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YARN TENSIONING DEVICE

Filed Jan. 29, 1964

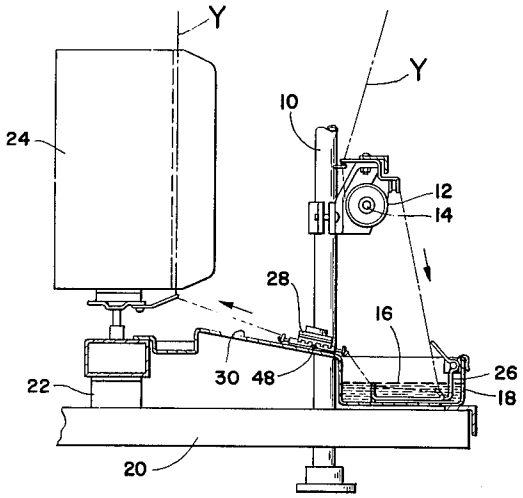

FIG. 1

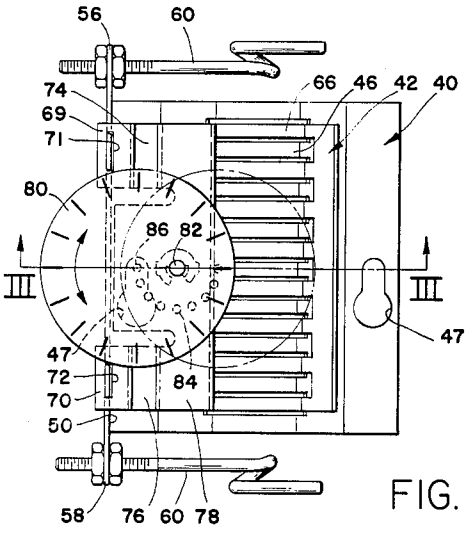

FIG. 2

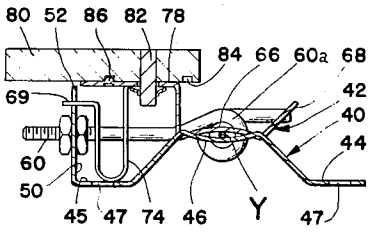

FIG. 3

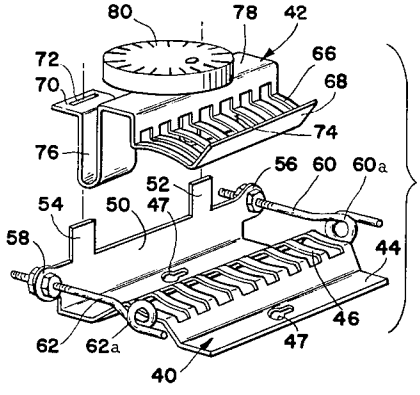

FIG. 4

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YARN TENSIONING DEVICE

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The present invention relates to a yarn tensioning device and relates, more particularly, to a new and novel tensioning device for controlling the tension in an advancing strand of yarn.

In the following specification and claims the term "yarn" is used in a general sense to relate to all kinds of strand material, either textile or otherwise.

It is well known in the textile art to control tension in an advancing strand of yarn as the yarn is being processed through a textile machine to thereby provide a uniform end product after the yarn is processed. Tension devices of the broad class having fingers which interdigitate to provide a tortuous path for tensioning the yarn as it advances through a textile machine are well known in the art. In certain textile processes tension devices of the broad class just related have been found to be quite acceptable. These tension devices normally take the form of a fixed member and a companion movable member. Normally, the movable member is spring biased toward the fixed member under a predetermined load which urges the two members into engagement thereby setting the tension value imparted by the tension device to the advancing strand of yarn. However, it has been found that with the advent of processes which include the step of moistening the yarn these known tension devices of the class just mentioned are not entirely satisfactory. These prior art tension devices, which are customarily comprised of a plurality of parts usually constructed to rather close tolerances, tend to become wet by the liquid material deposited on the yarn during its processing. As a result the tension devices of the prior art become sluggish and, therefore, fail to properly control the tension in the moistened strand of yarn.

