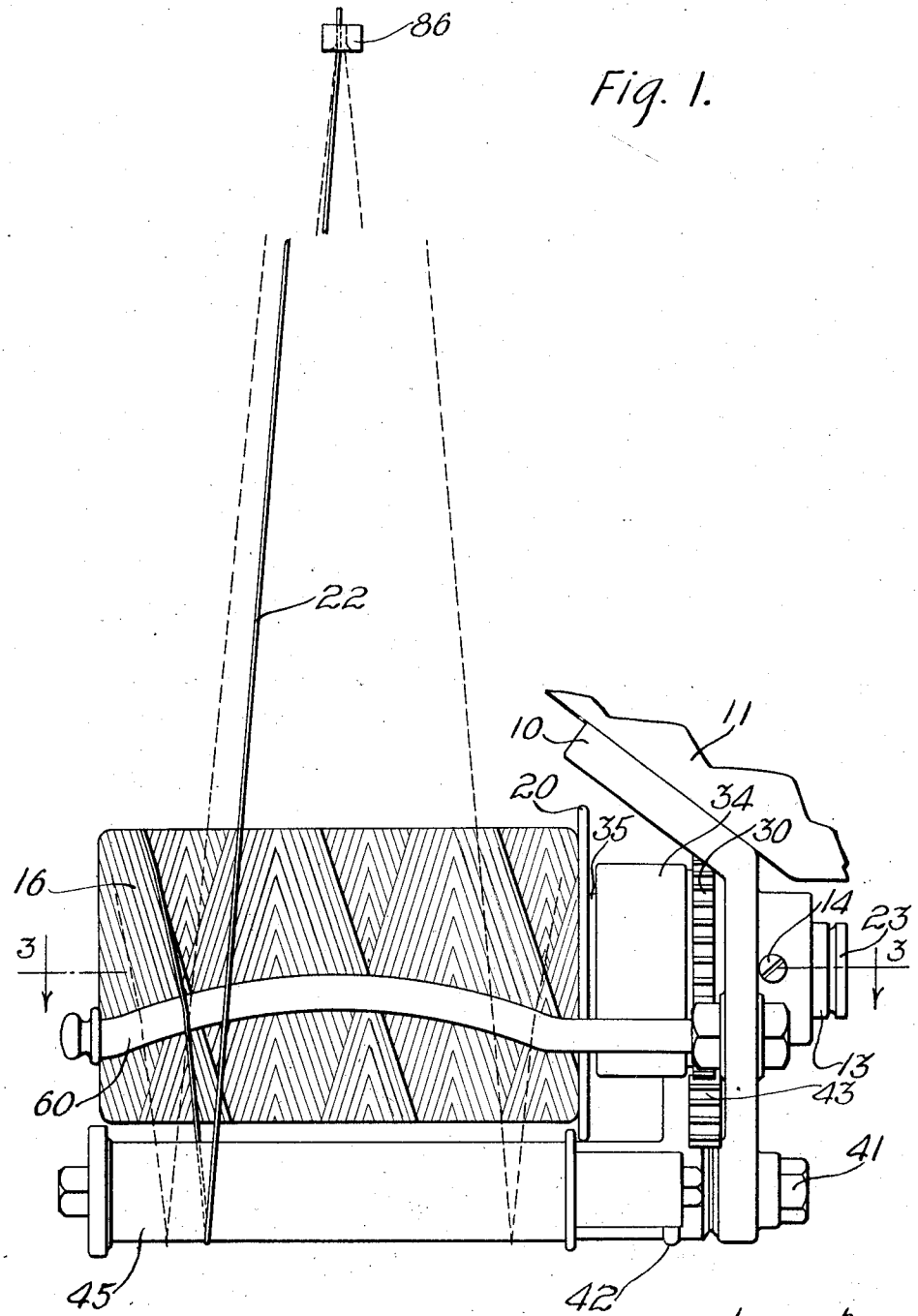
June 21, 1927. 1,632,876

G. A. BOUVIER

STRAND TENSIONING DEVICE

Filed Sept. 30, 1925 2 Sheets-Sheet 1

Fig. 1.



