April 25, 1961 J. B. YURYAN 2,981,498

TENSION REGULATING DEVICE

Filed Nov. 5, 1956 2 Sheets-Sheet 1

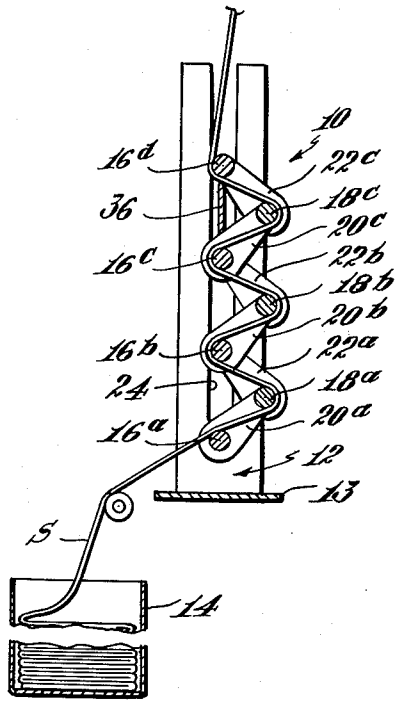

Fig. 1

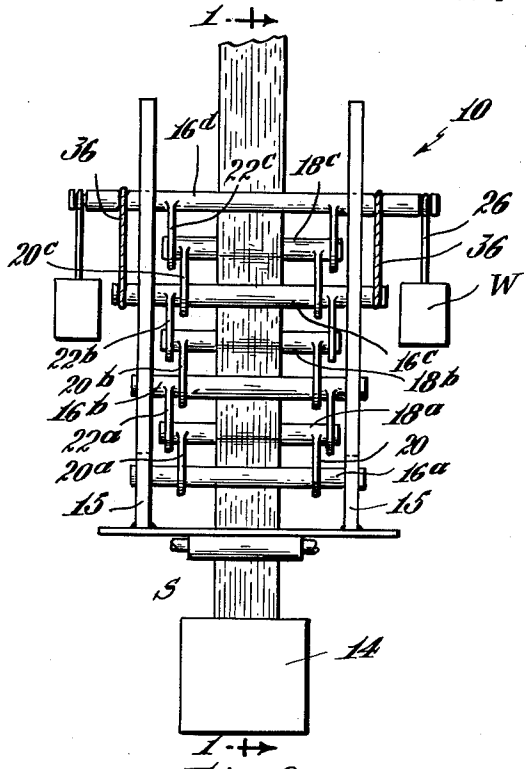

Fig. 2

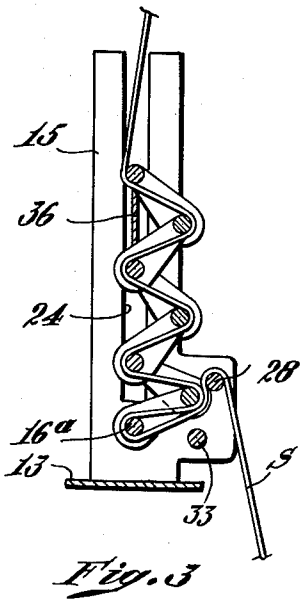

Fig. 3

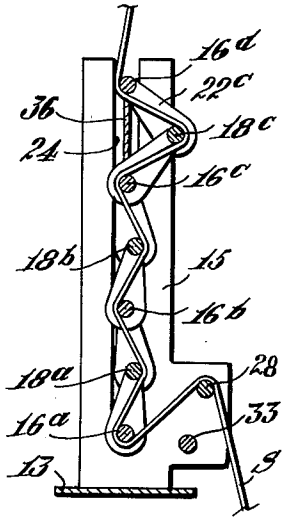

Fig. 4

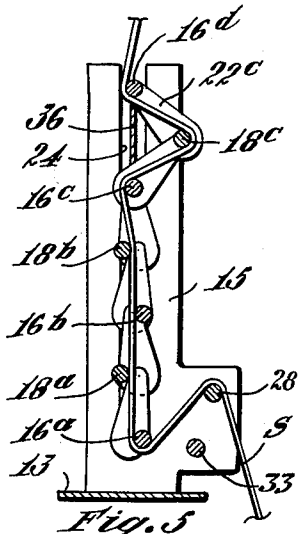

Fig. 5

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TENSION REGULATING DEVICE

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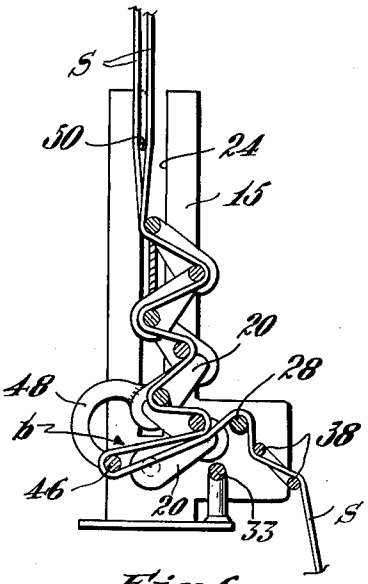