The tension device of the instant invention, unlike those of the prior art, readily operates to impart predetermined tension into an advancing strand of yarn, yet admits of quick disassembling for purposes of cleaning of residual materials deposited thereon and rapid reassembling for further operation.

Therefore, it is one object of the present invention to provide a device for imparting a predetermined amount of tension into an advancing strand of yarn.

A further object of the present invention is to provide a tension device of the interdigitated finger type which is readily disassembled for cleaning and the like and capable of rapid reassembling for further operation.

Still another object of the present invention is to provide a tension device capable for quick and easy assembeing and disassembling of the tension member thereof, which said device may be readily adjusted to impart a predetermined amount of tension to a strand of yarn passing therethrough.

Yet, a further object of the present invention is to provide a tension device for textile machines, said tension device being capable of rapid assembling and disassembling of the tension members thereof, which said device can be incorporated readily into existing textile machines.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the apparatus posessing the construction, combination of elements, and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawing wherein:

FIG. 1 is a side elevational view of a portion of a textile machine incorporating the present invention;

FIG. 2 is a plan view of the tension device of the present invention, an alternate position for the tension regulating member being shown in broken lines;

FIG. 3 is a view taken along lines III—III of FIG. 2; and

FIG. 4 is an exploded view in perspective of the tension device of the present invention.

Briefly, the present invention includes a pair of mating tension members each of which is provided with a plurality of aligned tines or tension fingers. The tension fingers of each member are so staggered or spaced as to admit the tension fingers of the companion member therebetween. One of the afore-mentioned tension members constitutes a fixed gate attached in a generally horizontal position on a textile machine and the mating member constitutes a movable gate which is laid in place on the fixed gate so that the respective tension fingers of these two gates intermesh to tension a strand of yarn flowing between the tension fingers. A weighted element constituting a tension applying member is arranged eccentrically on a stud embedded in the upper or top surface of the movable gate. Rotation of this tension applying member serves to locate it in a preselected position to exert a predetermined force on the movable gate to urge it against the fixed gate. In this manner the tension value imparted to the yarn by the tension device is fixed. Advantageously, the movable tension gate is arranged to pivot relative to the fixed gate on a pair of legs provided for this purpose. Also, the movable gate is damped against vibration which would normally occur if the strand of yarn passes through the tension device and which, in the absence of this damping means, would cause the movable gate to vibrate or chatter in a fashion to upset the constant tensioning effect of the tension device. The movable gate may be removed from the fixed gate without the necessity for releasing any part and without changing or loosing the tension preset by the tension applying member. Moreover the movable gate can be returned to place in engagement with the companion fixed gate by simply positioning the length of the movable gate on locating posts of the fixed gate. Additionally, the fixed gate is so constructed as to be quickly mounted on the related textile machine and rapidly removed therefrom. Thus, the tension device in the present invention is readily disassembled for cleaning and the like after which it may be rapidly reassembled for further operation.

Now, with attention to FIG. 1 of the drawing in the first instance the present invention is illustrated in connection with a textile machine of the type generally referred to as an "up-twister." The up-twister is seen to include a vertical frame member **10**, a section of which provides a mount for a furnishing roll **12** driven through a shaft **14**. The shaft **14** is connected to a suitable source of power, not herein illustrated, but which may be, for example, an electric motor to thereby rotate furnishing roll **12**. The furnishing roll **12** acts to assist in advancing the strand of yarn Y from a suitable supply source (not shown) and into a bath of treating materials **16** contained within an elongated trough **18**. Said trough **18** is supported from a horizontal frame **20** which extends rearwardly from the forward lower section of the machine. The rearward part of frame **20** supports an upstanding bracket **22**, this bracket in turn providing a

