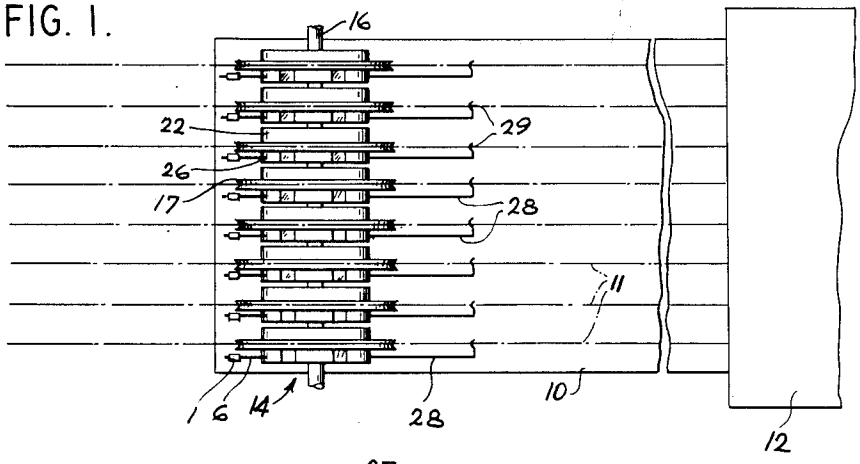
Jan. 6, 1953 R. S. VON KOHORN 2,624,527

THREAD TENSIONING DEVICE

Filed June 22, 1950 2 SHEETS—SHEET 1

FIG. 1.



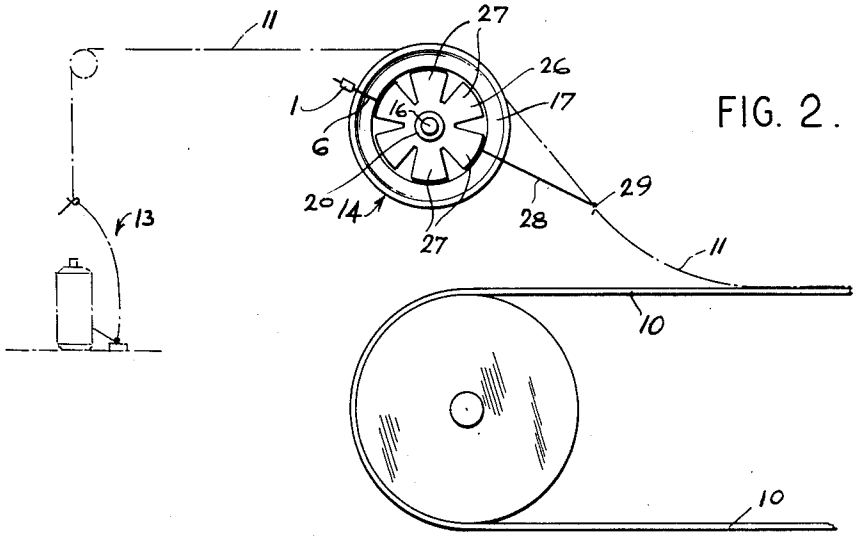


FIG. 2.

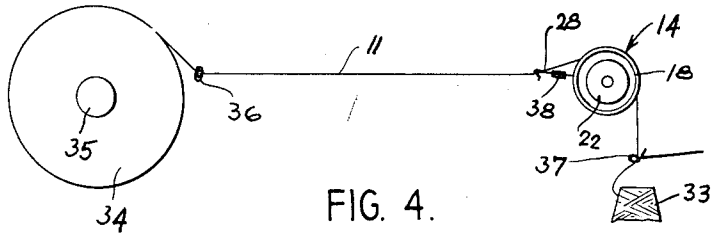


FIG. 4.

