Oct. 11, 1932. J. A. ANDERSON 1,882,539

TENSION DEVICE

Filed March 21, 1929 2 Sheets-Sheet 1

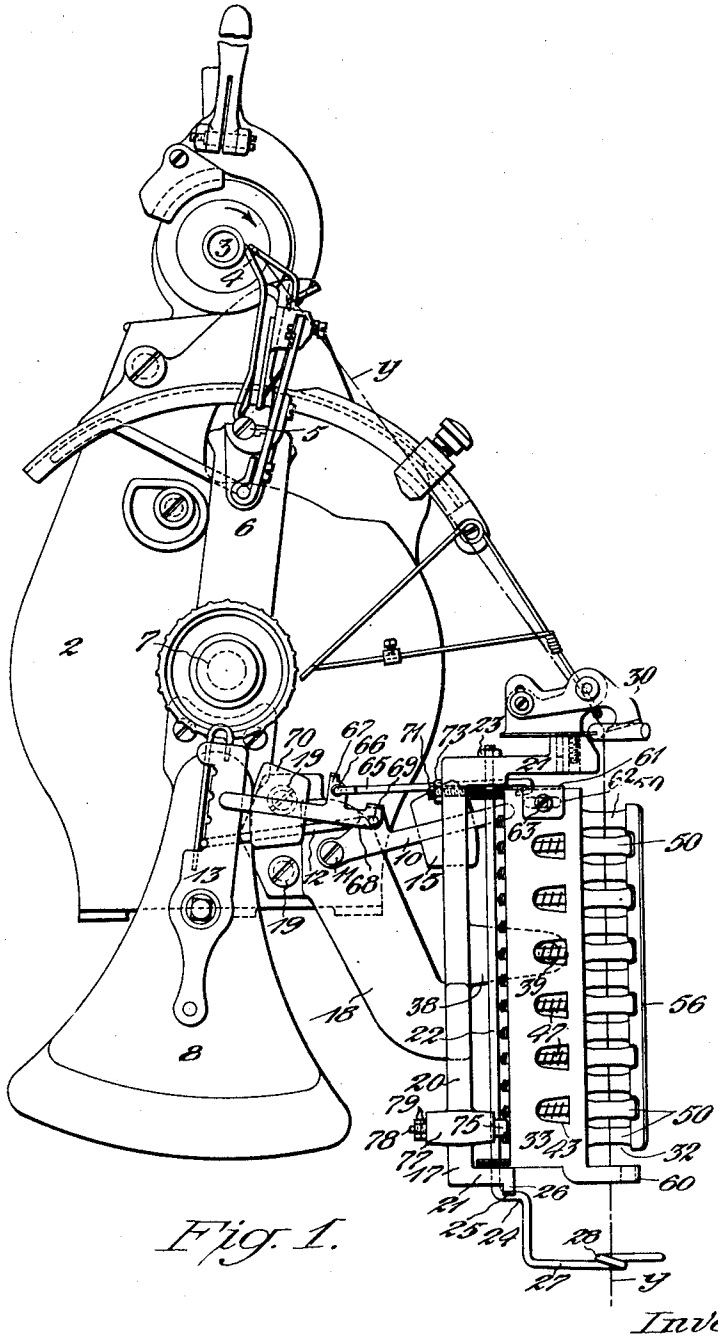


Fig. 1.

