Fig. 1.

Fig. 2.

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YARN TENSIONING DEVICE
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ABSTRACT OF THE DISCLOSURE
A yarn tensioning device having a friction brake and a magnetic responsive plate that engages the brake, the plate being secured to a pulley over which the yarn is driven. A magnet is mounted for movement toward and away from the plate for controlling the amount of pressure applied by the plate to the friction brake.

This invention relates to a device for tensioning strand material such as yarn, thread and the like, and more particularly to such a device which assists in the controlled feeding of elastic strand material.

Textile machines such as knitting machines require that the yarn or other strand material fed to the machine be under proper tension for successful operation. At present various devices are used for applying this tension. It is difficult however with these devices to change the amount of tension as required under different circumstances. Moreover, accumulation of lint cannot be removed too easily. Additionally, when such devices have a high inertia, there is a danger of the yarn breaking if intermittent operation (i.e., stop and go knitting) is attempted. Furthermore, the sticky characteristics of, for example, spandex yarns makes conventional tensioners impractical.

An object of this invention is to provide a tensioning device which overcomes the above indicated disadvantages.

In accordance with this invention, the tensioning device includes a support rod having a pulley operably mounted thereon, over which the yarn passes before it is fed to the textile or knitting machine. A magnet loaded friction brake controls the degree of freedom of the pulley, which in turn applies tension to the elastic yarn. The magnetic influence to the friction brake results from a magnet mounted on the support rod for movement toward and away from the friction brake. Accordingly, if the magnet is moved toward the friction brake, there is a strong braking effect which would result in the application of greater tension to the yarn. Conversely, when the magnet is moved away from the friction brake, the amount of tension is decreased.

In an advantageous form of this invention the magnet is threadable on the support rod. The pulley, in turn, is detachably mounted on a spindle at the end of the threaded support rod. A magnetically influenced plate is secured to one side of the pulley in contact with the friction brake. This plate is the only part of the pulley-brake arrangement which is influenced by the magnet. Accordingly, for example, when the magnet is moved closer to the brake and plate, the plate responds by being drawn into firmer engagement with the brake to increase the yarn tension.

Regarding features and advantages of the present invention, it will be apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is an elevational view of one embodiment of this invention.

FIG. 2 is an elevational view on an enlarged scale of the yarn tensioning device shown in FIG. 1; and

FIG. 3 is a perspective view of the tensioner shown in FIGS. 1—3 used in a full fabric machine.

FIG. 1 shows the general setup of a textile machine which includes the yarn tensioning device of this invention. As shown in FIG. 1, the yarn 2 is fed from the elastic yarn package 4 to the roller guide assembly 6 which is mounted on a spider arm 8 and secured to yarn stand 10. Roller guide assembly 6 includes a balloon entering eyelet 12 through which the yarn is fed and a roller guide 14.

The yarn 2 is, for example, wrapped once around roller guide 14 and then over another roller guide 16. For example, if necessary a further roller not shown. This general arrangement may vary depending upon machine conditions. A slight amount of pretension not exceeding 5 grams, is applied to yarn 2 between roller guides 14 and 16 to control the yarn. The yarn is then wrapped once around yarn tension pulley 20 and goes to the yarn feeder position, where it is drawn into textile machine 26. The yarn is accurately guided through guide device 24.

FIG. 3 shows the yarn tensioner used in a full fashion knitting machine. In this arrangement yarn 2 is drawn over tension pulley 26 through eyelet 28 of guide device 24 and into full fashion machine 30 where it is engaged by sliding member 35. Sliding member 35 reciprocates from the position shown in full lines to the position shown in phantom. The later described yarn tensioning device is especially useful with intermittent knitting machines, such as full fashion machine 30, because these machines require constant tension from start to stop without override.

