This invention relates to the art of spool carrier devices that are used in connection with braiding machines and has particular reference to an improved type of spool carrier that has tension adjusting properties that permit a wider range of more efficient use.

In the art of braiding machines it has long been known that it is preferable to dispense the wire, or other threaded material being braided, under tension and to this end the prior art has disclosed many spool type carrier devices that are intended to progressively release the wire or other thread material under tension, with the conventional form of device being one where the spool upon which the thread is wound is held against unwinding rotation until sufficient tension builds up in the wire, at which time this increased tension will release the spool for limited rotation to thus unwind a certain length of thread that is dispensed under the predetermined tension.

While devices of this general character have been known in the prior art for several years past, there have, nonetheless, been certain disadvantages that have been inherent with respect to the utility and operational aspects of the same.

As a principal disadvantage of the known prior art it has heretofore been unknown to provide any adjustment whatsoever of the tension pressure that will be required to release the spool for unwinding movement. Thus, it frequently happens that adjacent springs in adjacent carriers will develop unequal tensions, with the result that adjacent threads are played out at unequal tensions which is undesirable from a braiding standpoint. In this regard, it has been found that if means are provided for adjusting the tension pressure that trips or releases the spool for unwinding rotation, that uniform tensions can be obtained in adjacent carriers notwithstanding the fact that the springs per se may be of unequal tension. The end result of such adjustment is that the carriers can be adjusted to attain identical tensions.

It has further been found that the above described advantage will be further enhanced if second adjustment means are provided for adjusting the tension over a relatively wide range. In this manner the same springs can be utilized for a plurality of different tensions instead of changing springs to accommodate changed tension requirements as is presently done in existing devices of this type.

Thus, one such adjustment device may be used for a wide range of tension requirements, while the other adjustment means may be used to bring adjacent carriers into tension conformity with each other.

It has further been discovered that improved results can be obtained by providing a positive mechanical interlock that exists continuously between the control guide of the carrier and the pivot arm that retains the spool against movement during the time that the same is in engagement therewith. Preferably, this advantage is achieved by providing an adjustable lost motion type of connection between the movable control guide and the trip element that retains the spool against rotation pending build up of the requisite tension pressure.

As a further advantage, it has been discovered that thread breakage can be minimized if the carrier is provided with a guide rod that extends in parallel with the axis of the spool, with such guide rod being disposed adjacent a preselected peripheral region thereof. In this fashion thread is delivered to the guide means at a uniformly consistent angle, with the result that sharp bends, of the type that result in premature thread breakage, are eliminated. Elimination of such sharp bends additionally eliminates "cussy" or kinks that would otherwise result from such sharp bends.

Production of an improved wire braider carrier having the above advantages accordingly becomes the principal object of this invention, with other objects of this invention becoming more apparent upon a reading of the following brief specification, considered and interpreted in the light of the accompanying drawings.

Of the drawings:

FIGURE 1 is a perspective view of the improved wire braider carrier and showing the braiding thread being wound therearound for emission under tension.

FIGURE 2 is a longitudinal section taken on the lines 2—2 of FIGURE 1.

FIGURE 3 is a longitudinal section similar to FIGURE 2, but showing the position of the component parts when maximum tension has been built up in the thread.

FIGURE 4 is an elevational view taken substantially on the lines 4—4 of FIGURE 1 and indicating the position of certain component parts in full and chain dotted lines.

FIGURE 5 is a section taken on the lines 5—5 of FIGURE 4.

FIGURE 6 is a section taken on the lines 6—6 of FIGURE 1 and being slightly enlarged for clarity.

FIGURE 7 is a perspective view of the carrier with the spool removed.

Referring now to the drawings and in particular to FIGURE 1 thereof, the improved wire braider carrier, generally designated by the numeral 16, includes a support base 11 that is adapted to be mounted on existing braiding decks that will accommodate several such units of the type herein being described, with these units moving through an appropriate cross over path of movement that effectuates braiding in known fashion.

The base 11 serves as a support for the various elements of the individual carrier 10, and to this end the same includes a pair of projecting bosses 13 and 14, with the boss 13 serving to support a spool or bobbin 15 of wound thread material T, while the boss member 14 supports an elongate tensioning mechanism 16 that projects from base 11 in substantial parallelism with the spool 15.