mounting means for a heater 24. Suitable means such as electrically energized calrods (not shown) may be employed to heat the heater 24 to a desired temperature to dry the treating materials which are deposited on the yarn as the yarn is guided through bath 16 by yarn guide 26. The heater 24 may also advantageously serve to effect reactions between the treating materials and the yarn in the event such steps are part of the process for the yarn. The yarn is caused to flow upwardly through heater 24 to a suitable take-up, not herein illustrated, and, in the course of such movement from the heater to the take-up the yarn may be further processed and manipulated as dictated by the requirements of the particular process. Since these steps do not form a part of the present invention further discussion of such steps is not included herein.

It will be appreciated that, desirably, in the course of the movement of the yarn upwardly from bath 16 to heater 24 the yarn is tensioned in order that the heat treating imparted by the heater will be under controlled conditions of yarn tension at the time of said heating. To this end the tension unit 28 of the instant invention is disposed in a generally horizontal position on a panel 30 which spans the area between trough 18 and bracket 22. It will be understood that, except for tension unit 28, the structure just described is more or less characteristic of known up-twisters and the foregoing structure, save for tension device 28, does not constitute a part of the instant invention except a combination with the elements next to be described. Moreover, while the present invention is shown and described in connection with an up-twister it will be appreciated that the present invention will have equal utility with other textile machines adapted to advance strandular materials.

Turning now to FIGS. 2, 3 and 4 will be observed that the present invention includes a fixed tension gate 40 and a companion movable tension gate 42, both of which are preferably constructed of chemically-resistant material. Fixed tension gate 40 includes a pair of flat parallel sections 44 and 45 between which there is supported a raised or elevated section having a plurality of slightly concave yarn engaging fingers 46 (FIG. 3) formed therein. Each of the sections 44, 45 have elongated aperatures 47 therethrough midway therealong to accommodate seating screws 48 arranged to be threaded into panel 30 of the textile machine to attach gate 40 thereon. The rearward side of section 45 is upturned at 50 to present a generally perpendicular rear wall. The upper edge of rear wall 50 is provided with a pair of spaced ears 52, 54 which, as will be related hereafter, act to receive movable gate 42. The opposite edges of rear wall 50 project laterally in the form of tabs 56, 58, these tabs supporting a pair of oppositely disposed yarn guides 60, 62 respectively. The outer ends of each of said yarn guides 60, 62 are looped at 60*a*, 62*a*, respectively, these loops being situated in alignment with yarn engaging fingers 46 to thereby guide a strand of yarn across said fingers in a linear path.

Now, considering movable gate 42 in more detail, it will be seen that this gate is constituted as a unitary plate having a portion provided with a series of somewhat concave yarn engaging fingers 66, see FIG. 3. These fingers 66 are so spaced or staggered to interdigitate with fingers 46 of gate 40. The outer terminal edge of gate 42 is folded upwardly at 68 for clearance purposes as well as to provide a convenient gripping means for separating gate 42 from gate 40. Moreover, the edge 68 permits yarn to be guided therealong into engagement with fingers 46, 66 when threading up the tension device. The longitudinal edge of gate 42 remote from edge 68 is branched and bent to form a pair of spaced projections 69, 70. As is best seen in FIG. 2 each projection 69, 70 has an elongated slot 71, 72, respectively, therein for receiving an ear 52, 54 respectively. It is to be observed

that the fit between each ear and its respective slot is such so as to afford limited clearance between each said ear and the walls of the slot, thereby allowing rocking movement of gate 42 relative to gate 40 in order that the tension fingers 46, 66 of gate 40, 42, respectively, can separate and close in response to tension variations in the yarn passing therethrough. Moreover, by virtue of the fit affording clearance between the ears 52 and 54 and their slots 71, 72, it will be appreciated that gate 42 can be lifted off its companion gate 40 very readily without the requirement for releasing any intermediate parts. However, it is to be understood that the clearance between each ear and its respective slot is rather closely limited so that, while projections 69, 70 can be easily slid off the ears, nevertheless, rocking movement of gate 42 relative to gate 40 in the order of 1° will cause the particular projection 69, 70 to contact its respective ear 52, 54.