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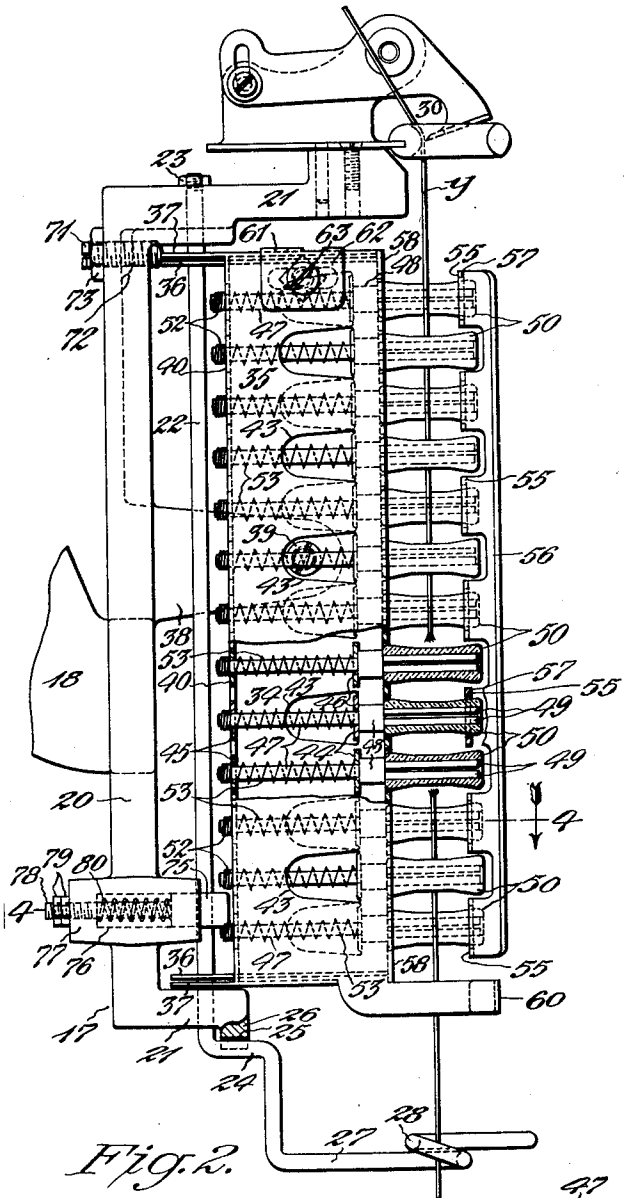


Fig. 2.

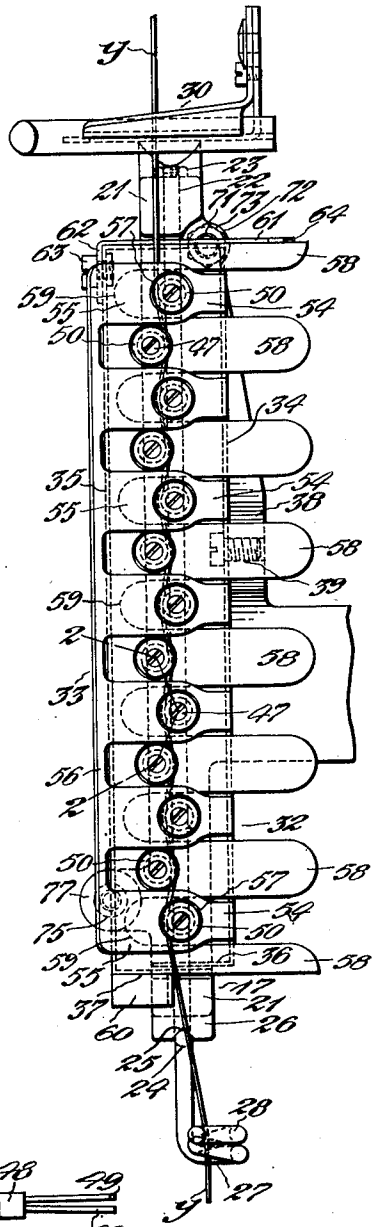


Fig. 3.

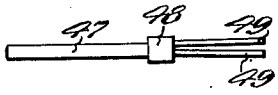


Fig. 5.