Fig. 6

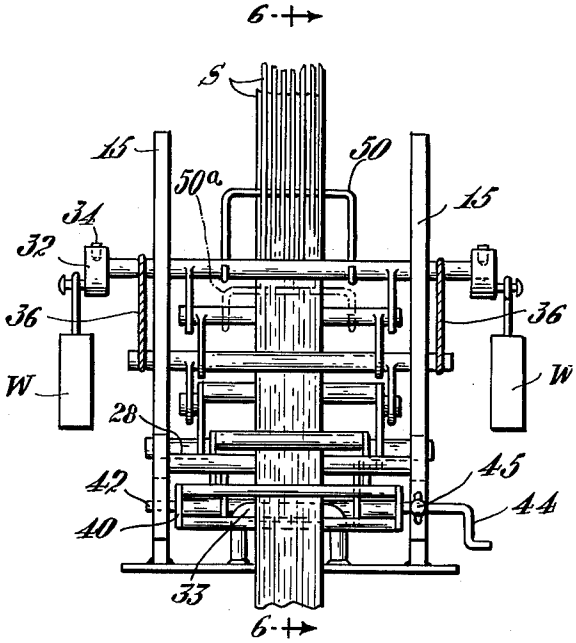

Fig. 7

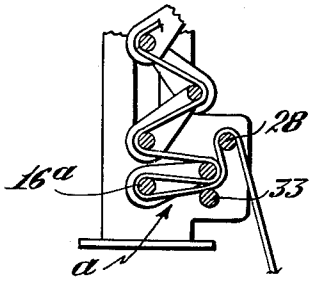

Fig. 8

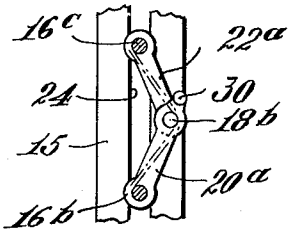

Fig. 9

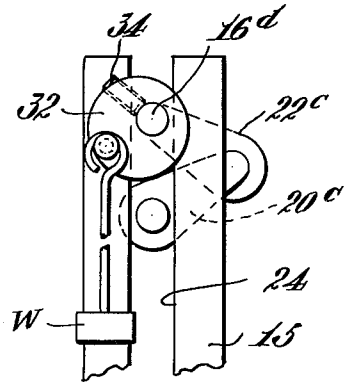

Fig. 10

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2,981,498

TENSION REGULATING DEVICE

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Filed Nov. 5, 1956, Ser. No. 620,272

9 Claims. (Cl. 242—154)

This invention relates to tension regulating devices and has for its principal object to provide a device for regulating the tension in elongate flexible elements as they travel from a storage container to a place of use, for example, strands or threads as they travel to textile machines for incorporation into a fabric by weaving, braiding, and the like. Another object is to provide a device which will regulate the tension in an element whether it is of an elastic or inelastic nature. Another object is to provide a device which will regulate the tension of an elongate traveling element whether it is one or more strands, cables, ribbons or sheets of single or multiple construction. Another object is to provide a device in which great sensitivity at the input end may be obtained with very little feed-back from the output. Another object is to provide a device which responds quickly to changes in tension so that no overfeed or tension losses occur. Another object is to provide a device for regulating tension which can compensate for minor changes in surface conditions of the element. Another object is to provide a device for regulating the tension in a traveling element which will compensate for any obstruction to free delivery from the storage at the input end and any irregularity in takeup at the output end. Another object is to provide a device in which surge and bounce due to rapid movement of the elements may be minimized. Another object is to provide a device for adjusting the total drag available. Another object is to provide a device in which it is possible to obtain ideal conditions of tension for splitting strands which have been rebonded thereby to prevent roll over and breaking. Another object is to provide a device for regulating the tension in a traveling element regardless of its intended use. Another object is to provide a device for regulating the tension in a traveling element which may easily be interposed between the source of the element and the machine or place where it is to be fabricated or operated on.

For the purpose of simplification the element, regardless of its make-up, will be referred to hereinafter, as a "strand."

