April 18, 1933. J. VACHER 1,904,394

AUTOMATIC TENSION MECHANISM FOR STRANDS, ETC

Filed Aug. 4, 1931

Fig. 1.

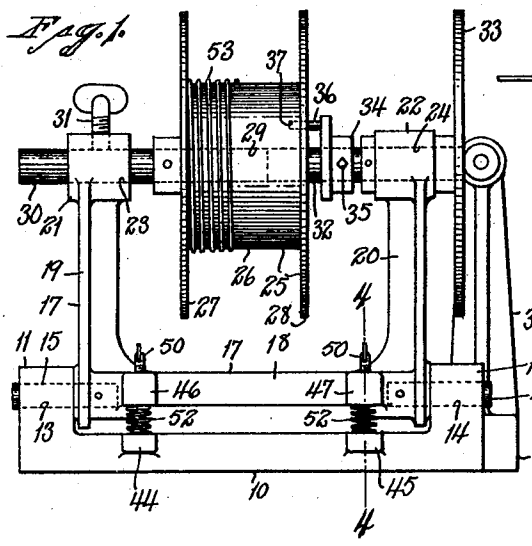


Fig. 2.

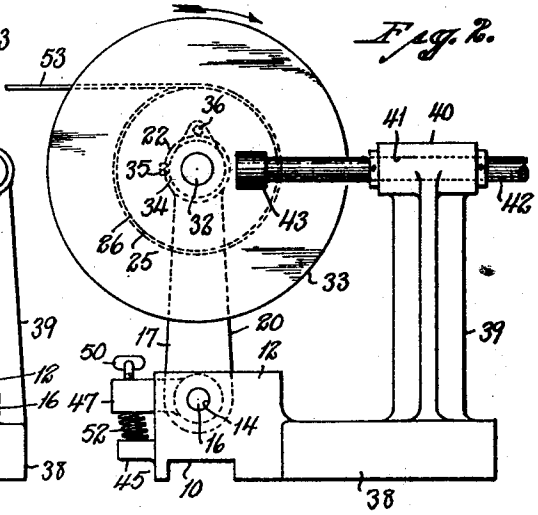


Fig. 4.

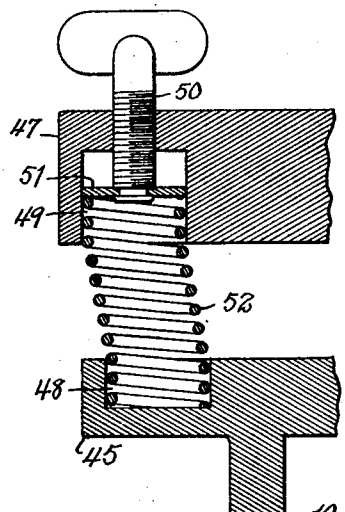
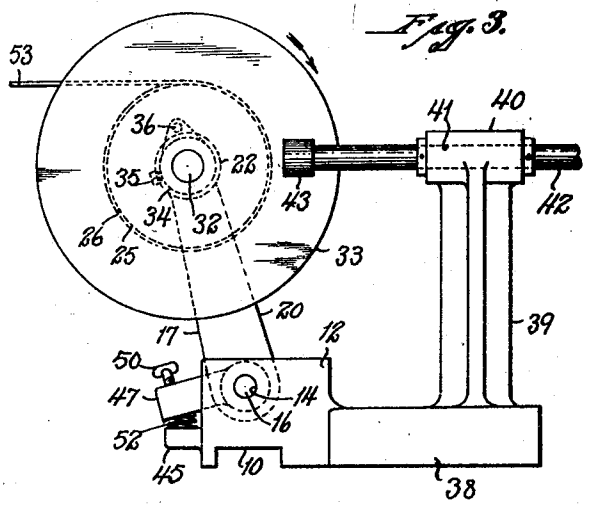


Fig. 3.



