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SELF-THREADING, SELF-CLEANING TENSION DEVICE

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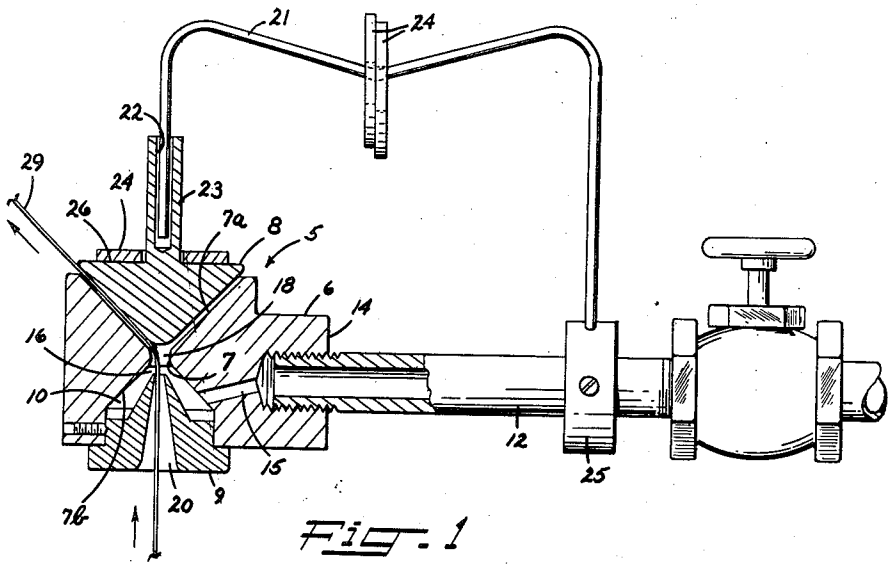


Fig. 1

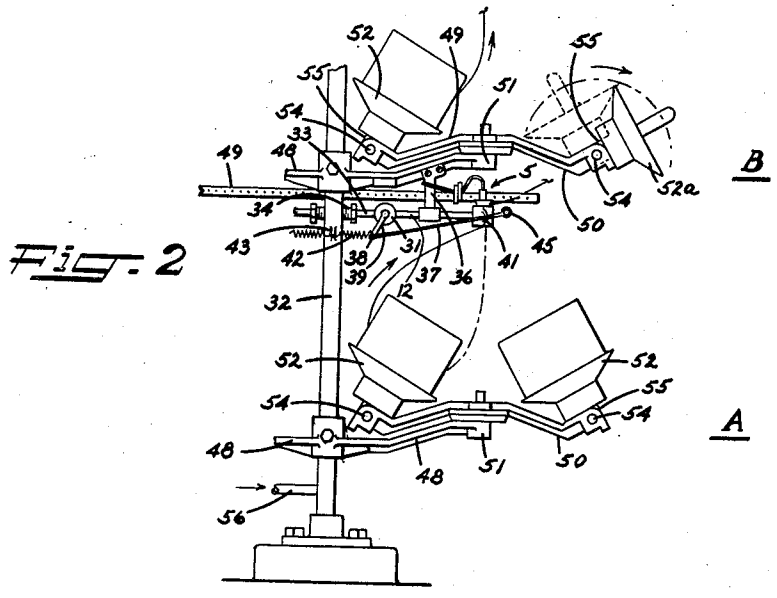


Fig. 2

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SELF-THREADING, SELF-CLEANING TENSION DEVICE

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The present invention relates to strand tension devices and creel structure. The lacing of creels or other equipment for continuously supplying a multiplicity of yarn ends involves considerable time, labor, and inconvenience particularly, if the equipment comprises individual tension devices through which the several yarn ends must pass. The space within such machines through which an operator has access to the various portions of the creel is limited by such factors as the large number of packages supported within the machine and the closeness of the spacing between the separate paths of the yarn ends. Threading is a particularly tedious procedure in creels wherein a balloon-terminating guide is supported above each package station in combination with a tension device such as a disc tension mechanism. In order to eliminate re-packaging operations in the rayon producing industry, it is becoming common practice to beam warp yarn directly from yarn packages such as the rayon cakes which are centrifugally collected in spinning buckets as the yarn passes from the filament forming equipment. However, because of the greater likelihood of the yarn being tangled in cakes, yarn breakage is more frequent when unwinding cakes than when unwinding packages of rewound yarn. Beaming cakes therefore entails greater annoyance to the operator and loss of operating time on account of the shut downs for relacing the creel.