Gate 42 is provided with a pair of legs 74, 76, the leg 74 being bent downwardly at a right angle from projection 69 and then upwardly therefrom, terminating in a flat inverted U-shaped portion at 78 which joins with one side of yarn engaging fingers 66. Similarly, leg 76 is bent in a path conforming to that described in connection with companion leg 74. Each of said legs 74, 76 projects downwardly a sufficient distance to bear on section 45 of gate 40 when projections 69, 70 are engaged on ears 52, 54. In accordance with this arrangement, legs 74, 76, in communication with gate section 45, act to damp vibrations which might otherwise be set up in movable gate 42 as yarn passes through the tension device, which vibrations might lead to disruption of the proper operation of the tension device. Due to the fact that ears 52, 54 engage projections 69, 70 under rather close tolerances as already discussed, legs 74, 76 slide laterally along section 45 as gate 42 rocks in response to tension variations and ears 52, 54 are moved into contact with projections 69, 70. Thus, legs 74, 76 are operative to damp vibrations in gate 42 at all times during operation of the tension device and the ears which are engaged with said projections serve to stabilize the positioning of said legs 74, 76 on section 45.

In order that a predetermined tension may be provided by the tension device to yarn passing therethrough a weight 80 is mounted eccentrically on a stud 82 embedded in the top surface of portion 78 of gate 42. The lower surface of weight 80 has a plurality of blind holes therein as at 84, these holes being arranged in a circular pattern corresponding to the rotary path of movement of weight 80 around stud 82. A detent 86 is stamped in the upper surface of portion 78 to engage in the various holes 84 of weight 80. It will be appreciated that, due to the eccentric position of weight 80 on its stud 82, this weight may be set in any one of a variety of locations between a position disposed only partially within the vertical plane of gates 40, 42, as depicted by the dotted lines in FIG. 2, to a position completely within the vertical confines of these gates, as shown in the full lines for weight 80 in FIG. 2. It will be rather apparent that the biasing force of weight 80 on gate 42 will gradually increase as the weight is rotated from a position partially extending beyond the confines of gates 40, 42 to a position within the vertical confine of these gates and cantilevered over fingers 46, 66. Thus, rotation of weight 80 about stud 82 is effective to establish a predetermined tension in the yarn passing through the tension device 28.

The operation of the present invention is believed to be more or less apparent from the foregoing description. Therefore, in summary, the gate 40 is mounted on panel 30 by engagement of screws 48 in apertures 47 of the gate. Movable gate 42 is laid on gate 40, the respective fingers 66, 46 of these two gates enmeshing as ears 52, 54 of gate 40 pass through slots 71, 72 respectively. With the parts so arranged as just stated,

legs 74, 76 of gate 42 bear on section 45 of gate 40. Weight 80 is rotated about stud 82 to position the weight to impart the desired tension in yarn to be directed through the tension device. Detent 86 acts to maintain the weight 80 in its selected position. Gate 42 can be raised readily to direct the yarn through the device, the yarn being threaded through loops 60*a*, 62*a*, of guides 60, 62 to maintain the yarn in a linear path flowing across the tension fingers 46, 66. As yarn advances through the device tension gate 42 rocks on ears 52, 54 to cause fingers 66 to intermesh to a greater extent with fingers 46 when tension in the strand drops. This causes the yarn to attain a greater wrap angle with each finger 46, 66 and thereby increase the tension in the yarn until the determined tension value for the yarn is again reached. In the event the tension in the yarn exceeds said predetermined value, the fingers 46 rock upward or counterclockwise, FIG. 3, thereby reducing the angle of wrap of the yarn with all of the tension fingers. In this manner the tension in the yarn on the downstream side, i.e., the output side of the tension device is maintained substantially constant. Legs 74, 76 slide across section 45 in contact therewith as gate 42 rocks relative to gate 40 so that effective damping of vibrations occuring in gate 42 is constantly maintained.

