May 16, 1944. J. N. SELVIG 2,348,856

STRAND HANDLING APPARATUS

Filed Dec. 22, 1942

FIG. 1

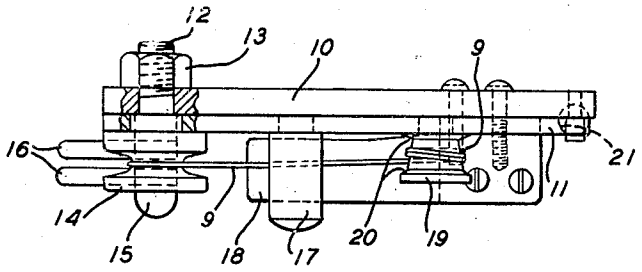
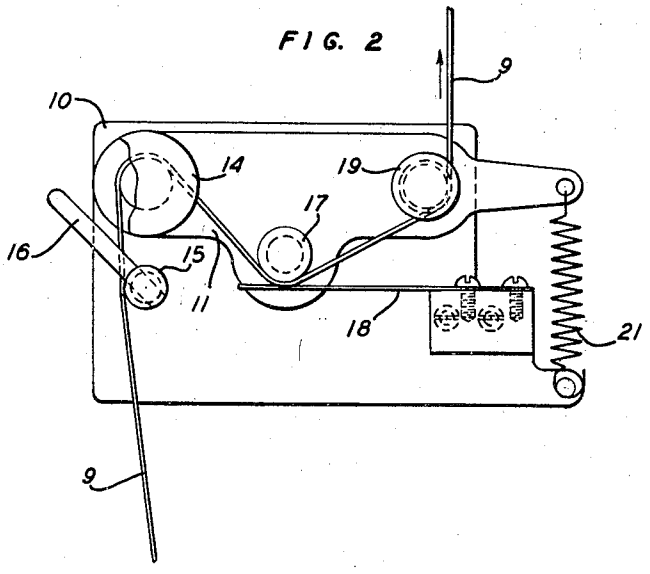


FIG. 2



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STRAND HANDLING APPARATUS

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5 Claims. (Cl. 242—149)

This invention relates to strand handling apparatus, and more particularly to apparatus for imposing tension upon a longitudinally advancing strand.

There are innumerable instances in the various arts which deal with strands, such as threads, strings, wires and the like, in which a strand is drawn through some apparatus, e. g. by a capstan, a pair of driving rolls between which the strand runs, a take-up spool or reel, or other advancing means, from a supply reel, supply cop, or other equivalent supply means, which latter offers no resistance to the removal of the strand therefrom. In many such cases it is of importance that means be provided to hold the strand yieldingly back against the pull of the advancing means, i. e. to impose an accurately controlled tension upon the advancing strand. Many devices have been made to effect this result, most of which are completely satisfactory for the requirements of specific combinations of strand nature, speed of advance, and other features of a given case. However, none appears to be entirely satisfactory in all instances. In particular, if the strand be relatively soft bodied and yet substantially inelastically inextensible, and if the strand, in view of the particular purpose in hand, is being advanced slowly, the imposition and maintenance of suitably accurately uniform tension of relatively small intensity is a matter of much difficulty. Thus in the manufacture of so-called "mandrellated wire," the control of the tension in the relatively large, soft bodied, textile fiber core to effect the slow but uniform advance of the core to and from the winding point where a very fine metal wire is served on the core, must be unusually sensitive and accurate.

An object of the present invention is to provide a device for imposing tension on a longitudinally advancing strand which device shall be simple, compact, reliable and capable of imposing tension of unusually sensitively and accurately controlled uniformity upon a strand being drawn therethrough.