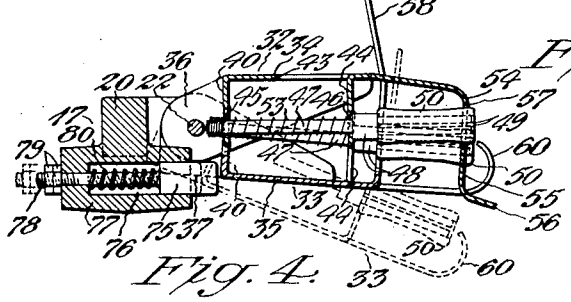


Fig. 4.

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UNITED STATES PATENT OFFICE

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TENSION DEVICE

Application filed March 21, 1929. Serial No. 348,898.

This invention relates to improvements in tension-devices for tensioning yarn, thread and other strand materials in winding or transferring the same from a source of supply.

One object of the invention is to provide a tension-device which is adapted to resist the wear and abrasive action of hard materials, such as worsted, silk and rayon yarns.

Another object of the invention is to provide a tension-device having tension-elements which may be constructed of porcelain or other vitreous material to resist wear, and in which the tension-elements are readily detachable to provide for their replacement when they become worn or scored.

Another object of the invention is to provide a tension-device having the tension-elements so mounted as to adapt them to be detached and replaced by others without the use of tools or other implements.

Another object of the invention is to provide a tension-device which is simple in construction, economical to manufacture and more efficient and durable in use than similar devices heretofore used.

Further objects of the improvement are set forth in the following specification which describes a preferred form of construction of the tension-device as adapted for use with winding and other textile machines and as illustrated in the accompanying drawings. In the drawings:

Fig. 1 is a view illustrating a well-known type of winding machine and showing the present improved tension-device as applied to use therewith;

Fig. 2 is an enlarged side elevation of the tension-device with a portion thereof shown as broken away and certain of the tension-elements illustrated in section on the line 2—2 of Fig. 3;

Fig. 3 is an enlarged end view of the tension-device;

Fig. 4 is a sectional plan view of the same taken on line 4—4 of Fig. 2; and

Fig. 5 is a detailed view of the spindle-mounting for the tension-elements or porcelain rolls.

Referring to the drawings, the improved tension-device is illustrated in Fig. 1 as applied to use on a machine for winding thread, yarn and other textile materials into cops, cones, cheeses and other forms of packages. It is to be understood, however, that the present invention is applicable to use with other types of textile machines for applying tension to various kinds of materials, the term "yarn" being hereinafter employed in the specification and claims of the application to designate a strand of any material whatsoever.

The winding machine illustrated in Fig. 1 comprises a main frame 2 provided with bearings for a rotating winding-spindle 3 on which the cop or package is wound. The yarn or other strand material is traversed longitudinally of the winding-spindle 3 by means of a reciprocating thread-guide 4 which is carried on a horizontal traverse-bar or rod 5 mounted to slide in a track or guideway of a swinging traverse-frame 6. The guide 4 may be reciprocated from a helical cam, not herein shown, and the traverse-frame 6 is pivotally mounted on the camshaft 7 to swing about the axis of the cam to adapt the guide to recede from the winding-spindle 3 as the cop or package is built up thereon. Suitable instrumentalities are provided for manually starting the operation of the machine and for automatically arresting its operation when the strand breaks or its supply becomes exhausted, these devices being shown in Fig. 1 of the drawings but not herein described as they form no part of the present invention.

The thread-guide 4 is normally maintained in contact with the surface on which the winding is being performed by means of a

counterbalance comprising a weight 8 fastened to the traverse-frame 6 below its pivot on the cam-shaft 7. The force of the weight 8 acts to resist the movement of the thread-guide 4 outwardly from the winding-spindle 3 during the growth in diameter of the package being wound and this resistance may be augmented through the use of a differential pressure-device as next described. As shown in Fig. 1, a lever 10, pivoted at 11, is connected by a rod or link 12 to a member 13 fastened to the counterweight 8 of the traverse-frame 6. The lever 10 carries a weight 15, and as the counterweight 8 swings away from the pivot 11 of the lever the weight is swung upwardly in an arc to diminish its active pressure tending to resist the movement of the thread-guide away from the winding-spindle. The arrangement of the differential pressure-means is herein shown and described in detail since it provides means for varying the amount of tension applied to the strand as will be later explained.

