July 14, 1942. R. N. TOONE 2,290,005

THREAD TENSIONING DEVICE

Filed Aug. 15, 1941 2 Sheets-Sheet 1

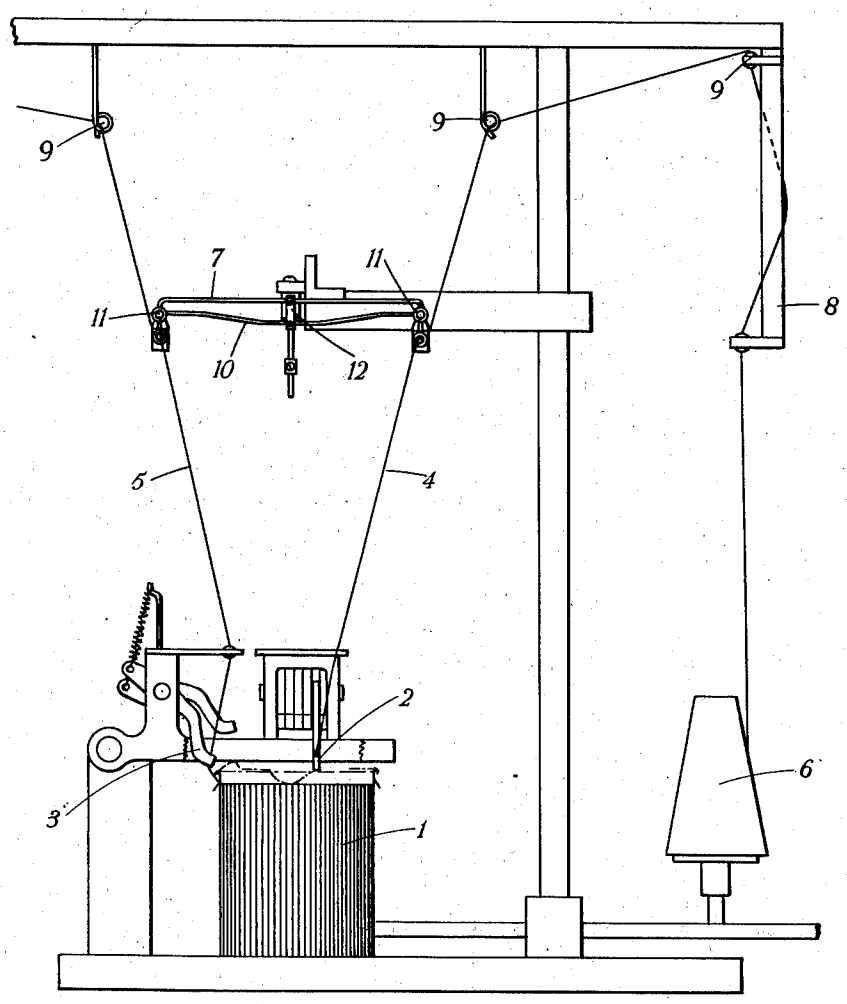


Fig. 1.

INVENTOR
Ralph N. Toone,
BY B. Collins.
ATTORNEY

July 14, 1942. R. N. TOONE 2,290,005

THREAD TENSIONING DEVICE

Filed Aug. 15, 1941 2 Sheets-Sheet 2

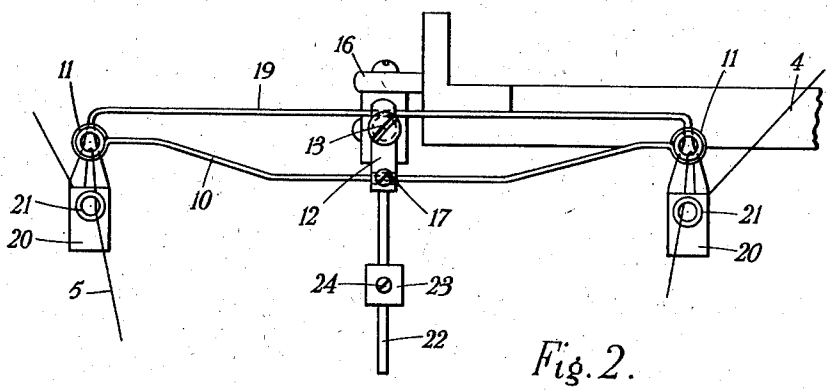


Fig. 2.