It is an object of the invention to facilitate the lacing of tension devices. It is also an object to provide a tension device which is self-cleaning with respect to the lint, finishing materials used on the yarn, or other matter that may collect on the surfaces of a tension device traversed by a strand. It is also an object to provide an improved creel and to save time and labor in the operation thereof. Other objects, features and advantages will be apparent from the following description of the invention and the drawing relating thereto in which

Fig. 1 is a view partly in section of a tension device in accordance with the invention; and

Fig. 2 is a fragmentary elevation view of a portion of a creel.

The present invention comprises a self-cleaning, self-threading tension device; and an improved creel system comprising one of the devices mounted therein adjacent each package-supporting station, and a conduit system for conducting a fluid medium to the tension devices, the conduit system comprising at least a portion of the framework. The tension devices each

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have a body portion which is chambered so as to receive and discharge the fluid medium, and in doing so, to produce suction at the strand-receiving portion of each device.

Fig. 1 illustrates a self-threading and self-cleaning tensioning device 5 which comprises a body member 6 having a generally hour-glass-shaped pasasgeway defined by annular surfaces 7, 7a, and 7b. The device may be supported in operation with the axis of this passageway disposed in a vertical or horizontal direction or at any inclination thereto. The surface 7 defines the constricted portion 18 of the passageway. A tapered thread-engaging element 8 rests within the upper portion of the hour-glass-shaped passageway on the peripheral surface 7a thereof, and a generally frusto-conical element 9 is secured within a lower enlarged portion of the passageway. The element 9 is so contoured that an annular chamber 10 extends between a considerable portion of the outer surface of the element 9 and the surface 7b of the lower enlarged portion of the passageway. A tube 12 extends from a lateral direction into the side of the body member 6 which is preferably constructed with a boss 14 extending laterally from the body member and provided with a threaded recess to receive the end-portion of the tube 12 in threaded relationship. A passageway 15 connects the bore of the tube 12 with chamber 10. A gas, supplied under pressure to the chamber through the tube 12, is discharged through an annular opening 16 between the smaller end of the element 9 and the surface 7b. The rapid discharge of air or other gas from the opening 16 into the pasageway 18 will lift the thread-engaging element 8 away from the surface 7a and induce a strong current of air or other fluid medium surrounding the device 5 to pass through a passageway 20 of the element 9 in a direction toward the element 8. During the passage of air between the surface 7a and the element 8, the element is prevented from being completely dislodged from the vicinity of the upper surface of the member 6 by a spring arm 21 which fits within the bore 22 of a tubular extension 23 of the element 8. The spring is secured to a collar 25 mounted on the tube 12; the spring resiliently limits the movement of the element 8 away from the surface 7a but only to a position from which the element may readily settle back toward the surface to engage either or both the surface and a thread passing through the device 5 when the passage of air into the device is discontinued. Springs of heavier or lighter construction may

be substituted also for limiting the movement of the element from the surface 7a. The spring 21 is provided with a curved portion on which to support apertured weights or ballast elements 24 which may be transferred to or removed from a seating surface 26 of the element 12. The number and size of these weights may be varied as desired to vary the pressure of engagement of the element 8 with a strand 29 passing through the device to produce any degree of tension desired in the strand. An arrangement shown for limiting the movement of the element 8 with respect to the body portion 6 is merely illustrative of many other arrangements possible. For example, a spring or other resilient means used to limit the movement of the yarn engaging element 8 may be adjusted to exert pressure on an element analogous to the element 8, and adjustment of the spring may be made to vary the pressure of the element on the yarn passing through the device in lieu of the aggregate of weights placed onto or secured to the element.