The tension-device of the present invention may be mounted in any suitable relation with respect to the winding mechanism and, as shown in Fig. 1 of the present drawings, it is carried on a bracket 17 supported from an arm 18 which is fastened to the side of the machine frame 2 by means of screws 19. The tension-bracket 17 comprises a vertical bar or upright 20 having outwardly projecting ears or lugs 21 at top and bottom. The lugs 21 form supports for a vertical rod 22 which serves as the mounting for the two opposite tension-members or plates to be later described. As herein shown, the upper end of the rod 22 is held in place by a nut 23, while its lower end is bent into an elbow-shaped arm 24 seated in a notch or recess 25 in a projection 26 on the under side of the lug 21, whereby to hold the rod from turning. The elbow-shaped arm 24 is extended in a horizontal portion 27 bent into a pigtail at 28 which serves as a guide for directing the strand through the tension-device.

Mounted on an extension of the upper lug 21 of the bracket 17 is a slub-catcher or yarn-cleaner, indicated generally at 30, through which the yarn draws as it leads to the thread-guide 4 to be fed to the winding.

The present improved device is in the nature of a grid- or finger-tension, so-called, comprising opposite members having alternating bars or fingers across which the strand draws in a sinuous course to apply resistance to its draft; one member preferably being movable with respect to the other member to vary the staggered relation of the tension-elements to alter the sinuosity of the course of the strand whereby to adjust the amount or degree of tension applied thereto. Conveniently, the tension-members may be constructed in the form of sheet-metal plates with one plate fixed and the other hinged or pivoted to adapt it to move toward and away from the fixed plate.

As illustrated in the present drawings, the two tension-members 32 and 33 comprise vertical plates 34 and 35 having ears 36 and 37 at top and bottom thereof formed by portions of the metal folded at right-angles and projecting rearwardly therefrom. The ears 36 and 37 are provided with holes for receiving the supporting rod 22 which is held in the bracket 17. The fixed tension-member 32 is fastened rigidly to the side of an arm 38 which projects forwardly from the bracket 17, a screw 39 being inserted through its plate portion 34 and screwed into the arm as shown in Figs. 2 and 3. The movable tension-member 33 is supported solely by the rod 22 with its ears 37 adapted to pivot thereon so that this member may swing toward and away from the fixed member 32.

The plates 34 and 35 of each tension-member are formed with right-angled portions or ears 40 bent around from their rearward edges as shown most clearly in Fig. 4. Each tension-plate is punched along its length with openings 43 and the strips of metal sheared therefrom are bent inwardly at right-angles to the plane of the plates to form projecting ears 44 arranged parallel with and in opposed relation to the rearward ears 40. The ears 40 and 44 are provided with alined holes 45 and 46, in which are journaled a plurality of rods or spindles 47 for rotatably supporting the porcelain rolls 50 which constitute the tension-elements for pressing against the strand to sinuate its course.

Referring to Figs. 4 and 5, the spindles 47 are provided with enlarged bosses 48 which abut the faces of the forward bearing-ears 44, and the free ends of the spindles are split longitudinally to provide opposite prongs or spring-members 49 which serve as a means for holding the rolls 50 in place thereon. The rolls 50 are formed with axial bores to adapt them to be slipped on over the prongs 49 of the spindles 47, the spring tendency of the prongs exerting a frictional pressure against the interior of the bores to hold the rolls in place.