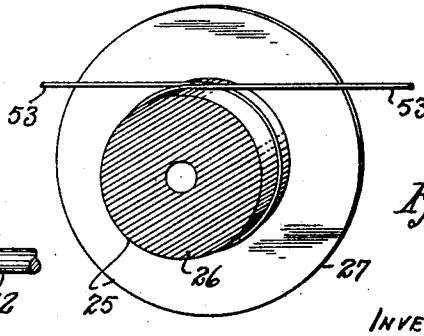


Fig. 5.

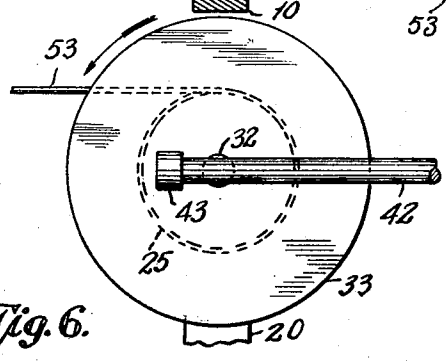


Fig. 6.

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UNITED STATES PATENT OFFICE

JOHN VACHER, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE AMERICAN MILLS COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION

AUTOMATIC TENSION MECHANISM FOR STRANDS, ETC.

Application filed August 4, 1931. Serial No. 555,024.

This invention relates to an improvement in automatic tension mechanisms for strands, etc., that is to say, mechanisms for automatically maintaining strands or sheet-material under a substantially-uniform tension as the same is being reeled, unreeled, or otherwise handled.

My invention, while useful in handling a wide variety of sheet and strand material, responds to a particular need in connection with the handling of elastic strands and its utility in that connection will be largely featured herein for the purpose of demonstrating its advantages.

In the manufacture of covered elastic strands for use in elastic fabrics and webbing, it is the practice to concurrently wind a large number of such strands upon a reel as the same come from a covering machine, and to subsequently draw the covered strands off the reel for incorporation into fabrics or webbing as the same is being woven. In order to insure uniform covering of elastic strands as the same are passed through a covering machine and to insure their proper weaving, as well as for other reasons, it is important that such strands be wound upon reels under as nearly uniform tension as possible.

Heretofore one of the main reasons for the differential tension of material wound upon power-driven reels resided in the fact that a substantially-empty reel draws off or takes on less material per revolution than a full or nearly-full reel, owing to the relatively-greater diameter of the latter.

The main object of my invention is to provide a power-driven or controlled mechanism which will automatically maintain a substantially-uniform tension upon the material being wound thereon, drawn therefrom or passed thereover, and while particularly useful in connection with the reeling, etc., of rubber or other elastic strands, my improved reel-mechanism is also admirably suited for other uses, such as reeling or delivery of cotton, silk, wire and other relatively-inelastic materials.

With the above and other objects in view as will appear from the following, my invention consists in an automatic tension mechanism characterized by a reel or drum and a power-driven control-mechanism therefor of such character as to automatically change the rotary speed of the said reel or drum in response to a change of tension upon the material being wound upon, unwound from or passing over the said drum or reel.

My invention further consists in a power-driven reel-mechanism characterized as above and having certain other features of construction and combinations of parts as will be hereinafter described and particularly recited in the claims.

In the accompanying drawing:

Fig. 1 is a schematic view in front elevation of one form which an automatic tension device embodying my invention may assume; Fig. 2 is an edge view thereof;

Fig. 3 is a view corresponding to Fig. 2 but showing the reel bodily moved forward as the result of increased tension upon the strand being wound to proportionately decrease its R. P. M.;

Fig. 4 is a broken detail sectional view taken on the line 4—4 of Fig. 1 but on a larger scale;

Fig. 5 is a perspective view of the drum or reel shown partly in section and illustrating its use as a capstan to maintain tension on a strand passing thereover; and

Fig. 6 is a broken edge view showing the parts of the device arranged for feeding or delivering strands.

The particular embodiment of my invention herein chosen for illustration consists as shown of a relative-long-and-narrow base 10 provided at each of its respective opposite ends with upstanding bearing-lugs 11 and 12 respectively provided with aligned horizontal bearing-openings 13 and 14. The base 10 may be rested upon any suitable support and has extending into its respective bearing-openings 13 and 14 horizontal trunnion-rods 15 and 16 extending outward from the respective opposite sides of a pivotal U-shaped reel-carrying frame 17 comprising a horizontal reach 18 and complementary upstanding arms 19 and 20.

