Jan. 16, 1923. 1,442,432

J. P. HOOPER.
TENSION DEVICE.
FILED MAR. 1, 1921. 2 SHEETS-SHEET 1

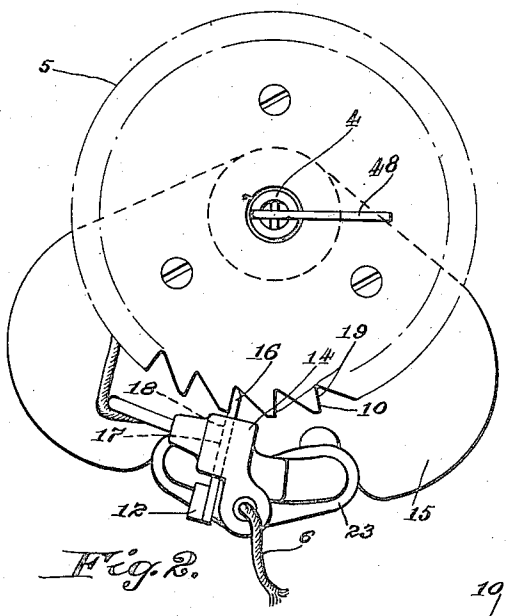


Fig. 2.

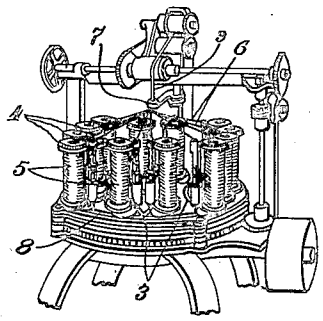


Fig. 1.

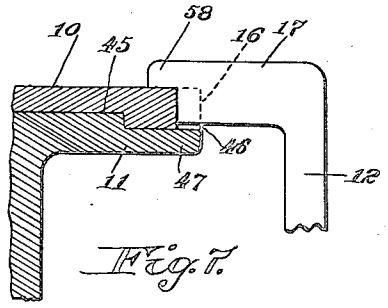


Fig. 7.

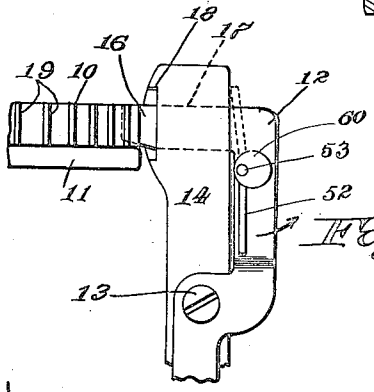


Fig. 8.

WITNESSES.
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Jan. 16, 1923. 1,442,432

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TENSION DEVICE.
FILED MAR. 1, 1921

2 SHEETS-SHEET 2

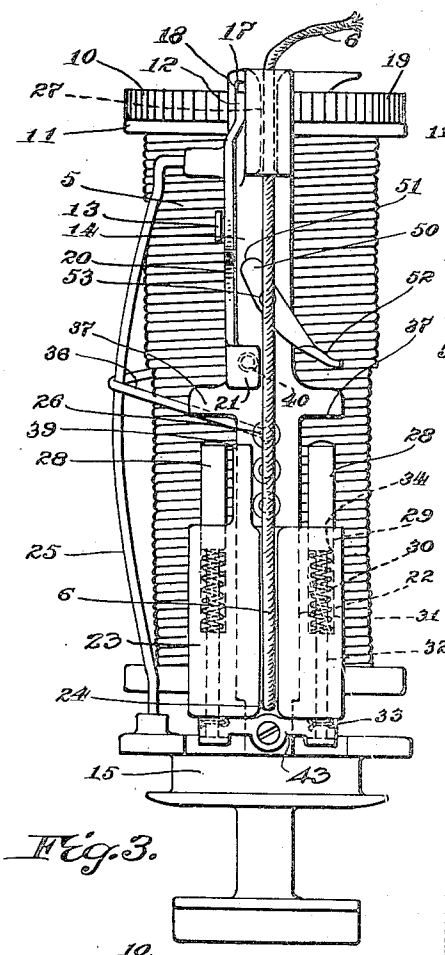


Fig. 3.