When threading the device, air or other gas is supplied through the tube 12 at sufficient pressure to lift the element from the surface 7a; at pressures insufficient to lift the element 8, the air supplied through the tube 12 will be discharged through the passageway 20. In this situation, the direction of air movement is reversed to that desired within the passageway 20. When the air lifts the element and passes out the upper end of the device, a strong current is produced through the passageway 20 toward the aperture 13 of the constricted section of the device. A yarn or thread-end held in the vicinity of the entrance of the passageway 20 is promptly drawn into and passed through the device. In ordinary operation, materials such as lint, dried material carried by the finish solution, or dust tend to collect on the surfaces defining the path of the thread through the device. These materials are readily removed by passing air through the device supplied thereto at a pressure preferably greater than 5 pounds per square inch. The passageway 20 may be cleaned by manually holding the element 8 in engagement within the seat therefor of the body portion 6 so as to cause air to discharge through the passageway 20. The cleaning action with respect to the surface 7a and the adjacent surface element 8 may be effectively promoted by manually working the element 8 and intermittently pressing it closely to the surface to restrict the passage of air.

Fig. 2 illustrates the tension device of the invention and a fragmentary section of a creel frame on which it is mounted. As shown in this figure, the tube 12 extends into a valve 31 which is connected with a hollow post 32 of the creel by a nipple 33 and a pipe bushing 34. Further support of the device 5 may optionally comprise a bracket 36 attached to an overhanging frame member 48. A pull rod 37 having a bent end 38 extending through an aperture in the end portion of a control lever 39 is slidably supported on the device 5 by an apertured extension 41 thereof. A spring 42 attached to the bent end 38 and an eye-fitting 43 secured to the post 32 holds the valve in the closed position. To pass air through the device as when threading or cleaning it, it is merely necessary to pull the handle portion 45 of the rod 37 in the direction of the arrow to actuate the valve 31 to the open position. When the rod 37 is released, the valve returns to the shut position.

Fig. 2 is an elevation view of a creel section as

seen when looking in a direction parallel to the longitudinal direction of the creel. It may comprise many such sections progressively spaced in a direction normal to the plane of the figure. While only two package supporting levels A and B are shown, the creel may readily comprise additional levels of package holders. The creel section comprises the post 32 and tension devices 5 supported as shown and hereinbefore described, frame members 48 corresponding to each package supporting level, and guide means such as an eye-bar 49 or a series of eye-bars spaced progressively in a direction normal to the plane of the figure toward the strand-discharging end of the creel. The eye-bars each extend transversely of the general direction of movement of the strands from the various tension devices toward one end of the creel. The frame members 48 although not completely shown, are centrally supported on the post 32. Turn-table members 50 pivot with respect to each of the opposite end portions 51 of each frame member 48. The turn-table members each support a pair of package holders 52. Pivot means is provided at both ends of the turn-table members comprising an arrangement such as shown wherein a pivot pin 54 extends through the bifurcated end of the turn table member and through an axial extension 55 of the package support. The members 50 are provided with stop surfaces whereby the package supports may be tilted to one or the other of two positions. At level B the package support 52a is shown in solid lines in the position to which the other package holders may be tilted to receive another cake to be unwound after the unwinding of the cake previously supported thereon has been completed. The other package holders are positioned in the normal alignment for unwinding in which the axis of the package holder is inclined upwardly and inwardly toward the pivot axis of the turn-table member into alignment with the thread-receiving passageway 20 of the device 5. In the other position as illustrated by the package holder 52a, a package holder is tilted outward with its axis inclined upwardly and outwardly away from the pivot axis of the member 50 to provide more convenient loading of a package thereonto. Air or other gas stored under pressure is piped to the device 5 from the hollow post 32 connected with an air reservoir (not shown) by a tube 56.

In the creel shown, as in conventional creels, yarn passing from the packages being unwound passes through one or more eye-bars spaced along a common level until they pass through a terminal eye-bar (not shown) in the end-portion of the creel nearest, for example, a beamer. The yarns may be passed through a circuit-interrupting device (not shown) mounted adjacent the terminal eye bar for controlling equipment such as a beamer. Once the yarn has been passed through the tension device of a creel, guide devices for supporting the yarn during its horizontal movement to the end-portion of the creel, such as eye-bars, are easily laced. In conventional creels having a balloon-terminating guide mounted in conjunction with a tensioning device, the lacing difficulty is particularly acute and is substantially eliminated by the creel construction herein described providing self-threading tension devices. In the present creel construction, the tension device serves also as a balloon terminating guide and thus simplifies the creel structure.