In this fashion, and as shown in FIGURE 1, thread T, upon being unwound and passed over the guide elements of the tensioning mechanism 16 will emit longitudinally of the unit 10 through the eyelet 17.

With reference to the structure by which the spool or bobbin 15 is mounted on the boss member 13, reference is first made to FIGURES 1, 4, 5 and 7 of the drawings. In this regard, it will be noted that the spool 15 is, in actual fact, journaled around a shaft member 20 that projects from the boss member 13 for this purpose. A swinging clip 21 is received in a slot 20a that is provided at the projecting end of the shaft 20, with the clip 21 having bifurcated legs 21a and 21b that are provided with slots that are received around a pin member 22. In this fashion, upon pulling of the clip 21 to one extreme end portion, the same can be pivoted around the pin 22 so as to permit withdrawal or insertion of the spool member 15 with respect to shaft 20.

Additionally, the spool member 15 is provided with the usual core sleeve that concentrically surrounds the just described shaft 20 and extends between the axial ends of spool 15. One such spool end has provided thereon a plurality of ratchet teeth 23, 23 that are designed for en-
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gagement with certain ratchet or pawl means that will now be described.

To this end, and referring to FIGURES 4 and 5 in particular, the ratchet means are shown as including a flat pawl member 30 that is pivoted to a flat surface 14c of the boss member 14 by mounting the same around a transversely extending pin 31, with the pin 31 being retained in position by split ring clip 31a and further preferably being integrally connected to the pawl member 30 so as to be movable therewith as will be described (see FIGURE 5). The pawl member 30 further includes divergent projecting arms 32 and 33, with arm 32 being diametrically engaged between the ratchet teeth 22, 23, while arm 33 is engageable with certain cam means 40, as will be hereinafter described.

In this fashion, arcuate movement of the arm 33 in the plane of rotation of pawl plate 30 will result in pivotal movement of the arm 32 between the full and chain doted line positions of FIGURE 4 so as to cause selective engagement or disengagement with the ratchet teeth 23, as will be described.

It has been previously indicated that the boss member 14 supports the tensioning mechanism 16 for controlling engagement of the thread T, and to this end the boss member 14 is provided with a bore 14b (see FIGURES 2 and 3) within which is seated an elongate tubular member 34, with this tubular member 34 projecting from support base 11 in parallel with the shaft 20. Additionally, a shaft 35 (FIGURES 1 and 7) also projects from the boss member 14 for supporting a guide roller 36, with the shaft 35 being offset, as shown in FIGURE 1, for effectuating a proper location of the guide roller 36.

In addition to the aforementioned projecting component parts just described (namely, shaft 20, tube 34 and shaft 35) there also projects from the base member 11 a guide rod 37, with this guide rod 37 being disposed adjacent the peripheral edge of the spool 15 so as to cause the thread to be introduced to the guide roller 36 at a constantly uniform angle, regardless of whether the spool is completely full or nearly empty (see FIGURES 4 and 7).

Referring now to FIGURES 2 and 3 for a detailed description of the guide control elements that are associated with the projecting tube 34, it has been previously noted that the pin 31 is journaled in the bore 14b and, accordingly, for the purpose of securing the tube 34 in place, the pin 31 also passes through eyelet 34a that is provided in the lower end of the tube 34, with the pin 31 being retained in place by the split ring clip 31a.

Additionally, the tube 34 further includes diametrically opposite slots 41 and 42 that are elongate in nature and that extend longitudinally of the tube 34 for purposes that will be described. A further slot 43 (see FIGURES 2, 3 and 6) extends inwardly from the projecting end 34b of the tube member 34, with this slot serving as a guide housing for the movable control guide element 45. It accordingly follows that the slot 43 will cause the end 34b of the tube 34 to be split, with this split end being encircled by ring 38 which is held against axial shifting on tube 34 by split lock rings 38a, 38b. Also, and as shown in the drawings, the ring 38 supports both an idler roll 39 and the previously described eyelet 17, with these components being best illustrated in FIGURE 1 of the drawings.