As shown in FIG. 2, a rubber O-ring 32 is positioned in the base of the pulley groove. Yarn 2 then becomes wedged between O-ring 32 and the side wall of pulley 20. This makes it possible for pulley 20 to satisfactorily drive both sticky and smooth yarns. This is particularly advantageous because heretofore pulleys with rough surfaces had to be used for smoother yarns and pulleys with smooth surfaces had to be used for sticky yarns. It is believed that the relatively sticky rubber wall on one side of yarn 2 and the smooth pulley wall on the other side provides the proper frictional characteristics for engaging both smooth and sticky yarns.

Yarn 2 is guided over pulley 20 by guide device 24. As shown in FIGS. 2—3 guide device 24 comprises a single strand of wire 25 bent to form a pair of loops or eyelets 28, 29 at each end with a somewhat central loop 27. Device 24 is secured in place with eyelets 28 and 29 on each side of pulley 20, by screw 31 passing through loop 27 into support plate 33.

FIG. 3 shows the details of the yarn tensioning device.

As indicated therein, pulley 20 rotates on spindle 21 which is secured to the end of threaded aluminum rod 34. The pulley 20 is detachably engaged by lock collar 36 to spindle 21 so that the pulley may be easily removed for cleaning and replacement. Pulley 20 is made of a non-magnetic material such as nylon. Magnetically influenced plate 38 made for example of steel is secured to one face of pulley 20. This plate 38 is engaged by friction brake 40 which is made, for example, of a plastic non-magnetic material. The amount of freedom of pulley 20 is accordingly determined by the pressure applied by plate 38 to friction brake 40. This pressure is in turn controlled by alnico magnet 42 which is attached to threaded collar 51 which is threaded on rod 34. Since all of the materials except steel plate 38 are non-magnetic, the magnet 42 only influences plate 38. Accordingly, when magnet 42 is moved closer to plate 38, the plate is drawn toward the magnet applying a greater amount of pressure to brake 40, which in turn decreases the speed of rotation of pulley 20 to thereby increase the tension of the yarn. Conversely, when magnet 42 is moved away from plate 38, the amount of tension of yarn 2 is reduced. The tension can be set up
and maintained in the range of for example approximately 5 to 50 grams. When the proper setting of magnet 42 has been achieved, the magnet is locked in place with threaded aluminum lock collar 53. Lock collar 53, which is non-magnetic, has a knurled surface to facilitate its manipulation on threaded rod 34. Lock collar 53 operates by being jammed against threaded collar 51 attached to magnet 42 to prevent the magnet from rotating and thereby changing its setting.

What is claimed is:

1. A device as set forth in claim 1 wherein said sticky track is an O-ring disposed about said groove base.

2. A device as set forth in claim 2 wherein said O-ring is rubber.

3. A device as set forth in claim 2 wherein said O-ring is rubber.

4. In a combination with a textile machine, a device for use in a yarn tensioning device for delivering yarn to said machine, a pulley, means mounting said pulley for rotation whereby yarn may be driven over said pulley, a peripheral groove in said pulley, the grooved portion of said pulley being a smooth working surface, a sticky track being in the base of said pulley groove, and said track having surfaces which slope from a point in the center of said groove downwardly toward the sides of said groove to provide a pair of troughs with each trough having a smooth surface and a sticky surface whereby yarn driven over said pulley may be wedged in one of said troughs between said smooth surface and said sticky surface for tensioning both smooth and sticky yarn.

5. The combination of claim 4 wherein said sticky track is an O-ring disposed about said groove base.

6. The combination of claim 5 wherein said O-ring is rubber.

7. A device as set forth in claim 1 in combination therewith a support rod, said pulley being mounted for rotation on said support rod, a magnetic responsive plate secured to said pulley, a friction brake on said support rod contacting said plate, and a magnet movably mounted on said support rod toward and away from said plate for controlling the amount of pressure applied by said plate to said friction brake.

8. A device as set forth in claim 7 wherein said support rod has a spindle portion at one end thereof, said pulley being mounted on said spindle portion, and a lock collar detachably mounting said pulley on said spindle portion.

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