As herein illustrated, the device comprises a plurality of parallel drag bars about which the strand to be tensioned alternately passes in a devious course, which bars are operably connected so that an increase in resistance to flow at the ingoing end or a decrease in the rate of flow at the outgoing end, decreases through the working of the linkage upward, the resistance to flow through the device; and vice versa, a decrease in the resistance at the input end or an increase in the rate of flow at the outgoing end increases the resistance to flow by means of the downward working of the linkage. The drag bars are connected by toggle links and are arranged vertically in a frame, one above the other, with the lowermost bar pivotally fastened to the frame and the alternate ones of the bars supported for vertical movement along tracks on the frame. The intermediate bars at the knees of the toggle links are freely floating so that extension of the

linkage decreases the length of the courses of the strand and the wrap-around friction as it passes alternately about the successive bars, and contraction or collapse of the linkage increases the length of the courses of the strand and increases the wrap-around friction as it passes about successive bars. The weight of the linkage itself tends to collapse it. However, other means may be arranged at the upper end to tend to collapse the linkage in opposition to the tendency of the strand traveling therethrough to extend it. There may be weights suspended from the top bar by eccentric means so that they reverse buckling so that the floating drag bars will all lie on the same side of the guided drag bars. A fixed bar may be arranged spaced from and parallel to the linkage at its lower end which, in conjunction with the pivotally fastened bar and the first floating bar, provides for doubling the strand upon itself, thereby to increase the sensitivity of the device. Surging or bouncing of the linkage may be damped by still another auxiliary bar spaced from and parallel to the linkage at the opposite side which is supported from the first of the toggles for vertical movement therewith. This auxiliary bar provides means for receiving a floating loop of larger dimensions than would be possible to obtain about the pivotally fastened bar. A limit bar is fastened to the frame adjacent the pivotally fastened bar in a position to support the lowermost one of the floating bars when the linkage is collapsed and to operate in conjunction with the lowermost floating bar to provide a pinch on the strand. Means may be applied to the upper bars of the linkage to prevent maximum angular opening of the toggles and hence by constraint of these bars affording a certain amount of adjustment of the total drag. Additional adjustment of the total drag may be had by a double drag bar at the input which is angularly adjustable to increase or decrease the wrap about the fixed bar.

The invention will now be described in greater detail with reference to the accompanying drawings wherein:

Fig. 1 is a vertical section of the device showing a continuous element being delivered from a container to it and the course of the element through the device;

Fig. 2 is a rear elevation of the device as seen from the right-hand side of Fig. 1;

Fig. 3 is a vertical section through the device modified to increase its sensitivity and shows the linkage partially collapsed;

Fig. 4 is a corresponding section showing the linkage nearly extended;

Fig. 5 is a vertical section modified to provide for lesser internal resistance to flow when the device is fully extended;

Fig. 6 is a vertical section of still another modification provided with additional means for increasing its sensitivity at the input end for minimizing surging;

Fig. 7 is a front elevation of the device as seen from the right-hand side of Fig. 6;

Fig. 8 is an elevation in section showing the linkage at a position of maximum collapse;

Fig. 9 is a fragmentary elevation in section showing the stop lugs; and

Fig. 10 is an enlarged fragmentary elevation of the weight eccentric.

For the purpose of illustration only, the device illustrates regulating the tension on ribbon rubber which is made up of a plurality of individual strands of rubber rebonded by taking advantage of its natural tack and which is being fed from a container to a textile machine for incorporation of the individual strands into a fabric; the device for this purpose being provided with a splitting bar in the form of a simple wire or rod as will be described hereinafter. For the purpose of this description,

however, the element being tensed will be referred to only as a "strand."