Turning now to the movable control guide that has been indicated by the numeral 45, it will be first noted that the same is intended to shift longitudinally of the tube 34 in association with the tension applied to the emerging thread T, and to this end the pulley element thereof (46) is shown mounted on a block 47 that is received between the opposed walls of slot 43, with block 47 being keyed or otherwise secured to an apertured shaft 50 that is concentrically disposed interiorly of tube 34 and in encircling relationship to shaft 51 (see FIGURES 2, 3 and 6). The elongate shaft 51 further has a threaded end 51a that receives a nut 52 for the purpose of providing adjustment in the extent of lost motion travel, as will now be described.

To this end, the opposed end 51b of the shaft 51 is shown fixed in known manner to an auxiliary sliding shaft 54, with this shaft 54 having a transverse opening 54a therethrough that permits the same to be journalled about a transversely extending pin member 55 that extends through the opposed slots 41 and 42, as clearly shown in FIGURES 2 and 3 of the drawings. Additionally, a ring member 56 is shown concentrically encircling the tube 34 and is adapted to engage the opposed ends of pin 55 so that shaft 51 and 54, pin 55 and ring 56 will move in unison relatively of tube 34. If desired a lifting rod 56a (FIGURE 1) can be provided on ring 56 for manual shifting of pawl 30 so as to permit playing out of thread during initial threading. To the end of providing return tension, a stop ring 57 is shown encircling the tube 34, with ring 57 serving as a seat for one end of a spring 58, while the opposite end of spring 58 is seated against an axial end of the ring member 56 as shown in FIGURES 2 and 3. In this fashion the ring 56 and the parts associated therewith will normally be urged to the position of the spring 58, with movement in this direction being limited by engagement of pin 55 with the left hand end of slots 41 and 42.

For the purpose of actuating the cam plate 30 upon axial shifting of pin 55, for example, a cam block 59 is shown provided on the left end of pin 55, with this cam block 59 being provided with a cross slot 59a (see FIGURE 4) that is designed to receive the previously described cam arm 33. In this fashion shifting of the ring 55 axially of tube 34 will cause rotation of the pawl member 30 so as to permit disengagement of the arm 33 with teeth 22, 23, with the movement of ring 56 will be between the full and chain doted line positions of FIGURE 4 effectuating such pivoting of the pawl plate 30.

In addition to the aforementioned component parts, the tube 34 also receives an internally positioned spring member 60 that encircles the projecting end of shaft 51 and has one end thereof that seats against the end 56b of shaft 50. The remaining end of this spring 60 is shown seated against a cap member 61 that is in threaded engagement with threads 34c that are provided in the open end of the tube 34. This arrangement of component parts can appropriately position in spring 60 to be adjusted upon rotation of cap 61 as by positioning a screw driver in the turning slot 62a thereof.

In use or operation of the improved braider carrier, it will first be assumed that the component parts have been assembled as shown in FIGURE 1 of the drawings, and further that the individual braider carrier 10 has been mounted in operating condition upon a carrier deck of a braiding machine. At this time and assuming that a full spool 15 has been placed on the braider carrier and locked in position by swing clp 21, it is merely necessary that the free end of the thread T be first passed around the guide shaft 37 as shown in FIGURE 4 and, at this time, the same can then be directed around the idler pulley 36, followed by passing of the thread end around the idler roll 39, the pulley 46, and thence through the eyelet 17, as clearly shown in FIGURE 1. At this time the device is ready for use upon connection of the thread end to the part being braided.

In this initial condition, the thread T will be under little, if any, tension, with the result that springs 60 and 58 will respectively urge the shaft 50 and ring 56 to the position of FIGURE 2, at which time the arm 32 will be in engagement with teeth 23 so as to prevent rotation of spool 15. At such time the tension on thread T increases in the direction of the arrow 100 (FIGURE 1) it will be seen that there will be an increased tendency to shift the shiftable control guide 45 and shaft 50 to the right of FIGURES 1, 2 and 3, against the force of spring 60. When this force becomes suffi-
cient to overcome the force of spring 60, it follows that members 45 and 50 will, in fact, shift to the right with such shifting being guided by slot 43. Continuation of said shifting will ultimately result in engagement between shaft 50 and nut 52, with the amount of such shifting that occurs being dependent upon the axial position of unit 52 on threaded portion 51a of shaft 51. However, following such engagement, additional shifting of shaft 50 to the right of FIGURE 2 will now result in simultaneous shifting to the right of auxiliary shaft 54, pin 55 and ring 56, with these last mentioned members moving against the force of spring 58, which has now been overcome by the increased tension on thread T.