The respective upper ends of the arms 19

and 20 just above referred to are formed with cylindrical bosses 21 and 22 respectively provided with aligned passages 23 and 24 and between which is located a reel or drum 25 comprising a cylindrical body-portion 26 and a pair of complementary side-flanges 27 and 28, though the latter are not essential.

The reel 25 above described is provided with an axial bore 29 into the left-hand end of which (as viewed in Fig. 1) extends the inner end of a supporting-rod 30 mounted in the passage 23 in the boss 21 of the U-shaped reel-carrying frame 17 and adjustably held therein by a wing-head clamping-screw 31.

Extending into the complementary right-hand end of the axial bore 29 of the reel 25 is the inner end of a control-shaft 32 mounted for rotation in the passage 24 in the upper end of the arm 20 and having secured to its outer end a friction-disk 33.

For the purpose of releasably coupling the reel 25 to the control-shaft 32 I provide the latter with a collar 34 adjustably secured to the same by a set-screw 35 and provided with a horizontally-offset coupling-pin 36 extending into an appropriately-positioned socket 37 formed in the adjacent face of the said reel 25.

Extending rearward from the right-hand end of the base 10 is an integral horizontal arm 38 provided with an upstanding bracket 39 terminating at its upper end in a boss 40 having a horizontal bearing-passage 41 substantially-aligned with the passage 24 in the arm 20 but extending at a right angle thereto. Rotatably mounted in the bearing-passage 41 of the bracket 39 is a primary control-shaft 42 which may be driven from any convenient source of power (not shown) and which is provided at its forward end with a friction-roller 43 bearing against the outer face of the friction-disk 33 for the purpose of rotating the same and the reel 25, or of controlling the speed of rotation thereof, as will hereinafter appear.

The base 10 is also provided with a pair of forwardly-extending lugs 44 and 45 respectively aligned with a corresponding pair of forwardly-projecting lugs 46 and 47 offsetting from the base-reach 18 of the pivotal reel-carrying frame 17. Each of the lugs 44 and 45 is formed with an upwardly-opening recess 48 positioned directly below a downwardly-opening recess 49, one of which is formed in each of the said lugs 46 and 47.

Each of the lugs 46 and 47 has axially threaded into it a wing-head spring-adjusting screw 50 extending into its complementary recess 49 and carrying at its lower end a washer 51 against which bears the upper end of a helical spring 52 seated at its lower end in the recess 48 of the lugs 44 or 45, as the case may be.

From the foregoing it will be seen that the springs 52 exert a constant effort to swing the reel-carrying frame, together with the reel 25 and friction-disk 33 carried thereby, rearwardly toward the friction-roller 43. The tendency of the reel 25 and friction-disk 33 to move rearward as just described is resisted by one or more strands 53 which may be wrapped around the body-portion 26 of the said reel and upon which it is desired to maintain a substantially-uniform tension.

Let it be presumed that the strand (or strands) 53 is being wound upon the reel 25, rather than being unwound therefrom, or merely passed thereover, as will hereinafter appear.

Having set the springs 52 to the desired tension, if for any reason the tension of the strand 53 is relaxed, the reel-carrying frame 17 will automatically swing rearwardly under the urge of the said springs 52, with the effect of positioning the center of the friction-disk 33 closer to the center of the friction-roller 43, with the effect of automatically speeding up the said disk 33 and hence the reel 25, thus immediately restoring the tension upon the said strand.

If, on the other hand, the tension upon the strand 53 should for any reason, such as the piling up of the convolutions thereof, increase beyond a predetermined point, the reel-carrying frame 17, together with the reel 25 and friction-disk 33, will be pulled forwardly away from the friction-roller 43, thus causing the latter to exert its driving-force nearer the periphery of the said disk and hence drive the same at a correspondingly slower rate of speed.