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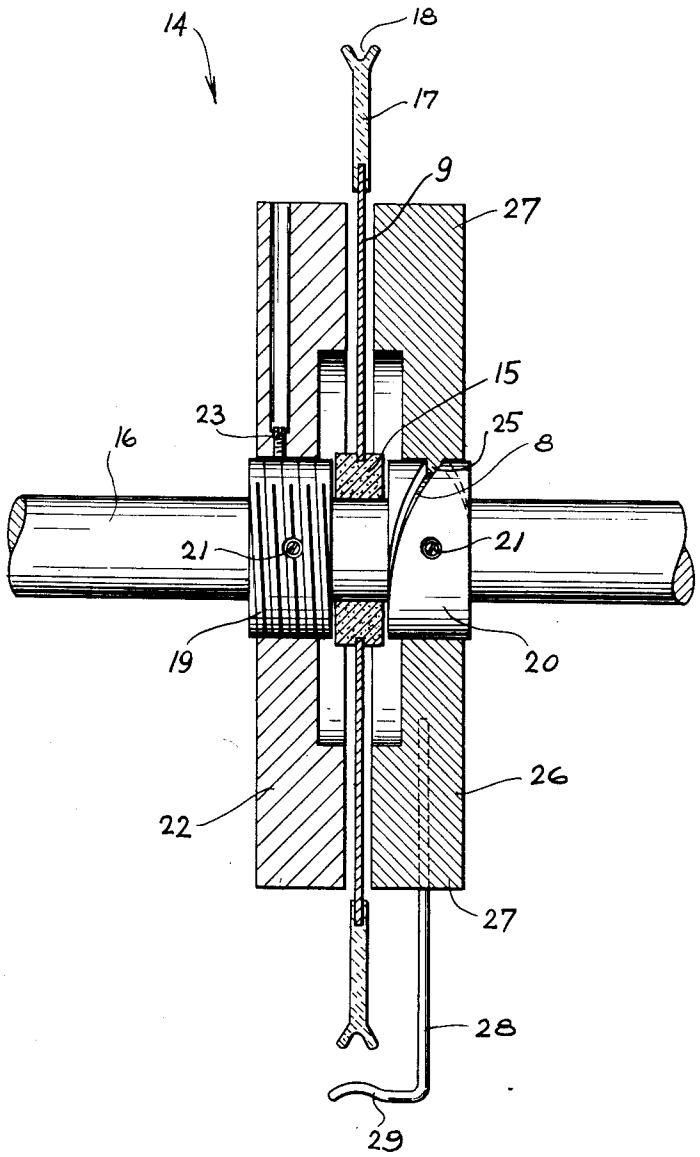
FIG. 3.



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THREAD TENSIONING DEVICE

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1 Claim. (Cl. 242—155)

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The present invention relates to an improved yarn tensioning device, and it relates more particularly to an improved yarn tensioning device suitable for use in combination with the endless belt-type of apparatus for the continuous production, treatment and drying of artificial yarn.

Many methods and apparatus have heretofore been proposed for the production of yarn by the so-called continuous system, but these have all been characterized either by their extreme complexity or by their inability to operate under normal commercial production conditions. A type of continuous spinning apparatus which has been proposed is that of the moving conveyor or endless belt type. In this type of apparatus the freshly spun yarn is deposited in a conglomerated fashion upon a slowly advancing endless belt and the yarn while so transported is subjected to the necessary liquid after-treating and drying and then is withdrawn and packaged in any desired fashion. In commercial application, each continuous belt must carry a plurality of such yarns in parallel side-by-side fashion in order to be feasible. The yarn while transported by the conveyor is generally subjected to numerous washes including neutralizing and acidifying solutions, desulphurizing solutions and a finishing solution whereafter the yarn is dried and packaged in either a twisted or untwisted condition.