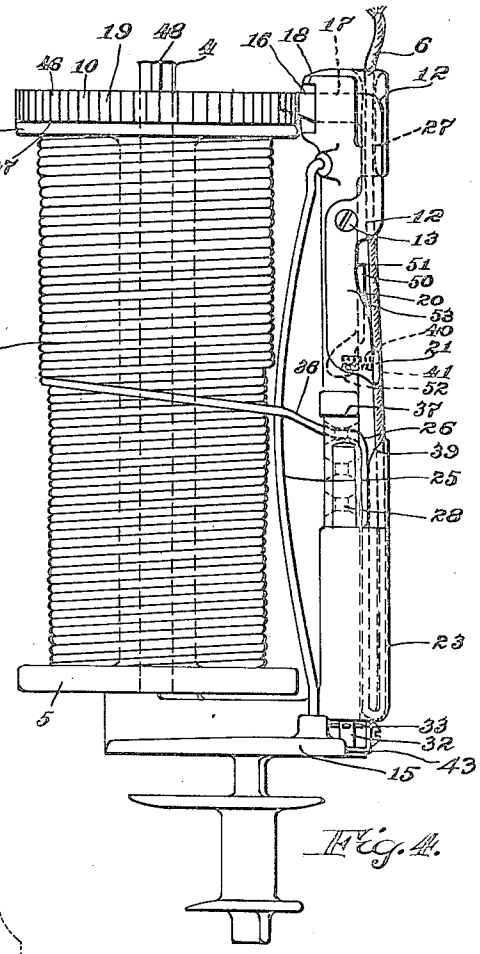


Fig. 4.

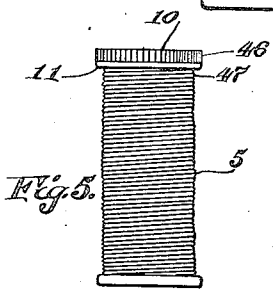


Fig. 5.

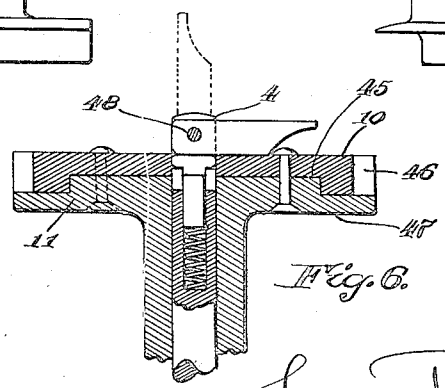


Fig. 6.

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Patented Jan. 16, 1923. 1,442,432

UNITED STATES PATENT OFFICE.

JAMES P. HOOPER, OF RUXTON, MARYLAND.

TENSION DEVICE.

Application filed March 1, 1921. Serial No. 448,826.

To all whom it may concern:

Be it known that I, JAMES P. HOOPER, a citizen of the United States of America, residing in Ruxton, Baltimore County, State of Maryland, have invented certain new and useful Improvements in Tension Devices, of which the following is a specification.

In rope and similar braiding a very considerable tension must be applied to the yarn to produce a hard and closely braided rope. This throws a heavy burden on the tension mechanism resulting in rapid wear and in the majority of tension mechanisms now in use such wear results in failure of the mechanism to act positively resulting in turn in a product which is defective at intervals on account of loose strands which occur wherever the tension skips or fails to act positively.

The object of the invention is to produce a tension mechanism particularly adapted to rope braiding machines which is positive in its action and which will not deteriorate and become less positive in operation within the term of use and under the conditions to which such mechanism is ordinarily subjected.

In addition to this improved construction the tension mechanism which is the subject of the invention includes means for locking the bobbin in position on the spindle and means for holding the tension and locking mechanism in inoperative position so that the bobbin may be conveniently removed and replaced.

In the accompanying drawings I have illustrated a rope braiding machine in a general way and in detail a spindle with a bobbin and tension mechanism embodying my invention in the preferred form.

In the drawings:

Fig. 1 is a perspective of a braiding machine on a reduced scale having the tension mechanism of the invention applied thereto.

Fig. 2 is a plan view of a bobbin and tension mechanism substantially full size with the spindle and carrier.

Fig. 3 is an elevation of the tension mechanism and bobbin and spindle.

Fig. 4 is an elevation of the same taken at right angles to Fig. 3.

Fig. 5 is an elevation on a reduced scale of a bobbin.

Fig. 6 is a fragmentary vertical section of a spindle head, bobbin head and bobbin catch.