While a preferred embodiment of the inven-

tion has been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A tension device for a running strand comprising a body section having a central passage which has a constricted intermediate portion and flaring end-portions, an annular tapered friction element for loosely engaging the surface defining one of the end-portions of the passage, resilient means for restraining the movement of the tapered element away from said surface, an annular member having a central bore and extending within the other end-portion of the passage, said member having a rim portion in continuous engagement with an annular surface at the end of the passage, the exterior surface of the member which extends within the passage having clearance with but not engaging the surface which defines the passage, duct means for connecting the chamber resulting from said clearance with a fluid-storage means.

2. A tension device for a running strand comprising a body section having a central annular passage which has a constricted portion, an element having an annular tapered surface adapting it to be loosely supported and to seat within one end of the passage, an annular member having a rim portion in continuous engagement and attachment to an end-surface of the body section adjacent the other end-portion of the passage and having a tapered sleeve portion extending within the last-named end-portion of the passage at substantial clearance with the surface which defines the passage, said clearance defining an annular cavity which joins with the passage adjacent the constricted portion thereof, a tube for supporting the body section attached thereto and extending from a direction which is lateral with respect to the longitudinal direction of the passage, a passage connecting the interior of the tube with the cavity, said element having a hollow stem extending coaxially with respect to the tapered surface in a direction opposite to that in which the tapered surface faces, a plurality of weights each having an aperture which permits extension therethrough of the stem, and means extending loosely within the hollow stem when the element rests within the cooperating end-portion of the passage for limiting the movement of the element away from the body section.

3. A creel system comprising a hollow frame, a frame member for supporting a wound strand package with the end-surface thereof facing away from the member, a tension device supported in superimposed spaced relationship with the end corresponding to the end-surface of a package of the region occupied by the package while supported by the member, said device comprising an injector having a passage for strand terminating in an annular strand-discharging surface and having a chamber surrounding the passage for receiving a fluid, said chamber merging with the passage for discharging the fluid into the passage in a direction away from the strand-receiving portion of the passage at an oblique angle with the longitudinal direction of the passage, and an element having an annular surface which rests against said strand-discharging surface, means for limiting the movement of the element away from the strand-discharging surface, a duct connecting the frame and the injector for communicating a fluid from a space within the frame to the chamber of the injector, and a valve in the duct for controlling the movement of fluid therethrough.

4. A creel system comprising a plurality of members for supporting wound strand packages, each member supporting a package with an end-surface thereof facing away from the member supporting it, a tension device supported in superimposed spaced relationship with the end corresponding to said end-surface of a region occupied by the package while supported by the member, said device comprising an injector having a passage for strand terminating in an annular strand-discharging surface and having a concentric chamber for receiving a fluid and discharging it into the passage at an oblique angle in a direction extending away from a strand-receiving portion of the passage, and an element having an annular surface which rests against said strand-discharging surface, said element being normally urged toward the injector, means for limiting the movement of the element away from the strand-discharging surface, a duct connecting the frame and the injector for supporting the tension device and for supplying a fluid to the chamber of the injector; and a valve in the duct for controlling the movement of fluid therethrough.

5. A creel system comprising a plurality of members for supporting wound annular strand packages with each package facing away from the member which supports it in a predetermined alignment of the package axis, a tension device spaced from each member in a direction approximately coinciding with said axis to receive strand withdrawn from the package, said device comprising an injector having a central passage through which thread may pass through the device and terminating in an annular tapered strand-discharging surface, an annular passage encircling the central passage for receiving a fluid and discharging it into the central passage toward said strand-discharging surface, and an element having an annular seating surface resting within and against the tapered surface, a hollow fluid-conducting frame for supporting the members and the tension devices, a duct extending between the frame and the injector for supplying a fluid to the outer passage, and a valve in the duct for controlling the movement of fluid therethrough.

6. A creel system comprising a plurality of members for supporting wound annular strand packages in a predetermined axial alignment for each package extending in a direction away from the member supporting the package, a strand tension device spaced along said alignment beyond the region occupied by the package, said device comprising an injector-type body portion having a central passage for strand transmission which terminates in an annularly tapered strand-discharging surface, and an element having an annular surface of which at least a portion thereof is complementary to a portion of the tapered surface, said element resting against the tapered surface for frictionally engaging a strand when passed through the device, a support frame for the system comprising hollow fluid-conducting members, duct means connecting the body portion and a hollow frame member, and means for supplying fluid under pressure to the frame members.