The description of the operation of my improved mechanism makes clear its operation when strand or sheet-material is being wound up upon the reel 25, but the operation of the mechanism illustrated would be the same were the material being drawn off from the said reel with the exception that in this instance, the roller 43 and the disk 33 would not function, strictly speaking, as a drive but more properly as a control mechanism in that they would automatically restrain the reel to a rotary speed appropriate for automatically maintaining the desired tension upon the material being unreeled. The term "speed-changing mechanism," as used herein, properly describes the so-called "friction-roller" 43 and friction-disk 33, or equivalent mechanism, where the same are functioning actively to drive the reel or permissively to restrain the latter when material is being drawn therefrom.

When the mechanism is being used as a feed for delivering the material, rather than winding the same up, the roller 43 would be reversed in position with respect to the tension of the spring 52, as indicated in Fig. 6. With the arrangement just referred to, as the tension upon the strand 53 is relaxed, the speed of the reel 25 will be decreased to a

corresponding degree by the action of the spring 52.

My improved automatic tension-mechanism is also useful when the reel or drum 25, or equivalent member, is merely used as a capstan, so to speak, as illustrated in Fig. 5, in which the strand 53 or a group thereof, is given one or more turns about the drum-portion 26 of the reel and immediately passes off therefrom.

When my improved mechanism is positioned as shown in the accompanying drawing, one or more springs 52, or an equivalent weight, is required for its proper functioning, but if the mechanism be placed horizontally, the weight of the reel and associated parts will serve to make the springs or equivalent parts unnecessary. This may be seen by turning the accompanying drawing to the right, so that the now vertical axis of the device lies in a horizontal plane. It will thus be seen that the weight of the reel and associated parts will normally tend to move the center of the friction-disk 33 toward the friction-roller 43, which movement will be resisted by the strand 53. However, the employment of one or more springs or equivalent yielding-means, is desirable for the reason that the same may be readily adjusted.

It will thus be seen that whenever, for any reason, the tension upon the strand 53 decreases or increases beyond a predetermined limit, the friction-disk 33 will be automatically moved with respect to the friction-roller 43 to effect an increase in the speed of the reel or a decrease in the speed thereof, as may be required to restore the desired and predetermined tension upon the said strand.

My invention contemplates broadly, automatically effecting a change in the speed-function of a control-mechanism to regulate the speed of the reel or equivalent element, in direct response to a change in tension upon the material being handled.

It will be understood, therefore, by those skilled in the art that my invention may assume varied physical forms without departing from my inventive concept and I, therefore, do not limit myself to the specific embodiment herein chosen for illustration, but only as indicated in the appended claims.

I claim:

1. In a mechanism of the class described, the combination with a revoluble reel mounted for bodily movement; of a pair of complementary interengaging rotary friction-members, one of which is adapted for connection to a source of power for being driven at a substantially constant speed and the other of which is operatively associated with the said reel and bodily movable therewith relatively with respect to its complementary friction-member to effect a speed-changing relationship between the two said members in direct response to a change in the tension of the material being handled by the said reel; the said parts being organized and related with respect to each other in such manner as to move the said reel and simultaneously slide the face of the movable friction-member across the periphery of its complementary friction-member to automatically effect a positive and proportional change in the speed of the said reel as the said tension is changed.

2. In a mechanism of the class described, the combination with a revoluble reel mounted for bodily movement; of a pair of coacting rotary friction-members, one of which is in the form of a friction-disk and the other in the form of a friction-roller engaged therewith, the said friction-disk being operatively associated with the said reel and bodily movable therewith across the periphery of its complementary friction-roller to effect a speed-changing relationship therebetween in direct response to a change in the tension of the material being handled by said reel, the said friction-roller being adapted for connection to a source of power for being driven at a substantially constant speed; the parts being organized and related with respect to each other in such manner as to move the said reel and simultaneously slide the face of the said movable friction-disk across the periphery of its complementary friction-roller to automatically effect a positive and proportional change in the speed of the said reel as the said tension is changed.