A principal difficulty encountered in the continuous production of yarn on a continuous belt type of machine, is the transfer from the belt of the finished dried yarn to the subsequent packaging apparatus. The linear production of yarn may vary not only between the individual yarns carried by the continuous belt, but also may vary in time with the individual yarns. Thus, in the withdrawal of the yarns from the belt, it is necessary that these yarns be withdrawn at the same average rate at which the individual yarns are brought to the discharge end of the belt. Numerous methods and apparatus have been proposed in order to effect the proper removal of the yarn from the belt, but these have proven either ineffective or too complex. Examples of such proposals are shown in U. S. Patent Nos. 2,333,278 and 2,333,279 to J. H. Truesdail. The systems illustrated fall short in achieving their purpose, and are too complicated for commercial use.

It is, therefore, a principal object of the present invention to provide an improved yarn tensioning device.

Another object of the present invention is to

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provide an improved yarn tensioning device which may be automatically and continuously regulated in response to a predetermined variable condition of the yarn.

Still another object of the present invention is to provide an improved yarn tensioning device adapted to impart a retarding force to a traveling yarn said retarding force being dependent upon the tension of the relative position of the yarn.

A further object of the present invention is to provide an improved apparatus for removing yarn which is being continuously advanced on an endless belt type conveyor.

Still a further object of the present invention is to provide an improved apparatus for removing yarn being advanced on an endless conveyor where the advance of such yarn is neither uniform nor constant.

The above and other objects of the present invention will be apparent from a reading of the following description taken in connection with the accompanying drawings wherein Figure 1 illustrates a top plan view of an improved embodiment of the present invention as applied to the removal of yarn from an endless conveyor; Fig. 2 is a front elevational view thereof; Fig. 3 is a detailed sectional view along line 3—3 of Fig. 1; and Fig. 4 is a front elevational view of another embodiment of the present invention.

The present invention broadly contemplates a circular rotatable thread guide being provided with a groove or track adapted to engage an advancing yarn. The circular thread guide has associated therewith magnetic means which imparts a drag or retarding force to the rotation of the thread guide which magnetic means may be continually adjusted in response to some predetermined variable.

More specifically, the circular thread guide may be a disc of aluminum or other suitable electrical conducting material and having an annular groove of wedge-shaped cross section. The guide is rotatably mounted upon a shaft which in turn supports a permanent magnet disposed adjacent one face of the guide and whose magnetic flux is directed through the metal disc. Confronting the opposite face of the guide is a soft iron disc, preferably of the same diameter as the magnet in order to provide a return path for the magentic flux. Thus, as a result of the eddy currents produced in the metal disc, a force retarding rotation of the disc is effected.

Furthermore, means are provided for varying the magentic retarding force acting upon the disc, for example, by varying the spacing between the disc and the magnet.

This variation in spacing may be produced in response to any variables, such as the position of the yarn which may be a consequence of the tension or other yarn variable. Thus, in the withdrawing of yarn which is advanced in a conglomerated fashion on a continuous belt and which is to be delivered to a yarn packaging apparatus of variable take-up, such as a cap twister or the like, the improved tensioning device may be regulated in response to the point of withdrawal of the yarn from the belt, thereby regulating the position of such withdrawal point.

Reference is now made to the drawings, and more particularly to Fig. 1–3 thereof, which illustrate the improved tension device as employed in connection with the withdrawal of yarn advanced by a continuous belt. More particularly, a forminipherous belt 10 whose discharge is illustrated in the drawing has its upper run advancing from the right to the left, accordingly advancing from right to left the threads 11 which rest upon the upper face of the belt 10 in conglomerated fashion. These threads 11 may have been produced in continuous fashion and deposited upon the belt 10 and transported through sequential liquid aftertreating states and then through a dryer 12 where the yarns 11 are suitably dried. The yarns 11, after they are withdrawn from the belt 10 are generally packaged either with or without a twist as may be desired, and in the present illustration, are shown as being wound and twisted by means of a cap twister 13.

Since the yarn 11 is generally delivered to the discharge end of the belt 10 at rates which may vary from yarn to yarn and from time to time in the individual yarn 11, it is necessary to adjust the yarn take-up so that the yarns 11 will not advance beyond the discharge end of the belt 10 nor recede to a point within the dryer 12. This regulation has been accomplished by means of a continuously regulated thread tensioning device 14 which is illustrated in detail in Fig. 3. A thread tensioning device 14 is associated with each of the yarns 11, and each tensioning device 14 is separately and continuously regulated by the corresponding registering yarn 11.