Fig. 7 is a fragmentary elevation of a bobbin head showing the new form of tension pawl provided with a catch for holding the bobbin in position on the spindle, the catch being a feature of the invention.

Fig 8 is a detail view illustrating a modified form of a bobbin release.

Referring to the drawings by numerals, the machine as illustrated in Fig. 1 includes a rotary table or head 3 with a plurality of spindles 4 each carrying a bobbin 5 from each of which bobbins the yarn 6 is led to a central eye 7. The rotation of the head combined with the action of cam slots 8 produces a relative in and out motion of the spindles and bobbins which combined with the rotary motion produces a braiding action which forms the rope 9. As the distance of each bobbin from the point of braiding at the eye 7 increases and decreases from time to time during the braiding action in order to produce a hard and uniform rope, it is necessary not only to apply continuous tension to the yarn but to so apply the tension that it will not be released even though the bobbin from time to time approaches the braiding point or eye 7. It is also necessary that the tension be so arranged as to permit the yarn to feed forward from time to time without releasing the tension.

This is accomplished by providing a resilient element in combination with a step by step release controlling the bobbin and operating by virtue of the tendency of the bobbin to rotate in response to the pull on the yarn exerted by the take-off or winding mechanism of the braiding machine.

The tension mechanism as illustrated in Figs. 2, 3 and 4 includes a ratchet toothed gear 10 secured to the top flange or head 11 of the spool or bobbin 5. The ratchet being engaged by a pawl 12 mounted to swing in or substantially in a radial plane of the axis of the spindle 4. The pawl 12 is pivoted at 13 on a support shown in the form of an upright 14 which is rigid with the carrier or follower 15 which rides in the slots 3 as aforesaid carrying the spindle 4 and bobbin 5. The pivot 13 as shown is substantially in the center of the pawl 12 which is provided at its upper end with a tooth 16 which swings substantially in a horizontal plane, the tooth being as shown at the end of a horizontal arm 17 of the pawl lever 12 which arm extends through a guide slot 18 formed in the upright 14 closely adjacent the ratchet

so that the tooth makes positive engagement with the radial faces 19 of the teeth of the ratchet 10, and cannot be caused to release or skip by any pull which the yarn is capable of transmitting, this being both on account of the formation of the teeth and ratchet and of the support for the pawl adjacent the teeth.

The arrangement of the pawl in its relation to the ratchet teeth and particularly the feature of the positive support for the pawl immediately adjacent the teeth and the lever, of cooperation of the pawl operating in a radial plane as it does with the teeth provided with an extensive flat engaging surface of the radial plane of the spindle, constitute important features of the invention.

The pawl 12 as shown is substantially vertical and the lower arm 20 of the pawl is provided at its lower extremity with a heel 21 oppositely disposed as to the tooth 16. Riding on the lower end of the upright 14 on a suitable guide or track 22 is a sliding yielding guide 23 having a groove 24 through which a loop of the yarn 6 is passed, the yarn being led from the spool or bobbin, indicated at Figs. 3 and 4, passed around a flyer arm 25 and through an eye 26 in the upright from which point it is looped around the sliding guide 23 in the course of which loop it is passed through the groove 24 as aforesaid. From the yielding slide guide the yarn is led upward through a vertical eye 27 in the upright, the same being as shown adjacent the guide slot 18 in which the pawl operates.

The guide 23 provides the resilient element of the tension apparatus by which the variation in the length of yarn between the eye 7 which is the point of braiding and the bobbin is taken up without perceptible loss of tension. This resilient feature comprises the pins 28 (see Fig. 3) sliding in sockets 29 in the sliding guide block 23, the pins being reduced in diameter at 30 throughout their lower extremities, the reduced portions being enclosed within the coils of spiral springs 31 seated in the sockets 29. The reduced portions 30 of the pin extend downward through the block through correspondingly reduced holes 32 in the blocks 23 and are secured at their lower extremities by suitable cotter pins 33 which bear on the bottom surface of block 23 back of the stop 43 so that they appear in dotted lines in Figure 3 and in full lines in Figure 4. The springs 31 rest at one end against shoulders 34 on the pins 33 at the points where they are reduced to form the small diameter portions 32 and at their opposite end the springs rest against the bottoms of the sockets 29, it being understood that the pins 28 are preferably upright, that is parallel to the axis of the spindle and spool. The upper ends of the pins bear against shoulders or stops 37 on the uprights 14 when tension is applied.