Inventor
George A. Bouvier
by H. A. Gattiker
Att'y

June 21, 1927. 1,632,876

G. A. BOUVIER

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Fig. 2.

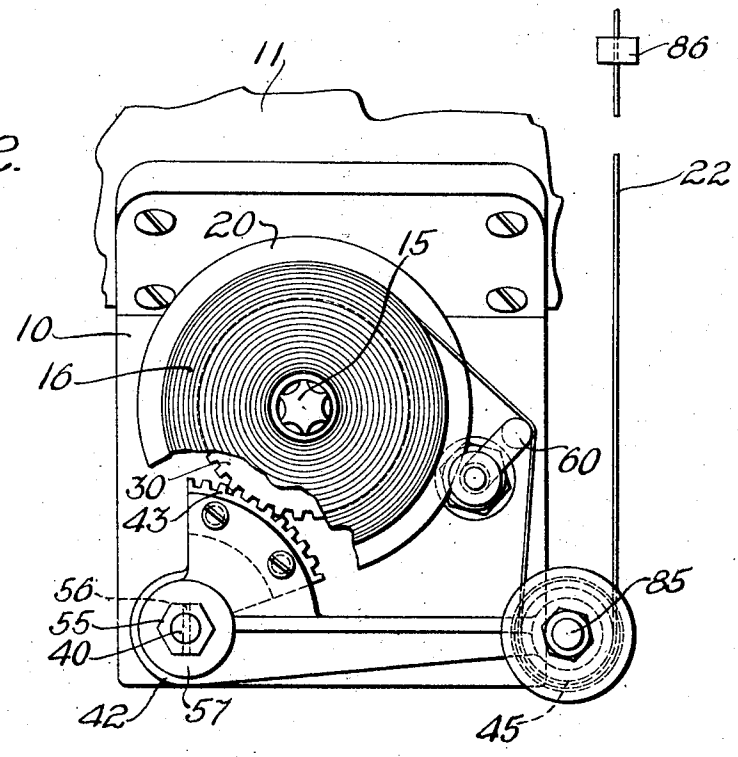
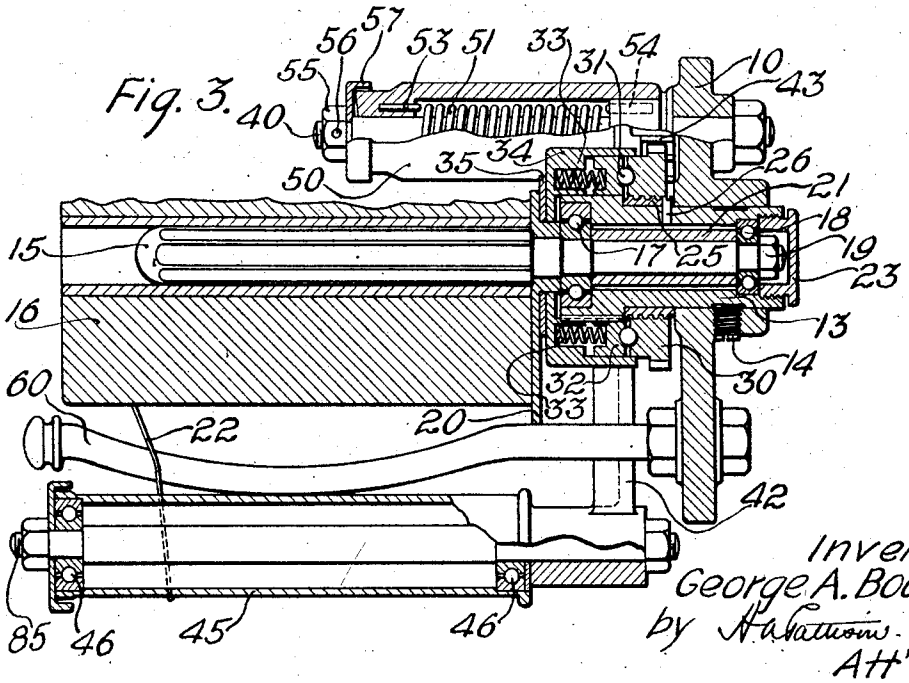


Fig. 3.