The yarn guides 14 are mounted on a rod or axle 16 which is disposed above the belt 10 and extends transversely thereof. Each of the yarn guides 14 includes a disc-shaped member 17 having its inner portion 9 separately formed of aluminum or other suitable electrical conducting material and having an annular track 18, which track 18 is of dihedral cross section and is adapted to engage the yarn 11. The disc 17 is supported on a ring 15 which is formed of a suitable material, such as, for example, nylon, Teflon, or other suitable material, which in turn is rotatably mounted on the rod 16. This mounting permits free rotation of the disc 17. Disposed on the rod 16 adjacent each side of the bearing 18 are a pair of collars 19 and 20, each of which are adjustably fixed to the shaft 16 by means of set screws 21. The collar 19 is externally threaded and the collar 20 is provided with a left-handed helical groove 8. It should be noted that the confronting faces of the collars 19 and 20 do not strongly abut the bearing 15, thereby allowing free rotation of the bearing 15 and disc 17.

A relatively shallow cylindrical member 22, preferably formed of soft iron, is mounted on the collar 19 and is adjustable relative to the disc 17 by means of a tapped axial bore formed in the cylinder 22 which engages the external thread on the collar 19. Furthermore, the cylinder 22 may be fixed in any pre-determined position by means of a set screw 23.

A multi-pole permanent magnet 26 is of cylindrical transverse cross section and is likewise provided with an axial bore in which is mounted a radially extending detent 25 which engages the helical groove 8 on the collar 20. The magnet 26 is provided along its periphery with a plurality of poles 27, adjacent poles being of opposite polarity and the pole faces facing the portion 9 of the disc 17.

Furthermore, a suitable thread guide 28 is mounted on the magnet member 26 and terminates in thread engaging hook portion 29.

The guide 28 is counterbalanced by a weight 1 adjustably mounted on a rod 6 extending from the magnet 26. It should be noted that the drag or force retarding rotation of the member 17 is a function, among other things, of the flux passing through the portion 9 of the rotating disc 17. Thus, by varying the spacing between the member 22 and the magnet 26, and hence the flux passing through the portion 9 of the disc 17, the drag may likewise be adjusted. To this end, the effective response of tensioning device may be controlled by the relative spacing of the soft iron disc 22, which may be accomplished by loosening the set screw 23 and shifting the member 22 to any desired position which is effected by the rotation of the member 22. The member 22 may then be locked in this position by means of the set screw 23. Furthermore, the drag on the disc 17, may be further varied by adjusting the position of the magnet 26. This may be continuously accomplished in response to the angular position of the thread guide 28. In the present illustration, the angular position of the thread guide 28 is controlled by the withdrawal point of the yarns 11 from the belt 10.

It should be noted that the helical groove 8 on the collar 20 in the present embodiment is left-handed so that upon a counterclockwise rotation of the yarn guide 28 about the shaft 16, the spacing between the magnet and the confronting space of the disc 17 is decreased and the magnetic flux through the portion 9 correspondingly increased, thereby increasing the force retarding rotation of the disc 17. Likewise, clockwise rotation of the thread guide 28 increases the spacing between the portion 9 of the disc 17 and the magnet 26, thereby decreasing the magnetic flux through said portion 9 and consequently the force retarding rotation of the disc 17.