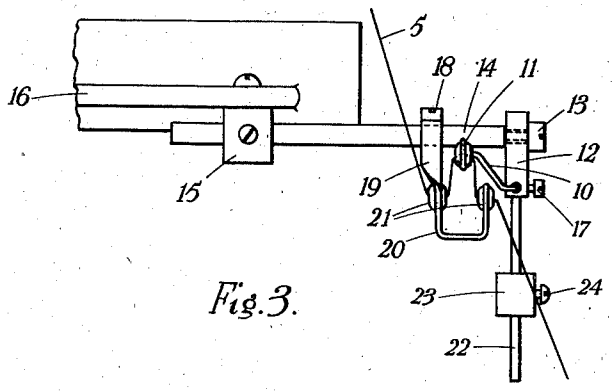


Fig. 3.

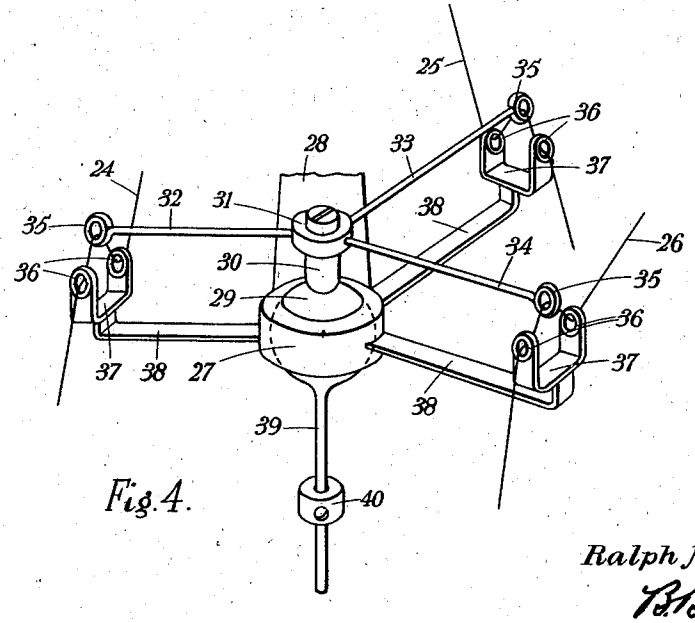


Fig. 4.

INVENTOR
Ralph N. Toone,
BY B. B. Ellings
ATTORNEY

Patented July 14, 1942 2,290,005

UNITED STATES PATENT OFFICE

2,290,005

THREAD TENSIONING DEVICE

Ralph Norman Toone, Wollaton Park, Nottingham, England, assignor to B. Toone (Nottingham) Limited, Nottingham, England

Application August 15, 1941, Serial No. 407,045
In Great Britain July 16, 1940

2 Claims. (Cl. 66—146)

This invention relates to improvements in thread tensioning devices and has particular, but not exclusive, reference to thread tensioning devices for circular knitting machines.

In connection with textile machines generally and particularly circular knitting machines it is frequently important to maintain a substantially constant tension on the thread as it is delivered to the needles or other position whereat it is worked up. If now two or more threads are being independently fed and independently knitted or worked up, particularly if they are knitted or worked up in close relationship with one another it is even more important to ensure that the tension of all the threads shall at all times be the same for the reason that lack of uniformity may be reproduced in the resultant fabric in the form of lines or other irregularities.

It is an important object of this invention to achieve this desideratum and with this and other objects in view the invention consists in the provision of a balanced member which is acted upon by all of the threads in such manner as to ensure that the tension of such threads remains substantially equal.

The arrangement is such that if the tension of one thread is momentarily increased the balance of said member is disturbed until the tension of all the threads is equalised.

The invention may be applied to any desired number of threads but is particularly suitable for maintaining the tension of two or three threads substantially equal.

The foregoing and other subsidiary features of the invention that are set out in the appendant claims are embodied in the examples now to be described with reference to the accompanying drawings, in which

Figure 1 illustrates the application of the invention to a dual feed circular knitting machine.