3. In a mechanism of the class described, the combination with a revoluble reel mounted for bodily movement; of a pair of coacting rotary friction-members, one of which is in the form of a friction-disk and the other in the form of a friction-roller engaged therewith, the said friction-disk being operatively associated with the said reel and bodily movable therewith across the periphery of its complementary friction-roller to effect a speed-changing relationship therebetween in direct response to a change in the tension of the material being handled by said reel, the said friction-roller being adapted for connection to a source of power for being driven at a substantially constant speed; and yielding-means normally exerting an effect to shift the said movable friction-disk together with the said reel in a direction in opposition to the pull of the said material; the parts being organized and related with respect to each other in such manner as to move the said reel and simultaneously slide the face of the said movable friction-disk across the periphery of its complementary friction-roller to automatically effect a positive and proportional change in the speed of the said reel as the said tension is changed.

4. In a mechanism of the class described, the combination with a revoluble reel mounted for bodily movement; of a friction-disk and a friction-roller engaged therewith, the

said friction-disk being operatively associated with the said reel and bodily movable therewith, across the periphery of the said friction-roller to effect a speed-changing relationship therebetween in direct response to a change in the tension of the material being handled by the said reel, the said friction-roller being adapted for connection to a source of power for being driven at a substantially constant speed; the parts being organized and related with respect to each other in such manner as to move the said reel and simultaneously slide the face of the said friction-disk across the periphery of the said friction-roller to automatically effect a positive and proportional change in the speed of the said reel as the said tension is changed.

5. In a device of the class described, the combination with a shiftable reel-carrying frame; of a revoluble reel carried by the said frame and shiftable therewith; a friction-disk also carried by the said reel-carrying frame with which it is movable in direct response to a change in the tension of the material being handled by the said reel and operatively associated with the said reel for controlling the rotary movement thereof; and a friction-roller contacting with the said friction-disk for sliding engagement with the face thereof and adapted for connection to a source of power for being driven at a substantially constant speed and having its axis extending substantially at a right angle to the axis of the said friction-disk; and yielding-means normally exerting an effort to shift the said friction-disk with respect to the said friction-roller in a direction required to increase the speed of the said reel; the parts being organized and related with respect to each other in such manner as to simultaneously shift the frame, reel and friction-disk with respect to the said friction-roller to automatically effect a positive and proportional reduction in the speed of the said reel when the said tension is increased and to automatically effect a similar increase in the speed thereof when the said tension is decreased.

6. In a device of the class described, the combination with a pivotal reel-carrying frame; of a revoluble reel carried by the said pivotal frame and shiftable therewith; a friction-disk also carried by the said pivotal reel-carrying frame with which it is movable in direct response to a change in the tension of the material being handled by the said reel and operatively associated with the said reel for controlling the rotary movement thereof; and a friction-roller contacting with the said friction-disk for sliding engagement with the face thereof and adapted for connection to a source of power for being driven at a substantially constant speed and having its axis extending substantially at a right angle to the axis of the said friction-disk; the parts being organized and related with respect to each other in such manner as to simultaneously shift the frame, reel and friction-disk with respect to the said friction-roller to automatically effect a positive and proportional reduction in the speed of the said reel when the said tension is increased and to automatically effect a similar increase in the speed thereof when the said tension is decreased.

7. In a device of the class described, the combination with a pivotal reel-carrying frame; of a revoluble reel carried by the said pivotal frame and shiftable therewith; a friction-disk also carried by the said pivotal reel-carrying frame with which it is movable in response to a change in the tension of the material being handled by the said reel and operatively associated with the said reel for controlling the rotary movement thereof; and a friction-roller contacting with the said friction-disk for sliding engagement with the face thereof and adapted for connection to a source of power and having its axis extending substantially at a right angle to the axis of the said friction-disk; and yielding-means normally exerting an effort to shift the said friction-disk with respect to the said friction-roller in a direction required to increase the speed of the said reel; the parts being organized and related with respect to each other in such manner as to simultaneously shift the frame, reel and friction-disk with respect to the said friction-roller to automatically effect a positive and proportional reduction in the speed of the said reel when the said tension is increased and to automatically effect a similar increase in the speed thereof when the said tension is decreased.

In testimony whereof, I have signed this specification.

JOHN VACHER.