The rearward end of each spindle 47 which projects through the hole in the ear 40 carries a collar 52 which holds the spindle in place in its bearings. The collar 52 as herein shown is constructed from a length of wire wound into a helical coil of such diameter as to adapt it to bind tightly to the end of the spindle 47 when it is sprung open and placed thereon. In this way the spindles 47 are held from longitudinal movement in their bearings in the ears 40 and 44 while being adapted to be rotated by the drag of the strand across the rolls 50. Surrounding the spindles 47 between their bearings in the ears 40 and 44 are helical springs 53 of relatively fine wire which act as a means for resisting the rotative

movement of the spindles and their rolls 50. The springs 53 are compressed between the ears 40 and 44 so that their coils are thrown out of alinement and thereby caused to bear frictionally against the periphery of the spindles. Through this arrangement the springs 53 apply a slight but perceptible degree of resistance to the turning movement of the spindles in their bearings.

The tension-members 32 and 33 are preferably provided with means as next described for preventing the strand from slipping off and catching over the ends of the rolls 50. The fixed member 32 is formed with a series of bars or tines 54 projecting forwardly from its plate portion 34 and then bent across at substantially right-angles with their end-portions widened at 55 and joined together by a vertical connecting-strip 56. The widened portions 55 are formed with circular apertures 57 through which the ends of the rolls 50 project, there being a slight clearance between the periphery of the rolls and the edges of the openings to prevent interference with the rotation of the rolls.

The opposite movable tension-member 33 is formed with fingers or tines 58 bent at right-angles to its plate portion 35 and disposed to extend through the gaps between the tines 54 on the fixed member 32. The tines 58 are formed with circular apertures 59 surrounding the inner ends of the rolls 50. The peripheries of the rolls 50 are concaved slightly between their ends whereby they tend to hold the strand in central position thereon, and the tines 54 and 58 encompass their ends to act as guards to prevent the strand from being displaced over the ends of the rollers or to catch thereon in threading it into the tension-device. The end portions of the tines 58 are angularly inclined to a slight extent, as shown in Fig. 4, so that as the movable member 33 is swung away from the fixed member 32 the tines 58 will not be displaced outwardly along the rolls 50. At the lower end of the movable member 33 is a forwardly projecting finger-lever 60 curled around at its end to adapt it to be conveniently operated from the hand to open the tension-device for the insertion of the strand.

Pressure is applied to the movable tension-member 33 through an arm 61 to cause it to swing toward the fixed member 32 to press the rolls 50 against the strand. As shown in Figs. 2 and 3, the arm 61 has a right-angled portion 62 clamped against the side of the plate-portion 35 of the member 33 by means of a bolt 63, the arm extending across the top of the fixed member 32 and provided with a hole 64 at its end.

Referring to Fig. 1, a rod or link 65 is hooked through the hole 64 in the end of the arm 61 and its opposite hooked end 66 is similarly connected to a lug 67 on a tension-lever 68. The tension-lever 68 is pivoted at 69 to the pressure-lever 10, previously referred to, and carries an adjustable weight 7. The weighted tension-lever 68 thus acts through the link 65 and arm 61 to cause the movable tension-member 33 to swing toward the fixed member 32, and as the pressure-lever 10 is swung upwardly in a contra-clockwise direction the lever 68 will be turned in a clockwise direction to diminish the force imposed on the movable tension-member. Thus, as the thread-guide 4 moves away from the winding-spindle 3 during the growth in the cop or package and the traverse-frame 6 is swung on its pivot, the pressure-lever 10 is operated to relieve the pressure of the guide on the surface of the winding and the tension applied to the yarn is also reduced, the purpose of this latter effect being to maintain a more uniform tension as the lineal speed of the strand increases with the increase in diameter of the package being wound.

The movement of the swinging tension-member 33 toward the fixed member 32 is limited by a stop-screw 71, shown in Figs. 2 and 3. The screw 71 is held in a rib 72 on the side of the upright 20 of the bracket 17 with its end adapted to bear against the edge of the end portion of the ear 37 of the member 33, the screw being adjustable in position and locked in place by a check-nut 73.