In operation as the take-up or take-off mechanism draws the rope through the eye 7 the pull on the rope and hence on the yarn is transmitted to the bobbin which is held against rotation by engagement of the pawl tooth 16 with the corresponding face 19 of one of the ratchet teeth, hence the loop 36 passing downwardly around the slide guide block and in effect terminated above the block in the eyes 26 and 27 is tightened tending to raise the block. In the position of the apparatus shown in Fig. 3 which is the extreme relaxed position with the block 23 resting on the stop 43 which position the apparatus does not ordinarily take in operation this pull would be first resisted by gravity, i. e., the weight of the block, until the pins 28 are firmly in contact at their upper ends with the stops 37 on the upright 14. As the pull on the yarn is increased the springs 30 yield, permitting the loop to shorten and the tension block to rise or advance still further.

The block as shown in Fig. 4 is provided at its upper end with a cam surface 39 turned inward, i. e., toward the bobbin and inclined downward and inward, this cam surface is so placed as to engage the heel 21 of the pawl lever 12 near the upper end of the traverse of the guide block tending to throw the lower end of the pawl inward, i. e., to the left in Fig. 4, throwing the upper end or tooth 16 outward and releasing the bobbin. In this connection it should be noted that the pawl lever is actuated by a spring shown in the form of a spiral compression spring 40 between the heel 21 and the upright or support 14 so that the action of the pawl in response to the engagement of the heel 21 by the cam 39 is opposed by the spring which tends to hold the pawl normally in engagement with the ratchet teeth. The spring rests in a slight cavity or socket 41 in the upright 14 from which it projects into contact with the heel 21. It should be understood that the flat radial faces 19 of the teeth are turned in the direction in which the bobbin tends to rotate in unwinding.

As a result of the operation just described, the tension mechanism applies to the yarn a yielding tension capable of taking up any slack which may result from the change of length of the radius, i. e. the distance between the bobbin and eye 7 as seen in Fig. 1. It also feeds the yarn step by step, each feeding action being so timed as to take place when the previous feed is exhausted, i. e. by the drawing of the guide block up by shortening the loop 36 until the cam 39 acts on the foot 21.

Other tension apparatus designed to give

a similar operation is in use but this is less positive in its action and more subject to wear on account of this lack of positiveness which causes the tension apparatus to skip more and more producing defective points in the rope until it finally becomes inoperative, whereas the apparatus herein described is of extremely long life, during which it is not subject to failure or skipping. The distinguishing features of the apparatus have already been pointed out, i. e., the relation of the pawl to the teeth, the formation of both members, the direction of the pawl and the rigid support for the pawl tooth immediately adjacent the ratchet.

In Fig. 6 I have illustrated an arrangement of the ratchet whereby a face of the ratchet gear is hollowed out and caused to take over or extend over a portion of the head of the bobbin, the hollowed portion being indicated by reference character 45. In this way I get a sufficient expanse of ratchet teeth 46, a greater available length of spool within the fixed overall dimension and also reinforce and protect the top flange of the head of the bobbin indicated by reference character 47.

At 48 in this figure I have illustrated a well known type of catch by which the bobbin is held on the spindle.

In Fig. 7 I have illustrated a modified form of pawl lever 12 which has a projection 58 beyond the tooth 16, the object being to provide means for locking the bobbin in position on the spindle, the same being substituted for the catch 48 shown in Fig. 6. The projection or extension 58 is of sufficient length to extend over the ratchet or spool in all positions of the pawl whether or not the tooth 16 is in engagement with the teeth of the ratchet.

It will be noted by examination of Fig. 4 that the pawl normally, i. e., when in engagement with the teeth of the ratchet extends over and locks the bobbin in position so that in order to remove the bobbin it is necessary to withdraw the pawl, this in the apparatus in use occupies one hand, lifting the pawl requires the use of the other hand and at the same time it is desirable to hold the yarn so that the end may not be lost, it being understood that it is necessary to tie the ends of the yarn in seating a new bobbin. To this end I have provided a catch 50 (see Figs. 3 and 4) which swings laterally over the heel of the pawl holding the same out of engagement with the ratchet. The catch 50 consists merely of a centrally pivoted lever having a head or operative portion 51, a tail or handle 52 and a pivot pin 53 which is seated in the upright support 14, the manner of operating the catch is obvious, it merely being necessary to withdraw the pawl, the heel being swung inward toward the upright when the catch 50, which is offset at the head 51, is swung over the heel of the pawl holding the pawl in inoperative position so that the bobbin may be withdrawn.

