith to receive the yarn therebetween, spring means for urging said second friction disc towards said first friction disc, a control arm mounted on said base operable by the yarn passing between said friction discs means connected to said arm for raising said second friction disc, and a spring for resisting operation of said arm.

8. A yarn tension control device comprising a base, a cushion member mounted on said base, a friction disc supported on said cushion member, a second friction disc superimposed on said first friction disc for cooperation therewith to receive the yarn therebetween, a leaf spring secured to said base having an end for urging said second friction disc towards said first friction disc, cushioning means between said spring end and said second disc, a control arm mounted on said base operable by the yarn passing between said friction discs, means connected to said arm for raising said second friction disc, and a spring for resisting operation of said arm.

9. A yarn tension control device comprising a base having an aperture extending upwardly therethrough, a member including a bushing rotatably mounted in said aperture provided with a screw bore and including a flange on said base for rotating said bushing, a friction disc having a central aperture in registry with said bushing bore, a second friction disc superimposed on said first disc for cooperation therewith to receive yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw bore and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to the lower end of said screw for effecting rotation thereof to cause said screw to raise said second disc, and a spring at the underside of said base for resisting operation of said arm.

10. A yarn tension control device comprising a base having an aperture extending upwardly therethrough, a member including a bushing rotatably mounted in said aperture provided with a screw bore and including a flange on said base for rotating said bushing provided with peripheral recesses, a friction disc having a central aperture in registry with said bushing bore, a second friction disc superimposed on said first disc for cooperation therewith to receive yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw bore and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to the lower end of said screw for effecting rotation thereof to cause said screw to raise said second disc, a spring at the underside of said base for resisting operation of said arm, and resilient means on said base cooperating with said peripheral recesses for restraining rotation of said flange.

11. A yarn tension control device comprising a base having an aperture extending upwardly therethrough, a member including a bushing rotatably mounted in said aperture provided with a screw bore and including a flange on said base for rotating said bushing provided with a central recess, an annular cushion member in said recess, a friction disc on said cushion member having a central aperture, a second friction disc superimposed on said first disc for cooperation therewith to receive yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw bore and extending through said cushion member and said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to the lower end of said screw for effecting rotation thereof to cause said screw to raise said second disc, and a spring at the underside of said base for resisting operation of said arm.

12. A yarn tension control device comprising a base having an aperture extending upwardly therethrough and a circumferential slot, a member including a bushing rotatably mounted in said aperture provided with a screw bore and including a flange on said base for rotating said bushing, a friction disc having a central aperture in registry with said bushing bore, a second friction disc superimposed on said first disc for cooperation therewith to receive yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw bore and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to the lower end of said screw for effecting rotation thereof to cause said screw to raise said second disc, a spring at the underside of said base for resisting operation of said arm having one end secured to said arm, and means movably mounted in said slot having the other end of said last mentioned spring secured thereto for varying the effectiveness thereof.

13. A yarn tension control device comprising a substantially circular base having a central aperture extending upwardly therethrough, a circumferential slot, and an upright post opposite said slot; a member including a bushing rotatably mounted in said aperture provided with a screw bore and including a flange on said base for rotating said bushing provided with peripheral recesses and a central recess; an annular cushion member in said central recess; a friction disc on said cushion member having a central aperture; a second friction disc superimposed on said first disc for cooperation therewith to receive yarn therebetween; a leaf spring having one end secured to said post and having cushion means on its other end positioned for urging said second disc towards said first disc; a screw cooperating with said screw bore and extending through said cushion member and said disc aperture for engaging said second disc; a control arm operable by the yarn passing between said discs and connected to the lower end of said screw for effecting rotation thereof to cause said screw to raise said second disc, a spring at the underside of said base for resisting operation of said arm having one end secured to said arm, means movably mounted in said slot having the other end of said last mentioned spring secured thereto for varying the effectiveness thereof, and resilient means on said base cooperating with said peripheral recesses for restraining rotation of said flange.

14. A yarn tension control device according to claim 13, wherein said base has a pair of spaced apart stops for said arm intermediate said slot and said post and has an upright wall opposite said stops provided with means for guiding yarn therethrough.

15. A yarn tension control device comprising a base having an aperture extending upwardly therethrough provided with a screw means and having an upright wall spaced from said aperture provided with means for guiding the yarn therethrough, a friction disc supported on said base having a central aperture in registry with said base aperture, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw means and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause said screw to raise said second disc, and a spring for resisting operation of said arm, said base having a pair of spaced apart stops for said arm opposite said upright wall.

16. A yarn tension control device according to claim 15, wherein said base has an upright post intermediate said wall and said stops and said first mentioned spring is a leaf spring having one end secured to said post.

17. A yarn tension control device comprising a base having an aperture extending upwardly therethrough provided with a screw means, a friction disc supported on said base having a central aperture in registry with said base aperture, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw means and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause said screw to raise said second disc, a spring for resisting operation of said arm, and means for simultaneously varying the effectiveness of both of said springs.

18. A yarn tension control device comprising a base, a friction disc supported on said base, a second friction disc superimposed on said first

disc for cooperation therewith to receive the yarn therebetween, a leaf spring secured to said base for urging said second disc towards said first disc, a control arm mounted on said base operable by the yarn passing between said discs means connected to said arm for raising said second disc, a spring for resisting operation of said arm, and means for simultaneously varying the effectiveness of both of said springs.

19. A yarn tension control device comprising a base having an aperture extending upwardly therethrough and provided with a screw means and having a circumferential slot, a friction disc supported on said base having a central aperture in registry with said base aperture, a second friction disc superimposed on said first disc for cooperation therewith to receive the yarn therebetween, a spring for urging said second disc towards said first disc, a screw cooperating with said screw thread and extending through said disc aperture for engaging said second disc, a control arm operable by the yarn passing between said discs and connected to said screw for effecting rotation thereof to cause the screw to raise said second disc, a spring for resisting operation of said arm having one end secured to said arm, means movably mounted in said slot having the other end of said last mentioned spring secured thereto for varying the effectiveness thereof, a pivotally mounted arm having its free end connected to said last mentioned means, and means at the other end of said last mentioned arm including a cam for varying the effectiveness of said first mentioned spring.

20. A device for tensioning yarn comprising a pair of friction discs including an upper disc and a lower disc arranged for receiving the yarn therebetween and said upper disc being movable with respect to said lower disc, a fixed cam, follower means engaging said fixed cam and being mounted for rotation with respect thereto, an element engaging said upper disc and urging the same towards said lower disc, means connecting said element and said follower means, and means for effecting rotative movement of said follower means to render said element at least partially ineffective.

21. A device for tensioning yarn comprising a base, a lower friction disc supported by said base, an upper friction disc mounted on said lower disc and arranged with respect thereto for receiving the yarn therebetween, said upper disc being movable with respect to said lower disc, a leaf spring connected to said base and engaging said upper disc to urge the same towards said lower disc, an upright rod slidably mounted on said base having its upper end connected to said spring, an arm pivotally mounted at one end thereof, and cam means associated with said pivotally mounted end of said arm for moving said rod to vary the force exerted by said spring on said upper disc.

JOHN WARWICK.

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