With the above and other objects in view, the invention may be embodied in a device for imposing tension upon a longitudinally advancing strand and comprising a stationary base, a lever pivoted upon the base, a rigid pinching member mounted on the lever, a friction member to receive the strand from the pinching member, a resilient second pinching member mounted on the base to press against the strand passing over the first pinching member, and spring means to urge the first pinching member against the second pinching member and the strand thereon, the parts being so arranged that excessive tension in the strand beyond the friction member will cause the strand to pull the friction member and thereby move the lever against the urge of the spring means to lessen the pressure on the strand between the pinching members.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawing, in which the same reference numerals are applied to identical parts in the several figures, and in which

Fig. 1 is a plan view of a device constructed in accordance with the invention, and

Fig. 2 is a view thereof in front elevation.

The embodiment of the invention herein disclosed represents a device primarily adapted to impose delicately and accurately controlled tension upon a relatively soft bodied strand, e. g. a soft spun thread or cord of silk, being drawn therethrough. The device comprises, in the particular form shown, a tabular vertically disposed base member 10 to be stationarily supported where needed by any suitable means (not shown). On the front face of the base, a vertically movable lever 11 is pivoted by means of a bolt 12 and nut 13. The head of the bolt is formed to be a stationary, grooved guide sheave 14. Below the sheave, a horizontal post 15 mounted in the base 10 carries a pair of upwardly and outwardly slanting guide fingers 16, 16. A pinch pin 17 is rigidly mounted in the lever 11 to the right of and below the sheave 14. A flat, elastic pinch spring 18 is mounted horizontally on the stationary base 10 to be tangent to and press up against the under side of the pin 17. Above and to the right of the pin 17, a friction peg 19 is rigidly mounted on the lever 11. This peg 19 is preferably made, as shown, with a broad, slightly conically tapering circumferential groove 20. A tension spring 21 connected from the outer end of the lever 11 to a suitable part of the base 10, draws the lever down against the upward urge of the flat spring 18 against the pin 17. The spring 21 and the spring 18 are preferably relatively light and stiff respectively as compared with each other.

The strand 9 to be tensioned passes from some substantially resistanceless supply means at the bottom (not shown), and is drawn off upwardly at the top by some suitable advancing means (not shown). The strand 9 passes first between

the fingers 16, whose function is merely to suppress any whip or variation in direction of approach due to the supply means. From the fingers 16, the strand 9 passes over the sheave 14, in the groove thereof, thence down and between the pin 17 and spring 18, and thence to the peg 19. The strand is wound one or more times around the peg 19 in the groove 20, and passes thence to the advancing means (not shown).

The friction between the strand 9 and the sheave 14 is negligible. The function of the latter is chiefly to make the strand come to the pin 17 all the time at the same place. But between the pin 17 and the spring 18, the advancing strand is definitely pinched and thus subjected to a frictional force resisting its advance, which depends for its intensity at any moment upon the position of the lever 11, increasing as the lever falls and diminishing as the lever rises. In the particular instance here described, the strand 9 is a soft spun, silk thread or cord about 0.022 inch in diameter. This strand is made to pass in two complete turns around the peg 19 in the groove 20, before passing away from the device. Since the bottom of the groove is slightly conical, as shown, these turns around the peg tend to crowd down into the deeper side of the groove (nearer to the lever) and to leave the pin 17 and approach the peg 19 at a slight angle which prevents the first turn on the peg from overlapping the second turn, so that the turns on the peg always lie side by side and cannot pile up and tangle. With the advancing means pulling the strand away from the peg and the pin 17 and spring 18 resisting the advance of the strand to the peg, the peg acts as a non-rotating capstan or snubbing post and thus exerts a frictional resistance to the advance of the strand which is constant if all affective circumstances are constant.

But frictional devices are notoriously subject to partly understood perturbing effects. Probably minor variations in temperature and humidity of the neighboring atmosphere affect the frictional effects of such devices in ways which are not predictably calculable. If this were not so, it should be theoretically possible to make the lever 11 stationary instead of movable, and have the device impose uniform tension on the strand. However, these unpredictable variations do occur.