7. A creel system comprising a plurality of members for supporting wound annular strand packages, said members each having a seating

surface for supporting a package with its axis aligned along an unwinding axis, a tension device spaced from each member to receive strand withdrawn from the package through a balloon generally centered about the axis, said device having a central passage for a strand and the surrounding fluid medium, said passage terminating in an annular strand-discharging surface, a passage concentric with the central passage for receiving a fluid and for discharging it into the central passage toward said strand-discharging surface, and an element having an annular surface for engaging said annular strand-discharging surface, said element being resiliently urged toward the injector, a support frame for the system comprising hollow fluid-conducting members, a hollow fluid-conducting element extending from a fluid-conducting member for supporting each tension device and for communicating fluid thereto, valves in the fluid-conducting elements for controlling the movement of fluid therethrough.

8. A creel system comprising a plurality of members for supporting wound annular strand packages, said members each having means for approximately aligning its axis along a predetermined unwinding axis, a tension device spaced from each member along the axis and beyond the region occupied by a package when supported by the member to receive strand withdrawn from the package, said device having a central passage of sufficient size for the passage of strand and a small stream of air, said passage terminating in an annular rounded strand-discharging surface over which strand may be discharged from the device in a direction lateral with respect to the longitudinal direction of the central passage, an annular passage concentric to the central passage for receiving a fluid and discharging it into the central passage toward said strand-discharging surface, and an element having an annular surface, means for resiliently limiting movement of the element to movement in a direction corresponding generally to the longitudinal direction of the central passage and for limiting the extent of such movement away from the strand-discharging surface, a hollow fluid-conducting frame for supporting the members and the devices, separate duct means for connecting the frame and the annular passage of each device, a valve in the duct means to each device, and means for supplying air under pressure to the frame.

9. A tension device for a running strand comprising a body portion having a passage extending therethrough for the transmission of the strand, the strand-discharging end-section of the passage being enlarged and being defined by a tapering surface extending inwardly of the body to a smaller diameter, a friction element adapted to seat within and engage said tapering surface, a support for the body portion, and an elongate member extending from the support into adjacent relationship with the friction element for limiting the movement of the element away from the tapering surface.

10. A tension device for a running strand comprising a body portion having a passage extending therethrough for the transmission of the strand, the strand-discharging end-section of the passage being enlarged and being defined by a circular tapering surface extending inwardly of the body to a smaller diameter, an annular tapering friction element adapted to seat within and engage said tapering surface, a support for the body portion extending therefrom in a direction lateral with respect to the passage, and an elongate member extending from the support into adjacent relationship with the friction element to limit its movement away from the tapering surface, said device having the region adjacent the element and the portion of the member adjacent thereto free of obstruction for deflection of said portion of the member to facilitate removal of the element.

11. A tension device as defined in claim 10 wherein the elongate member comprises a spring having a portion extending into loosely-engaging axially overlapping relationship with a portion of the element.

12. A tension device as defined in claim 11 wherein the element has an axially-extending bore and the free end-portion of the spring extends at least partly into the bore.

13. A tension device for a running strand comprising a body portion having a passage extending therethrough for the transmission of the strand, the strand-discharging end-section of the passage being enlarged and being defined by a tapering surface extending inwardly of the body to a smaller diameter, a friction element adapted to seat within and engage the tapering surface, a hollow support for the body portion, and an elongate member extending from the support into adjacent relationship with the friction element for limiting the movement of the element away from the tapering surface, the body portion having a chamber connected with the passage of the hollow support, the chamber extending obliquely toward the passage of the body portion and joining therewith to direct gas supplied to the chamber toward said enlarged section of the passage.

14. A tension device as defined in claim 13 wherein all sections of the first-named passage are substantialy circular in cross section, the chamber being annular and substantially concentric with respect to said passage.

15. A tension device as defined in claim 14 wherein the element has an axially-extending bore extending inwardly from a surface thereof facing away from said seating surface of the body portion, and the elongate member comprises a spring extending from the support into the bore.

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