Inventor
George A. Bouvier
by H. A. Cattow.
Att'y

Patented June 21, 1927. 1,632,876

UNITED STATES PATENT OFFICE.

GEORGE ALFRED BOUVIER, OF OAK PARK, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STRAND-TENSIONING DEVICE.

Application filed September 30, 1925. Serial No. 59,468.

This invention relates to strand tensioning devices, and more particularly to devices for applying tension to a strand as it is withdrawn from a package thereof.

The object of the invention is to provide an improved strand tensioning mechanism, by means of which a strand may be safely withdrawn from a package at a high rate of speed.

The invention is of particular utility in balancing the changing effect on the tension of a strand, due to the change in the torque moment when a full and reduced diameter strand package is employed. A portion of the mechanism is also of greater utility when a so-called "universal wound" strand package is employed.

In accordance with one embodiment of the invention the strand package is supported by a spindle which has a disc rotatable therewith, and friction is applied to the face of the disc by a friction member held resiliently thereagainst. A bell crank lever has one arm equipped with a guide over which the strand is withdrawn from the package, and the other arm thereof controls means to vary the pressure of the friction member on the spindle disc. As the strand is withdrawn it passes over a curved stud positioned lengthwise of the package and which is designed to maintain substantially the same length of strand between the package and a common guiding point or the point of application thereof, independently of location of the point of withdrawal along the package, and thus insure an even unwinding of the package.

Other objects and features of the invention will become more apparent from the following detailed description taken with the accompanying drawings, wherein

Fig. 1 is a view in side elevation of a strand unwinding and tensioning device embodying the main features of the invention;

Fig. 2 is a plan view of the same mechanism; and

Fig. 3 is an irregular fragmentary section taken on the line 3—3 of Fig. 1 looking in the direction of the arrows.

Referring now in detail to the drawings in which like numerals are employed to designate corresponding members throughout the several views, the numeral 10 refers to a base plate of an unwinding and tensioning device, which is suitably secured to a main frame 11 of a strand working machine, which may be of any suitable type and is not shown in the drawing because it is not essential to an understanding of the invention. A spindle holding member 13 is secured in the plate 10 by a set screw 14 and supports a spindle 15 for a cop or package 16 of strand 22 (Fig. 2), bearings 17 and 18 (Fig. 3) being provided to permit free rotation of the spindle and an assembling nut 19 being secured to a threaded portion on one end of the spindle shank. The bearings 17 and 18 may be mounted in any convenient manner, but in the drawing, as shown particularly in Fig. 3, the inner race of the bearing 17 is clamped between the hub portion of a disc member 20 which is secured to the spindle and a sleeve or bushing 21 in which the spindle is free to rotate. The inner race of the bearing 18 is secured between the sleeve 21 and the assembling nut 19. In this manner the spindle 15, disc member 20, the inner races of the ball bearings, the sleeve 21 and the assembling nut 19 all rotate together. The outer race of the bearing 17 is secured in any suitable manner to member 13, and the outer race of the bearing 18 is secured between a shoulder on the member 13 and a set screw 23 which is threaded in the member 13 and which also acts as a cover to prevent the entrance of dust into the bearings. A ring member 25 having comparatively long pitched threads as shown, is pinned at 26 to the member 13, and a gear member 30 is provided with internal threads which engage the threads on the member 25. One face of the member 30 is provided with an annular recess for balls 31—31, which also ride in an annular recess in a member 32 which engages coil springs 33 bearing against a friction member 34, a friction disc 35 being inserted between the friction member 34 and the member 20 to prevent too great wear of these members. As shown in Fig. 2 friction member 34 is cup-shaped and thus furnishes a housing for other portions of the mechanism, and is keyed with the member 32 to the stationary member 13 whereby longitudinal motion is permitted but no rotary motion is possible.