The resistance of the strand to the pull of the advancing means, i. e. the tension in the strand, is the sum of the resistances caused by the passage of the strand around the peg 19 and by the passage of the strand between the pin 17 and spring 18. Furthermore, the resistance at the peg 19 is dependent upon the resistance at the pin 17 and spring 18, increasing when the latter increases and diminishing when the latter slackens, because the peg 19 is a stationary capstan.

If, now, the tension between the peg 19 and the advancing means becomes larger, the pull of the strand tending to lift the lever 11 against the urge of the spring 21 increases, thus lifting the lever. This motion of the lever eases the pinching effect of the pin 17 and spring 18 on the strand. Hence the total tension in the strand beyond the peg 19 is diminished in two ways, directly by the smaller friction between 17 and 18, and indirectly because this last effect also diminishes the capstan resistance at the peg 19. It is clear, from the characteristic property of capstans, that a small change in the resistance to advancement between 17 and 18 is multiplied by the capstan effect at the peg 19. Hence the combination of these elements in the manner shown affords a remarkably sensitive and swiftly and accurately acting, self-governing control of the strand tension. The capstan effect, through the lever, controls the pinching effect which, in turn, modifies the capstan effect.

The particular device pictured and described above is an illustrative embodiment of the invention, and may well be variously modified and departed from without departing from the spirit and scope of the invention as particularly pointed out and described in the appended claims.

What is claimed is:

1. In an apparatus for imposing controlled tension on an advancing strand, means to impose friction upon the strand, movably mounted capstan means to receive the strand from the said means and to frictionally resist the advance of the strand and to have the back pull therefor provided by the first named means, and means actuable by displacement of the capstan means to cause variations of the effectiveness of the capstan means to vary correspondingly the effectiveness of the first named means and thereby to vary the back pull on the strand coming to the capstan.

2. In an apparatus for imposing controlled tension on an advancing strand, pinching means to impose friction upon the strand, movably mounted capstan means to receive the strand from the said means and to frictionally resist the advance of the strand and to have the back pull therefor provided by the pinching means, and means actuable by displacement of the capstan means to cause the variations of the effectiveness of the capstan means to vary correspondingly the effect of the pinching means and thereby to vary the back pull on the strand coming to the capstan.

3. In an apparatus for imposing controlled tension on an advancing strand, a stationary pinching member, a movable pinching member to press the advancing strand against the stationary member, a non-rotating movably mounted capstan to receive the strand emerging from between the two pinching members which latter thereby provide the back pull for the capstan, and means actuable by displacement of the capstan means to cause variations of the effectiveness of the capstan to move the movable pinching member to correspondingly vary the pinching effect of the two members on the strand and thereby to vary the back pull on the strand coming to the capstan.

4. In an apparatus for imposing controlled tension on an advancing strand, a base, a lever pivotally mounted on the base, a pinching member mounted on the lever and movable therewith, a second pinching member mounted on the base to coact with the movable pinching member to receive the advancing strand therebetween, a capstan on the lever to receive the advancing strand emerging from between the two pinching members which latter thereby provide the back pull for the capstan, and a spring to urge the lever to press the pinching member thereon resiliently against the pinching member on the base, the parts being so proportioned and arranged that the pull of the strand advancing from the capstan tends to move the lever against the urge of the spring.

5. In an apparatus for imposing controlled tension on an advancing strand, a base, a lever pivotally mounted on the base, a rigid pinching member mounted on the lever and movable therewith, a resilient second pinching member mounted on the base to coact with the movable pinching member to receive the advancing strand therebetween, a capstan on the lever to receive the advancing strand emerging from between the two pinching members which latter thereby provide the back pull for the capstan, and a spring to urge the lever to press the pinching member thereon resiliently against the pinching member on the base, the parts being so proportioned and arranged that the pull of the strand advancing from the capstan tends to move the lever against the urge of the spring.

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