To prevent the movable tension-member from being swung open to such an extent that the weighted tension-lever 68 will not close it again, an automatic tension-closer is provided at the bottom of the bracket 17. As illustrated most clearly in Fig. 4, the tension-closer consists of a spring-pressed plunger 75 which is engaged by the corner of the rearward bent portion of the plate 35 when the movable tension-member 33 is swung back as indicated by the dotted lines in Fig. 4. The plunger 75 is mounted in the bore 76 of a barrel-shaped hub 77 on the side of the bracket 17. The reduced stem 78 of the plunger projects through a smaller bore at the rearward end of the hub 77 and carries a pair of nuts 79 which are adjustable on its threaded end to regulate the extent to which the plunger is projected forwardly. A helical spring 80 is coiled around the stem 78 of the plunger 75 to normally maintain it projected from its bore, the nuts 79 being adjusted to leave a space between the end of the plunger and the corner of the tension-plate 35 as indicated in the drawings. The movable tension-member will therefore be free to swing open to a certain extent as the pressure of its tension-weight is reduced without causing it to contact with the plunger. When, however, the movable tension-member 33 is manually operated to swing it open to provide for threading the yarn or other strand *y* into place between the rolls 50 the corner of its plate 35 will bear against

the end of the plunger 75 to slide the latter to compress its spring 80. When the operator releases the lever 60 the spring 80 will act on the plunger 75 to swing the tension-member 33 back into closed position to cause its tension-elements or rolls 50 to bear against the strand drawing across the rolls of the fixed tension-member. The weighted tension-lever 68 then exerts sufficient pressure to bring the tension-rolls of the two plates into staggered relation as shown in Fig. 3 whereby the yarn y is caused to follow a sinuous course through the tension-device to apply a drag or resistance to its draft.

The operation of the complete tension-device is as next explained: In threading the yarn into the device the strand y is drawn upwardly from its source of supply and the operator may use the fingers in which the end of the yarn is grasped to operate the lever 60 to swing back the movable tension-member 33. This may be accomplished with one motion of the hand as the strand is drawn upwardly on the inside of the guide-strip 56 to lead it across the porcelain rolls 50 on the fixed tension-member 32. The movable tension-member 33 may be held open during the upward movement of the hand by passing the fingers across the ends of the rolls 50, and after the strand is in place the member 33 is released to allow it to swing back into the position shown in Fig. 3.

The strand y is led up from the tension-device through the slub-catcher 30 and thence carried through the eye or notch in the thread-guide 4 and attached to the winding spindle 3. When the machine is started to operate the strand y will be taken up by the winding and its draft through the tension-device will be resisted to the extent required to apply the proper degree of tension thereto, it being understood that the tension-weight 70 is adjustable on the lever 68 to vary the pressure on the tension-member 33. As the strand draws across the rolls 50 the friction of the yarn against their peripheries will cause them to rotate with their spindles 47 turning in the bearings 40 and 44. This rotatory motion of the rolls is resisted by the frictional action of the springs 53 on the spindles 47.

The frictional braking action of the springs on the spindles 47 prevents the rolls 50 from being turned at a rapid rate so that they will apply the proper degree of resistance to the draft of the yarn. The relatively slow turning movement of the rolls, however, serves to continuously present new surfaces to the strand so that the wear is distributed around the full circumference of each roll, thereby reducing the tendency of the yarn to cut into or score the surface of the porcelain. The rolls will therefore wear for a much longer period without deterioration and when finally worn or scored they may be discarded and replaced with new ones. The replacement of the rolls is easily accomplished by slipping them off from the prongs 49 of the spindles 47 and new rolls may be substituted therefor without requiring the use of wrenches, screw-drivers or other tools for this purpose.

While the device is herein illustrated as embodied in a preferred form of construction and as applied to a particular use, it is to be understood that various modifications may be made in the form and arrangement of the parts of the device and in the manner of applying it to use without departing from the spirit and scope of the invention as expressed in the accompanying claims, I claim:

1. In a tension-device, a tension member having a series of bearings spaced at a distance apart, spindles rotatably mounted in said bearings, rolls on said spindles disposed outwardly beyond the bearings, and helical springs coiled around the spindles and compressed longitudinally between the spaced bearings to force their coils out of alignment whereby to cause the springs to bear frictionally against the spindles to resist their turning movement under the draft of a yarn drawing across the rolls.