In FIGURE 2, shaft 50 and auxiliary shaft 54 have already been moved to the right by a distance equivalent to the length of the slots 41 and 42, and as a result of this movement just described, the cam block 59 has caused the cam arm 33 to be pivoted to the chain dotted line position shown in FIGURE 4. This just described pivoting of cam plate 30 is simultaneously accomplished by an equivalent pivoting of the arm 32 around the axis of pin 31, with the result that arm 32 is disengaged with respect to the teeth 23, 23.

Upon such disengagement the spool 15 will rotate about shaft 20 and cause additional thread to be played out. As additional tension is played out, it is believed manifest that the tension on the thread adjacent the eyelet 17 will be reduced, with the result that the springs 60 and 58 will now return the shafts 50 and 54 to the position of FIGURE 2.

Return of the shafts 50 and 54 to the position of FIGURE 2 also results in repivoting of cam just described, with the result that arm 32 is once again re-engaged between teeth 23, 23 to terminate rotation of spool 15 pending repetition of the above cycle of events.

In the event it is desired to adjust the actuating tension of spring 60 it is merely necessary that either one or both of the adjustment means above described be operated.

If a major adjustment in tension is to be effectuated, it is normal and preferable to remove the cap 61 and shift the nut 52 axially of the shaft 51 by rotating the same on the threaded portion 51a thereof. In this regard if the nut 52 is moved to the right of FIGURE 2, for example, it follows that a greater degree of tension will be required to trip the pawl arm 32 due to the fact that such tripping will not occur until the shaft 50 has traveled a greater distance and has thus overcome a greater degree of force exerted by the spring 60. Conversely, if the nut 52 of FIGURE 2 is adjusted towards the shaft 54, tripping of the pawl arm 32 will occur at a lesser tension.

In the event only a minor adjustment in tripping tension is required for the purpose of attaining tension uniformity between adjacent carriers, it is believed apparent that such minor adjustment can be made by merely rotating the cap screw 61 to thus compress or expand the spring 60 and thus change the degree of resistance to tension forces that is offered by the same.

In practice it has been found desirable to effectuate an approximate setting of the nut 52 and at this time reassemble the carrier as shown in the drawings by replacing the spring 60 and the cap screw 61. The exact degree of tension tripping can then be achieved by rotating the cap 61 so that preliminary adjustment is made by the nut 52, while final adjustment is made by the cap 61.

It will be seen from the foregoing how there has been provided a new and improved type of carrier for use with braiding machines of the character described.

It has been shown how the above described carrier is easily adjustable to any one of several required degrees of tension that are required in the braiding operation, and further that adjustment of this requisite tension pressure can be effectuated in many instances without disassembly of the component parts.

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It has been further shown how the use of an auxiliary guide rod constantly introduces the emitting thread to the guide rolls at a constantly uniform angle of inclination regardless of the amount of thread remaining on the spool.

It has been further shown how the use of an adjustable type lost motion connection between the engagement pawl and the tension responsive elements facilitates adjustment over a wide range of tripping tensions with the result that the necessity for use of a plurality of springs of different tensions for tripping purposes is obviated.

While a full and complete disclosure of the invention has been set forth in accordance with the patent statutes, it is to be understood that the invention herein described is not intended to be limited to the specific form shown herein.

Accordingly, it follows that modifications of the invention may be resorted to without departing from the spirit hereof or the scope of the appended claims.