Having thus described specifically and in detail a tension embodying my invention in the preferred form I would have it understood that the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim and desire to secure by Letters Patent is:

1. In a yarn tension for a rope braiding machine, a spindle, a bobbin thereon, a ratchet gear on the bobbin, the ratchet having teeth with operative faces projecting radially of the bobbin, an upright support rigid with the spindle, a pawl pivotally mounted thereon to swing substantially in a radial plane of the spindle and having a rigid guide adjacent the ratchet, the pawl having a tooth with a flat substantially radial surface to engage the operative faces of the ratchet teeth, means tending to hold the pawl normally in engagement with the teeth, a sliding tension guide block adapted to carry a loop of yarn, means on the block adapted to engage the pawl when the yarn is tightened, shortening the loop to a predetermined extent, throwing the pawl out of engagement with the ratchet.

2. In a rope braiding machine, a tension comprising a ratchet controlling the bobbin, a pawl having a substantially horizontal throw in a substantially radial plane of the bobbin the pawl having a pivot at right angles to the spindle, yielding means tending to maintain the pawl normally in engagement with the ratchet, a yielding tension block having means for carrying a loop of yarn and means on the block for engaging the pawl when the loop is tightened and shortened by the yielding of the block throwing the pawl out of engagement with the ratchet and guiding means for the pawl immediately adjacent the ratchet teeth.

3. In a rope braiding machine, a tension comprising a ratchet controlling the bobbin and having radially disposed teeth, a pawl having a substantially horizontal throw in a substantially radial plane of the bobbin, yielding means tending to maintain the pawl normally in engagement with the ratchet, a yielding tension block having means for carrying a loop of yarn and means on the block for engaging the pawl when the loop is tightened and shortened by the yielding of the block throwing the pawl out of engagement with the ratchet resilient means carried by the tension block, an abutment to be engaged thereby increasing the resistance presented by the block during the upper portion of its traverse.

4. In a yarn guide for a rope braiding machine, in combination with a vertical spindle and bobbin, a ratchet on the bobbin, a pivotted pawl having its axis at right angles to the spindle adapted to engage the ratchet, means tending to maintain the pawl normally in engagement with the ratchet in which position the pawl projects over the bobbin tending to hold it on the spindle, means for locking the pawl out of engagement to provide for convenient removal of the bobbin from the spindle.

5. In a yarn tension for rope braiding machine, a spindle, a bobbin, a ratchet gear connected to the bobbin, a support, a pawl pivotally mounted on the support, the pawl in engaging position serving to hold the bobbin in position on the spindle and means for locking the pawl out of engagement to permit of free removal of the bobbin, the same being in the form of a pivotted lever mounted on the support and adapted to swing into the path of the pawl.

6. In a yarn tension for rope braiding machine, a spindle, a bobbin, ratchet gear connected to the bobbin, an upright support, a pawl pivotally mounted on the support, the pivot being substantially intermediate of the length of the pawl, the engagement of the pawl with the ratchet being at the upper end of the pawl, the pawl in engaging position projecting over the portion of the bobbin which it holds it position on the spindle, means for locking the pawl out of engagement to permit of free removal of the bobbin, the same being in the form of a pivotted lever mounted on the support, the same being adapted to swing over the end of the pawl on the lower side of the pivot.

7. In a rope braiding machine, a bobbin having a ratchet gear secured to the head, the ratchet gear being of metal and being hollowed out to receive the head of the bobbin which is thereby reinforced, the ratchet gear having teeth projecting substantially across its entire vertical extent.

8. In a rope braiding machine, a bobbin, a ratchet gear on the bobbin, a pawl swinging in a vertical plane into and out of engagement with the ratchet gear, the pawl being provided with a horizontal projection in addition to the gear tooth engaging portion extending over the ratchet gear and providing a locking means whereby the bobbin is held in position on the spindle.

Signed by me at Baltimore, Maryland this 24th day of Feb., 1921.

JAMES P. HOOPER.

Witnesses:
HARRY C. HALE,
HOWARD H. TUNIS.