Figure 2 is an enlarged front elevational view of the thread controlling mechanism of Figure 1.

Figure 3 is a side view.

Figure 4 is a perspective view illustrating means for controlling three threads in accordance with this invention.

Referring now to Fig. 1 the knitting cylinder, provided with the usual complement of knitting needles and accessories, is indicated at 1 and such cylinder is rotated by any suitable means. The machine is referred to as a dual feed machine for the reason that there are two feeding stations and two sets of knitting cams so that two courses of knitting are produced at each revolution of the cylinder, but it will be understood that at either or both stations a plurality of yarn feeders may be provided in conjunction with means for throwing such feeders into and out of operation for the purpose of patterning, splicing or performing other operations in accordance with customary practice. Two ground yarn feeders, one at each station, are indicated at 2 and 3, such feeders respectively delivering to the needles yarn 4 and 5 drawn from independent supplies, one of which is indicated at 6. Intermediate the source of supply and the yarn feeder a balancing device generally indicated at 7 in Figure 1 is provided in accordance with this invention. In the passage of each yarn from its source of supply to the device 7 it is preferably tensioned by any convenient means such as by being twisted around a rod 8 and is guided by suitable eyes 9. Each yarn is tensioned in the same manner and as nearly as possible to the same extent, but it will be appreciated that as the yarns are drawn from their respective sources of supply during the knitting process variations of tension in the yarns occur due to irregularities in each yarn and numerous other causes and unless compensation for such variations is provided the same will be apparent in the resultant fabric and an imperfect fabric with streaks or lines will be produced. It will be appreciated that such defects will be most particularly apparent when knitting fine gauge fabric by the employment of fine (as opposed to coarse) yarns.

In the embodiment illustrated the balancing device 7 comprises a balanced beam or rod 10 provided at each end with a thread eye (preferably having an internal porcelain ring) or other thread-engaging part 11. When in balance this rod lies substantially in a horizontal plane and passes through a hole in a vertical block 12 pivotally mounted on a bolt 13 screwed into the forward end of a horizontal rod 14 fixed in and extending from a block 15 secured to the underside of a fixed frame 16. The rod 10 is fixed to the block 12 by a screw 17. Secured by means of a screw 18 to the rod 14 at a convenient position intermediate the blocks 12 and 15 is a flat strip member 19 which extends horizontally from either side of such rod and at each end is twisted and formed into a stirrup 20, each stirrup being formed with two opposed horizontal eyes (preferably porcelain lined) or other thread-engaging members 21, the axes of such eyes being parallel with one another and with the axis of each eye 11 and at right angles to the length of rod 10 and strip 19. Furthermore, each eye 11 is positioned

in a vertical plane equi-distant from the eyes of one pair of eyes 21 and a short distance thereabove. The threads 4 and 5 from their separate sources of supply are fed first through one eye of a pair 21, then through the associated eye 11 and then through the other eye of said pair from whence the thread passes to its yarn finger. Projecting vertically down from the base of the block 12 is a rod 22 on which a slidable weight 23 is fixed by a screw 24.

In operation when the tension of the yarns 4 and 5 is equal the balance of rod 10 is undisturbed. If now the tension of one yarn is for any reason increased so that the tension of such yarn is greater than that of the other yarn the length of thread passing from the associated pair of eyes 21 and through the associated eye 11 is reduced with the result that the balance of rod 10 is disturbed and that end through which the yarn of increased tension is passing is pulled down; consequently the opposite end is forced up with the result that the tension of the other yarn is necessarily increased until the tension of both yarns is the same. Similarly if when the rod 10 is horizontal the tension of one yarn is reduced that end of the rod contacting with such yarn rises and the other end falls thus reducing the tension of the other yarn until the tension of both yarns is the same. The weight 23 is constantly endeavouring to maintain the rod 10 horizontal and by adjusting the position of such weight on the rod 22 the moment exerted by such weight consequent upon movement of the rod 10 is varied and the device can thus be adjusted for different conditions such as the control of different types of yarn.