What is claimed is:

1. A braiding carrier of the character described, comprising: a support base; a standard projecting from said base; a spool rotatably journaled on said standard and having ratchet teeth provided thereon; a ratchet pawl pivotally supported by said base and being pivotally into and out of locking engagement with said ratchet teeth with rotation of said spool being prevented during engagement with said teeth; an elongate guide standard projecting from said base and substantially parallel with said spool; said elongate guide standard being engaged with said ratchet teeth of said spool; and Said spool; a control guide carried by said elongate guide standard in axially shaftable relationship therewith; tension means urging said control guide away from the projecting end of said guide standard; a series of auxiliary guide elements cooperating with said control guide and emitting thread longitudinally from the projecting end of said guide standard as the same is wound upon said spool with said emitted thread being unwind under tension and with said control guide shifting towards the projecting end of said standard against the force of said tension means during increase of tension pressure on said emitted thread; and cam means carried by所述 elongate guide standard in axially shaftable relationship therewith; said cam means being in engagement with said pawl and pivotally moving the same relatively of said base during shifting thereof axially of said guide standard.

2. The device of claim 1 further characterized by the fact that said tension means may be adjusted with respect to the amount of pressure that the same exerts against said control guide.

3. The device of claim 1 further characterized by the presence of a lost motion connection between said control guide and said cam means, whereby initial increase in tension pressure will result in axial movement of said control guide relatively of said standard and said cam means, while subsequent increase in tension pressure will result in axial movement of said control guide and said cam means in unison relatively of said guide standard.

4. The device of claim 3 further characterized by the fact that the length of lost motion travel between said control guide and said cam means may be varied.

5. The device of claim 4 further characterized by the fact that said tension means may be adjusted with respect to the amount of pressure that the same exerts against said control guide.

6. A braiding carrier of the character described, comprising: a support base; a standard projecting from said base; a spool rotatably journaled on said standard and having ratchet teeth provided thereon; a ratchet pawl pivotally supported by said base and being pivotally into and out of locking engagement with said ratchet teeth with rotation of said spool being prevented during engagement with said teeth; an elongate guide standard projecting from said base and substantially parallel with said spool; a control guide carried by said elongate guide
standard in axially shiftable relationship therewith; tension means urging said control guide away from the projecting end of said guide standard; a series of auxiliary guide elements coacting with said control guide and emitting thread longitudinally from the projecting end of said guide standard as the same is unwound from said spool with said emitted thread being unwound under tension and with said control guide shifting towards the projecting end of said standard against the force of said tension means during increase of tension pressure on said emitted thread; and cam means carried by said elongate guide standard in axially shiftable relationship therewith; said cam means shifting axially of said standard in response to axial shifting of said control guide relatively of said standard; said cam means pivoting the ratchet pawl relatively of said base during shifting thereof axially of said guide standard.

7. The device of claim 6 further characterized by the fact that said shifting of said cam means occurs only after said control guide has shifted a predetermined distance.

8. The device of claim 7 further characterized by the presence of means for varying the amount of predetermined shifting that occurs with respect to said control guide prior to shifting of said cam means.

9. In combination with a braider carrier having an axially projecting spool portion that is repetitively unwound during repetitive disengagement of a spring loaded locking arm therewith, with said arm being repetitively disengaged from said spool in response to repetitive shifting of a thread receiving control element through a predetermined linear distance in opposition to uniform tensional forces, the improvement comprising adjustment means for varying the length of the predetermined linear distance traveled by said control element and required to repetitively unwind said spool for thread emission purposes.

10. In combination with a braider carrier whose spool portion is repetitively unwound in response to the repetitive attainment of a predetermined unwinding tension applied to the spool thread, the improvement comprising: first adjustment means for varying the amount of predetermined unwinding tension required to repetitively unwind said spool for thread emission purposes; and second adjustment means operating independently of said first means and varying the amount of predetermined unwinding tension required to unwind said spool for thread emission purposes; both said adjusting means being operable on the same tensioning means, whereby said predetermined unwinding tension can be varied by either of said adjusting means.

11. The device of claim 10 further characterized by the fact that at least one of said adjustment means can be operated while said spool is operatively positioned on said carrier.

12. The device of claim 10 further characterized by the fact that said first adjustment means can vary said predetermined unwinding pressure over a greater range that can be achieved by said second adjustment means.

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