Now, as the yarn passes through the bath 16 it will be quite evident that the yarn will pick up the materials therein and that these materials will, thus, be conveyed to tension 28 as the yarn path of FIG. 1 is followed. These materials will, in the course of machine operation, clog the tension device causing it to become sluggish and generally malfunction. It is, therefore, desired that this condition be corrected as rapidly as possible. To this end the present tension can be rapidly removed, cleaned, and restored to operating condition on the machine in a very short time. Further, removal and repositioning on the machine can be accomplished without loosing the tension setting since weight 80 is held in its preestablished position by detent 86. Gate 42 is readily separated from gate 40 by sliding said gate 42 off ears 52, 54. Gate 40 is easily removed from panel 30 by lifting it off screws 48. Repositioning of these parts is achieved by reversing the steps just recited.

From the foregoing it will be evident that the instant invention provides a new and novel tension device which is operative to provide a predetermined amount of tension in a running strand of yarn, which is readily adjustable to impart a preselected tension to the yarn, and which can be easily removed from the machine for cleaning and quickly assembled on the machine for further operation.

Since certain changes may be made in the above device without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative only and not in a limiting sense.

What is claimed is:

1. A tension device for use with a textile machine comprising, a first member adapted to be removably fixed to said textile machine, said first member having projection means thereon, a plurality of spaced yarn engaging fingers formed in said first member; a second member, said second member having projection-receiving means, said projection-receiving means being formed with at least one aperture, said aperture having longitudinal and transverse dimensions greater than said projection means, a plurality of spaced yarn engaging fingers formed in said second member and arranged to intermesh with the fingers of said first member when said projection means is engaged with said projection-receiving means to present a tortuous path to impart tension in an advancing strand of yarn, said projection-receiving means being yieldably engageable with and freely slidable longitudinally of said projection means, said projection means and projection-receiving means when engaged affording limited relative swinging movement between said first and said second members to thereby vary the degree of intermeshing of the fingers of said first and said second members, and damping means for controlling vibrations between said first and said second members.

2. A tension device for use with a textile machine comprising a first member adapted to be removably fixed to said textile machine, said first member having a projection means thereon, a plurality of spaced yarn engaging fingers formed in said first member; a second member, said second member having projection-receiving means, said projection-receiving means being formed with at least one aperture, said aperture having longitudinal and transverse dimensions greater than said projection means, a plurality of spaced yarn engaging fingers formed in said second member and arranged to intermesh with the fingers of said member when said projection means is a tortuous path to impart tension in an advancing strand of yarn, said projection-receiving means being yieldably engageable with and freely slidable longitudinally of said projection means, said projection means and projection-receiving means when engaged affording limited relative swinging movement between said first and said second members to thereby vary the degree of intermeshing of the fingers of said first and said second members, damping means for controlling vibrations imparted to said second member, a tension applying element for imparting a force to bias the fingers of said second member into engagement with the fingers of said first member, and pivot means for mounting said tension applying element, said element being movable about said pivot to vary the force imparted by said element on said second member.

3. In a textile machine having means for advancing a strand of yarn in a path therethrough, the improvement therein comprising, a first member adapted to be removably fixed in a substantially horizontal position on said textile machine, said first member having projection means thereon, a plurality of spaced yarn engaging fingers formed in said first member and positioned to engage the strand of yarn being advanced through said machine; a second member, said second member having projection-receiving means, said projection-receiving means being formed with at least one aperture, said aperture having longitudinal and transverse dimensions greater than said projection means, a plurality of spaced yarn engaging fingers formed in said second member and arranged to intermesh with the fingers of said first member when said projection means is engaged with said projection-receiving means to present a tortuous path to impart tension in the advancing strand of yarn, said projection-receiving means being yieldably engageable with and freely slidable longitudinally of said projection means, said projection means and projection-receiving means when engaged affording limited relative swinging movement between said first and said second members to thereby vary the degree of intermeshing of the fingers of said first member and the fingers of said second member, and damping means for controlling vibrations between said first and said second members.