Figure 4 illustrates a suitable device in accordance with this invention for controlling three independent yarns 24, 25 and 26. A cup member 27 is carried by a fixed part 28 and a ball 29 is housed in said member 27 so as to be capable of limited rotary movement in all directions. A stem 30 projects vertically upwardly from said ball and at or near its upper end is fixed a collar 31 from which project in a radial direction three arms 32, 33, 34 spaced 120°. Each arm at each end is formed with an eye (preferably provided with a porcelain ring) 35 which is located midway between and a short distance above the two eyes of an opposed pair 36. The eyes 36, each preferably provided with a porcelain ring, are formed in stirrups 37 carried by arms 38 fixed to and extending from the member 27, each of said arms lying in substantially the same vertical plane as one of the arms 32, 33, 34. The axes of the eyes 36 of each pair are horizontal and parallel with the axis of the associated eye 35. Each yarn 24, 25, 26 preferably drawn from a separate supply is threaded through one of the eyes of a pair of eyes 36, then through the associated eye 35 and finally through the other eye of the pair 36 and from thence passes to a feeding station. Each yarn in its passage from its supply to the device illustrated in Figure 4 may be tensioned in any suitable manner such as illustrated and described with reference to yarn 4 of Figure 1. The ball 29 projects below the member 27 and is provided with a vertically depending rod 39 on which is slidably fixed a weight 40. Normally, the tension of all the yarns being equal, all of the arms 32, 33 and 34 assume a horizontal attitude. If now the tension of one yarn, say yarn 24 increases arm 32 drops, thus causing arms 33 and 34 to rise and thereby increase the tension of yarns 25 and 26 until the tension of all the yarns is the same. Similarly if the tension of one yarn, sav yarn 24 decreases, arm 32 rises and arms 33 and 34 drop until the tension of yarns 25 and 26 is the same as that of yarn 24. The weight 40 constantly tends to maintain the arms horizontal and the moment exerted by the weight on displacement of rod 39 from the vertical is controlled by fixing that weight in different positions on the rod; consequently the device can be adjusted to different conditions such as the control of different types of yarn.

Although the specific embodiments of the invention described illustrate the manner in which two or three yarns are controlled, it will be understood that the invention is not so limited and may be applied to the control of more than three yarns. For example, in the embodiment illustrated in Figure 4 there may be four or more arms 32, 33, 34 and stirrups 37 equally spaced and each functioning to control a yarn in the manner described.

I claim:

1. In a knitting or textile working machine operating upon a plurality of separately fed threads, means for maintaining substantially equalized tension upon all of the threads, comprising a plurality of rigidly interconnected arms each provided with a guide for one of said threads, said arms being pivotally supported and yieldably biased to a predetermined position; a rigidly mounted arm substantially paralleling each of said pivotally mounted arms; and thread guides carried by each of the rigidly mounted arms spaced from and normally out of alinement with the thread guide of the companion pivoted arm: each thread being zig-zagged through the associated guides of its pivoted and rigidly mounted arms, whereby variations in the tension upon any of the threads tend to disturb said predetermined biased position of the pivoted arms and correspondingly vary the tension upon the other threads.

2. In a knitting or textile working machine utilizing a plurality of threads withdrawn under tension from independent sources of supply, means for maintaining substantially equalized tension upon all of the threads, comprising a plurality of rigidly connected radiating arms, one for each thread, pivotally mounted at their juncture and each provided at its outer end with a thread-guiding eye; pendulous means for yieldably maintaining said arms in a predetermined normal position; a rigidly mounted arm substantially paralleling each of said pivotally mounted arms; and a stirrup member carried by each of said rigidly mounted arms adjacent the outer end of its companion pivotally mounted arm, said stirrup members having a pair of legs, each provided with a thread-guiding eye disposed to either side of and spaced from the thread-guiding eye of the companion pivotally mounted arm, the arm and stirrup eyes being normally out of alinement: each thread being rove through the misalined eyes of its associated stirrup and pivotally mounted arm, whereby variation in the tension upon any of the threads tends to move its said arm in one direction and the corresponding arms of the other threads in a different direction and thereby correspondingly vary the tension upon said other threads.

RALPH NORMAN TOONE.