Considering now the operation of the yarn tensioning devices employed in combination with the yarn advancing belt 10, as illustrated in the drawings, the yarns 11 are engaged by the portions 29 of the guide 28, pass along the yarn engaging tracks 18 of the discs 17, and thence to the cap twister 13. The relative angular position of each guide 28 is controlled by the withdrawal point of the corresponding yarn 11 from the belt 10. Thus, should the yarn withdrawal point advance along the belt 10, the guide 28 would advance in a clockwise direction. Whereas, if the yarn withdrawal point were to recede, the

guide 28 would advance in a counterclockwise direction. Upon movement of the guide 28 in a clockwise direction following an advance in the withdrawal point of the yarn, the position of the magnet 26 is withdrawn from the disc 17 and the soft iron cylinder 22. This in turn, decreases the magnetic flux passing through the portion 9 of the disc 17 and hence the force retarding rotation of the disc 17. The take-up of the cap twister is thereby reduced and the withdrawal point of the yarn 11 is advanced towards the equilibrium position.

Reference is now made to Fig. 4 of the drawing which illustrates the improved tension device as employed in connection with the rewinding of yarn from one package into another. More particularly, the tension device is illustrated as used in the removal of yarn from a cake or cheese 33, and would upon a suitable bobbin 34. The bobbin is mounted on a spindle 35 which may be rotated by any suitable drive mechanism and has associated therewith a thread guide 36 which is traversed along the length of the bobbin 34 by any well-known traversing mechanism. The cake 33 may be mounted below the winding mechanism, including the spindle 35, and has positioned direct axially above the cake, a thread guide 37, and a yarn tensioning device 14. The yarn tensioning device 14 is of similar construction to that previously described and includes the annular track 18, whose vertical outer tangent preferably extends through the thread guide 37. Furthermore, the thread guide 28 associated with the tensioning device 14 is provided with a weight 38 which is slidable along the arm of the thread guide 28 and may be fixed by a set screw, or the like, along any desired position on said arm. The yarn from the cake 33 passes through the thread guide 37 along the track 18 through the guide 36 and then on the package formed on the bobbin 34. The yarn engaging end 29 of the guide 28 rests upon the yarn being rewound as it extends between the tension device 14 and the rewinding mechanism, including the spindle 35. Thus, the tension on the yarn, as it is being wound upon bobbin 34 is controlled by the regulated drag of the tension device 14. The rewinding tension may be adjusted by adjusting the position of the weight 38 along the guide 28 or by adjusting the relative position of the cylinder 22 to the disc 17.

In operation, the yarn from the cake 33 passes through the guide 37 along the track 18 through the guide 36 and is thence wound upon bobbin 34. The position of the guide 28 and hence the magnet 26 relative to the disc 17, is determined by the position of the yarn where it is engaged by the portion 29 of the yarn guide 28. The yarn guide 28 assumes an equilibrium position in accordance with the position of the weight

38 and the cylinder 22, thus establishing the rewinding tension. In the event that there is a reduction in the tension of the yarn, the yarn will drop where it is engaged by the guide 28, causing the guide 28 to rotate counter-clockwise as shown in Fig. 4, thus advancing the magnet 26 towards disc 17, increasing the drag on the disc 17 and therefore increasing the tension on the yarn being rewound. This in turn will lift the guide 28, urging it back to its equilibrium position. Furthermore, in the event that the tension on the yarn 11 increases, the yarn guide 28 will be rotated in a clockwise direction from its equilibrium position, causing the magnet to move from the disc 17, thereby decreasing the drag on the disc 17, and hence the tension on the yarn. This causes the tension on the yarn 11 to return to its normal preset condition.

While there has been described and illustrated the preferred embodiments of the present invention, it is apparent that numerous alterations and improvements may be made without departing from the spirit thereof. For example, while the axial movement of the magnet 26 has been illustrated as being effected by means of an engaging detent and helical groove, it is apparent that other well-known mechanisms may be employed.

What is claimed is:

A thread tensioning mechanism comprising an axle, a disc-shaped member rotatably mounted on said axle and having an electrical conducting portion and an annular thread engaging portion, a collar disposed on said axle and having a helical groove formed therein, a permanent magnet rotatably mounted on said collar and having a detent engaging said helical groove, said magnet having its polar faces confronting a face of said disc-shaped member and an elongated arm radially extending from said magnet and terminating in a thread engaging portion.

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