The mechanism described in the preceding

paragraph permits withdrawal of a strand from the package 16 and will also permit tensioning of the strand by friction between the members 20, 35 and 34 as controlled by the springs 33 and associated mechanism. Rotation of the member 30 causes it to move relative to the member 25 on which it is threaded, resulting in an increase or decrease in the compression of the springs 33, thereby increasing or decreasing the amount of friction between the members 20, 35 and 34. The tension in the strand, however, is utilized to control the friction between these members by means of the portions of the mechanism now to be described.

A pivot stud 40 is secured to the plate 10 by means of a nut 41 and a bell crank lever generally designated by the numeral 42 is pivoted thereon. A short arm of the bell crank is provided with a gear segment 43 which meshes with the member 30, and the long arm of the bell crank is provided with an elongated guide pulley comprising essentially a sleeve 45 which turns freely on bearings 46, 46 on a stud 85 which is suitably secured to the bell crank lever. The sleeve 45 acts as an idler roller and guide for the strand, which is permitted to travel from end to end thereof as it is being withdrawn from the package.

The bell crank 42 is provided with an integral sleeve 50 parallel to axis thereof, which sleeve houses a coil spring 51, one end of the spring being secured at 53 to the sleeve, and the other end being secured at 54 to a hub portion on the pivot stud 40. A nut 55 threaded to the free end of the pivot stud 40 is pinned thereto at 56 and engages a flanged washer 57 which functions as a thrust bearing for the adjacent portion of the sleeve 50. The tension spring 51 is regulated by loosening the nut 41, rotating the pivot stud 40 in a clockwise or a counter-clockwise direction to either increase or decrease the tension as required and then again tightening the nut 41.

While employing tensioning devices heretofore in use, when a strand is being withdrawn from a package it is obvious that when its point of withdrawal or "take off" from the package and the point to which it is being supplied are in a plane which is not vertical to the axis of the package, a greater length of strand exists between these points than when they are in a plane which is vertical to the axis of the package. Explicitly, if a strand is being withdrawn from a package to a point which is midway between the ends of the package, the greatest length of strand will be between this point and the package when the strand is being withdrawn from the extreme end; and the shortest length of strand when it is being withdrawn from the center portion of the package. When operating at very high speeds with previously used tensioning devices this condition leads to a jerking action which is considerably magnified when a so-called "universal wound" package is employed, since the point of withdrawal of the strand from the package rapidly shifts from end to end thereof.

This condition is obviated in the present invention by providing a curved stud 60 over which the strand passes as it is withdrawn from the package and which serves as auxiliary tension regulating means. The stud 60 is so shaped that there is always substantially the same length of strand between various parts on the package and a fixed point, for example the point at which the strand is associated with a guide or other portions of a strand working mechanism, for which the package may serve as a supply, which guide is indicated schematically by the numeral 86 (Fig. 2).

When employing a mechanism embodying the features of the present invention, the pressure between the disc member 20 and the friction member 34 is regulated by loosening the set screw 14 and turning the member 13 to the right or left, meanwhile holding the bell crank lever 42 in a stationary position. This causes a rotation of the member 13 with the other portions of the mechanism associated therewith, with the exception of the member 30 which is prevented from turning by its engagement with the gear segment on the bell crank lever. The turning of these portions results in an increased or decreased tension in the springs 33, 33 and the set screw 14 is again tightened to hold the parts in the new position. The tension of the spring 51 is then regulated in the manner described to balance the tension in the springs 33, 33.

When the mechanism has been adjusted, the package 16 is placed upon the spindle in which, as shown, splines having been formed to prevent rotation of the package thereupon. The strand 22 is then withdrawn from the package by any suitable means (not shown), brought around the curved stud 60 (shown particularly in Fig. 2), over the guide member 45, and thence to the point 86. As the strand is withdrawn, should the tension therein become too great, the bell crank lever will rotate in a counter-clockwise direction, thus turning the member 30 upon the threads of the member 25 and decreasing the tension of the springs 33, 33, resulting in a decreased pressure between the disc member 20 and the members 35 and 34. Should the tension in the strand become too slight, the bell crank lever will rotate about its pivot in a clockwise direction, whereby the opposite result will take place and the friction between the members will be increased.