4. In a textile machine having means for advancing a strand of yarn therethrough, the improvement therein comprising, a first member adapted to be removably fixed to said textile machine, said first member having projection means thereon, a plurality of spaced yarn engaging fingers formed in said first member and arranged to engage said strand of yarn being advanced through said machine; a second member, said second member having nrojection-receiving means, said projection-receiving means being formed with at least one aperture, said aperture having longitudinal and transverse dimensions greater than said projection means, a plurality of spaced yarn engaging fingers formed in said second member and arranged to intermesh with the fingers of said first

member when said projection means is engaged with said projection-receiving means to present a tortuous path to impart tension in said advancing strand of yarn, said projection-receiving means being yieldably engageable with and freely slidable longitudinally of said mounting means said projection means and projection-receiving means when engaged affording limited relative swinging movement between said first and said second members to thereby vary the degree of intermeshing of the fingers of said first and second members, damping means for controlling vibrations imparted to said second member, and a tension applying element for imparting force to bias the fingers of said second member into engagement with the fingers of said first member, said tension applying element being adjustable to vary the force imparted by said element on said second member.

5. In a textile machine having means for advancing a strand of yarn therethrough, the improvement being comprising, a first member adapted to be removably fixed to said textile machine in a generally horizontal position, a plurality of spaced yarn engaging fingers formed in said first member, upwardly directed projection means connected with said first member, yarn guide means supported on said first member and arranged to direct the yarn across said fingers in a generally straight path, a second member having projection-receiving means, said projection-receiving means being formed with at least one aperture, said aperture having longitudinal and transverse dimensions greater than said projection means, a plurality of spaced yarn engaging fingers formed in said second member and arranged to intermesh with the fingers of said first member when said projection means is engaged with said projection-receiving means to present a tortuous path to impart tension in said advancing strand of yarn, said second member having damping means connected therewith, said projection-receiving means being yieldably engageable with and freely slidable longitudinally of said projection means, said projection means and projection receiving means when engaged affording limited relative swinging movement between said first and said second members to thereby vary the degree of intermeshing of the fingers of said first and second members, said damping means being engageable with said first member to control vibrations imparted to said second member.

6. In a textile machine having means for advancing a strand of yarn therethrough, the improvement therein

comprising, a first member adapted to be removably fixed to said textile machine in a generally horizontal position, a plurality of spaced yarn engaging fingers formed in said first member, upwardly directed projection means means connected with said first member, yarn guide means supported on said first member and arranged to direct the yarn across said fingers in a generally straight path, a second member having projection-receiving means, said projection-receiving means being formed with at least one aperture, said aperture having longitudinal and transverse dimensions greater than said projection means, a plurality of spaced yarn engaging fingers formed in said second member and arranged to intermesh with the fingers of said first member when said projection means is engaged with said projection-receiving means to present a tortuous path to impart tension in the advancing strand of yarn, said second member having damping means connected therewith, said projection-receiving means being yieldably engageable with and freely slidable longitudinally of said projection means, said projection means and projection receiving means when engaged affording limited relative swinging movement between said first and second members to thereby vary the degree of intermeshing of the fingers of said first and second members, said damping means being engageable with said first member to control vibrations imparted to said second member, a tension applying element for imparting a force to bias the fingers of said second member into engagement with the fingers of said first member, said tension applying element being adjustable to vary the force imparted by said element, and detent means for holding said tension applying element in a selected position.

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