2. A tension-device comprising a pair of tension members arranged for relative movement toward and away from each other, pairs of spaced bearings on said tension members, spindles rotatably journaled in said bearings, rolls of vitreous material secured fast to the spindles outwardly beyond the bearings, and helical springs coiled around the spindles and held under compression between the spaced bearings to distort the springs whereby their coils will bear frictionally against the spindles to resist the turning movement of the rolls under the draft of a yarn drawing thereacross.

3. A tension-device comprising a member having opposite spaced bearings arranged in series therealong, spindles rotatably journaled in said bearings, tension elements carried on the spindles in position for the yarn to draw thereacross to sinuate its path to apply resistance to its draft, and helical springs coiled around the spindles and held under longitudinal compression by the spaced bearings thereof to cause the coils of the springs to be displaced to bear frictionally against the spindles to resist their rotation under the draft of a strand feeding across the tension elements.

4. In a tension-device, a tension-member comprising a plate having a series of ears bent around from its edge and a second series of ears sheared from the metal of the plate and bent around to stand in opposite parallel relation with respect to the fixed ears, spindles journaled in said ears, rolls carried on said spindles, and means to resist the rotation of the spindles as the rolls are

turned under the draft of the strand drawing thereacross.

5. In a tension-device, the combination of a tension-member, a tubular tension element of vitreous material, and means for mounting said elements on the tension-member comprising opposite divergent spring-prongs inserted into the bores of the tubular elements.

6. In a tension-device, the combination of a plurality of spindles having split ends forming opposite spring-prongs, and tubular elements constructed of vitreous material adapted to be slipped over the split ends of the spindles to be held in place by the spring action of their prongs.

7. In a tension-device, a tension-member comprising a plate having a series of ears bent around from its edge, a second series of ears bent from the plate in opposite parallel relation with the ears of the first series, spindles rotatably journaled in said ears and provided with bosses engaging the side of the ears of one series, a helically coiled wire encircling the opposite end of the spindle to hold it in its bearings, and rolls mounted on the spindles to adapt them to be rotated therewith.

8. In a tension-device, the combination of a tension-member comprising a plate formed with bearings, spindles rotatively journaled in said bearings, rolls mounted on the ends of the spindles, and fingers extending from the plate across the axes of the spindles and having apertures into which the ends of the rolls project, said fingers serving as guards to prevent the strand from slipping over the ends of the rolls.

9. In a tension-device, the combination of a fixed tension-plate having spaced bearings, spindles rotatable in said bearings, porcelain rolls mounted on the ends of said spindles, and fingers extending from said plates across the axes of the spindles and having apertures in which the ends of the rolls are received, one set of fingers being disposed across the inner ends of the rolls and the other set of fingers being disposed across the outer ends of the other rolls.

10. A tension-device comprising a pair of tension-plates having portions bent around from their edges and apertured to provide bearings, a plurality of ears sheared from the metal of the plates and bent around in opposite relation to the fixed bearing portions with apertures therein, spindles journaled in said bearings and provided with split ends forming spring-prongs, rolls of vitreous material releasably held by said prongs, and fingers extending across the axes of said spindles and formed with openings for receiving the ends of the rolls, the fingers of one set alternating with those of the other set and the opposite sets of fingers being disposed at opposite ends of the rolls.

11. In a tension-device, the combination of a pair of tension-members mounted for relative swinging movement one with respect to the other, means acting thereon to adapt said elements to press against a strand drawing therebetween, and means for closing said elements together after they have been swung into extreme open position comprising a plunger normally free from engagement therewith, and a spring acting when compressed to slide the plunger to close the elements.

In testimony whereof I hereunto affix my signature.

JOHAN A. ANDERSON.