The principal purpose of the mechanism

is to regulate the tension of the strand as the size of the package is decreased. When a full package is placed on the spindle the torque moment, due to the pull of the strand tending to rotate the spindle, is at a maximum. Thus, the friction must also be at a maximum with a full strand package. The tension of the springs are so arranged that the guide member on the end of the bell crank will be drawn to a position farthest away from the package when the package is full. When this takes place the tension will be increased in the manner described. As the package reduces in diameter the friction becomes too high to balance the shortening torque arm with the result that the pull and consequent tension on the strand tends to increase. This tendency to increased tension of the strand, however, results in a slight shift of the guide member and a consequent small rotation of the bell crank and member 30 to release the pressure between the friction members. In operation the correction in friction takes place smoothly and steadily.

In service the member 34 may become worn and result in a change of position of the bell crank lever. This condition may be corrected, however, by loosening the set screw 14 and rotating the member 13 in the same manner as described above in adjusting the tension.

Although for purposes of description, details of one embodiment of the invention have been given in particular, it is to be understood that the invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. In a mechanism for regulating the tension of a strand as it is withdrawn from a package thereof, a stationary member, a spindle for holding a strand package and rotatably mounted in the stationary member, a disc member rotatable with the spindle, a friction member coaxial therewith, resilient means associated with the friction member, a member associated with the resilient means for maintaining the friction member in engagement with the disc member, said member associated with the resilient means being threaded on the stationary member and having a gear toothed section associated therewith, a bell crank having a gear segment on one arm thereof engaging the toothed section of the member associated with the resilient means, a strand guiding member associated with the other arm thereof over which the strand is withdrawn, the bell crank actuating in response to changes in the tension of the strand as it passes over the guiding member, thereby rotating the member associated with the resilient means to vary the effectiveness of said resilient means.

2. In a mechanism for regulating the tension of a strand as it is withdrawn from a package thereof, a stationary member, a spindle for holding a strand package and rotatably mounted in the stationary member, a disc member rotatable with the spindle, a friction member coaxial therewith, resilient means associated with the friction member, a tensioning member associated therewith to maintain the friction member in engagement with the disc member, said tensioning member being threaded on the stationary member and having a gear toothed section associated therewith, a bell crank having a gear segment on one arm thereof engaging the toothed section of the tensioning member, a strand guiding member associated with the other arm thereof and responsive to the tension of the strand as it passes over the guiding member to actuate the bell crank and thereby regulate the pressure of the friction member on the disc member, and a resilient member associated with the bell crank lever to limit the pivotal action thereof.

3. In a mechanism for regulating the tension of a strand as it is withdrawn from a package thereof, a stationary member, a spindle for holding a strand package and rotatably mounted in the stationary member, a disc member rotatable with the spindle, a friction member coaxial therewith, resilient means associated with the friction member, a tensioning member associated with the resilient means to maintain the friction member in engagement with the disc member, said tensioning member being threaded on the stationary member and having a gear toothed section associated therewith, a bell crank lever having a gear segment on one arm thereof engaging the toothed section of the tensioning member, a strand guiding member associated with the other arm thereof, and responsive to the tension of the strand as it passes over the guiding member serving to actuate the bell crank and thereby regulate the pressure of the friction member on the disc member, a resilient member associated with the bell crank lever to limit the pivotal action thereof, and separate means for changing the tension of the resilient means associated with the tension member and the resilient member associated with the bell crank lever.

4. The combination with mechanism for withdrawing a strand sequentially from a plurality of points on a package thereof to a relatively fixed point, and mechanism for providing a predetermined tension in the strand as it is withdrawn, of auxiliary tension regulating means serving to maintain a constant length of strand between the fixed point and each of the plurality of points.

5. The combination with mechanism for withdrawing a strand sequentially from a plurality of points on a package thereof to

a relatively fixed point, and mechanism for providing a predetermined tension in the strand as it is withdrawn, of auxiliary tension regulating means serving to maintain a constant length of strand between the fixed point and each of the plurality of points, said means comprising a member over which the strand passes and which is designed to "bow" the strand varying degrees as it passes thereover.

In witness whereof, I hereunto subscribe my name this 18th day of Sept. A. D. 1925.

GEORGE ALFRED BOUVIER.