As shown in Figs. 1 and 2, the tension device is a complete unit in itself, having its own supporting frame **12** which may be arranged between a source of supply **14** of the continuous strand which is to be tensioned and the machine which is to operate on the strand. The frame **12** has a base **13** and spaced parallel uprights **15** and may stand on its own base adjacent the machine or may be fastened to an appropriate part of the frame of the machine depending upon the availability of space and the best location for feeding the strand to the machine. In its simplest form, as shown in Figs. 1 and 2, there is an expandable linkage comprised of a plurality of spaced parallel, alternate drag bars **16***a*, **16***b*, **16***c* and **16***d*, and a plurality of spaced parallel intermediate drag bars **18***a*, **18***b*, and **18***c*. The bars are connected by toggle links **20***a*—**22***a*, **20***b*—**22***b* and **20***c*—**22***c*. The lowermost of the bars **16***a* is pivotally fastened in the frame **12** between the uprights **15**, in fixed bearings, for example, bearing holes in the uprights so that the lower end of the linkage is fixed. The remaining bars **16***b*, **16***c* and **16***d* are vertically movable with respect to the pivotally fastened bar **16***a* along tracks **24**, constituted by a pair of vertical slots in the uprights **15** of the frame **12**, through which their ends or prolongations thereof extend. The bars **18***a*, **18***b* and **18***c* are freely floating at or near the knees of the toggles and are laterally displaced from the vertical plane of the bars **16***a*, **16***b*, **16***c* and **16***d* by the degree of extension or collapse of the toggles. As will be seen by reference to Fig. 2, the upper ends of the toggle links **20***a*, **20***b* and **20***c* are fixed to the bars **18***a*, **18***b* and **18***c* respectively, and their lower ends are pivotally connected to the bars **16***a*, **16***b* and **16***c*. The toggle links **22***a*, **22***b* and **22***c* are fixed at their upper ends to the bars **16***b*, **16***c* and **16***d* respectively, and their lower ends are pivotally connected to the bars **18***a*, **18***b* and **18***c*. The parallel drag bars are thus allowed to pivot freely about their link centers but are held parallel by the toggle link pairs which are locked to one bar but pivoted about the succeeding bar. Since only the lowermost drag bar **16***a* is pivotally fastened to the frame all of the others float up and down the slots **24**—**24** freely.

The tension is produced by the alternate wrapping of the continuous strands about the bars **16***a*, **18***a*, **16***b*, **18***b*, **16***c*, **18***c* and **16***d* and the controlling action of the floating bars. The weight of the bars and toggle tends to collapse the linkage so that the bars constantly float on the moving strand and in effect constitute a rate device which constantly readjusts its internal flow rate to keep the linkage suspended and floating so that the delivery rate is equal to the demand of the machine to which the strand is being delivered. Basically the device is built around the commonly used equation for wrapping friction $T_2=T_1e^{\mu\alpha}$, where T_2 is the output tension and T_1 is the input tension. Regarding the formula e is a mathematical constant having a value of 2.718, μ is the co-efficient of friction and α is the angle of wrap in radians. It can be seen that as the linkage opens up by extension of the toggle links the total angle of wrap decreases and hence the friction decreases and that as the linkage collapses the total angle of wrap increases with a corresponding increase in friction.

In the formula initial tension T_1 at the incoming end increases exponentially which is the place in the device for any given change in resistance to flow which will have the greatest effect upon the output T_2. This relation is attained in this device by the fact that the vertical floating action of the linkage and bar assembly allows the lowest link to do the controlling in the normal working range where it is most sensitive and where the least amount of feedback is required.

Although the linkage itself tends to collapse, it is desirable for a wider range of control to employ auxiliary weights W—W which may, as shown in Fig. 2, be suspended by flexible cords **26**—**26** from the opposite ends of the uppermost of the bars **16***d*. Because of the high unbalanced side thrust that the top drag bar imparts to one side of the vertical guide slots **24** considerable friction is set up between the drag bars and the sides of the slots which reduces the sensitivity of the device. Accordingly, it is preferable, as shown for example in Fig. 10, to hang the weights W—W on adjustable eccentrics **32**—**32** mounted on the ends of the top drag bar. These eccentrics are rotatable on the bar and may be fixed at any desired position by means of set screws **34**. By adjustment of the eccentrics and hence counterbalancing of the side thrust, the frictional resistance of the bars to movement along the slots may be substantially nullified so as to greatly increase the sensitivity of the device.

In order to make the device produce a controllable initial tension in the lowest and most sensitive drag bar region the device may be modified, as shown in Fig. 3, by the addition of a fixed drag bar **28** mounted between the upright **15**, spaced from and parallel to the other bars so as to lie outside the knee of the first toggle. As thus constructed, the strand to be tensioned is drawn over the guide bar **28** and beneath the bar **16***a* before it passes upwardly about the bar **18***a* thereby to provide a floating loop *a* which is closed by movement of the bar **18***a* downwardly to and below the level of the bar **28** as the linkage collapses to bring portions of the loop into surface contact. This results, in a sensitive and yet powerful controlling action by the result of the contact of the strand surfaces that are moving in opposite directions. Hence, the floating guide **18***a* affords most of the control by allowing relatively large changes in the flow rate to occur from relatively small feedback forces and displacement.

Under these conditions the device has the ability to correct the variations in the co-efficient of friction (such as variations in the amount of talc on the ribbon) or other conditions which change the frictional resistance of the ribbon to movement, as well as minor snarls and binds of the ribbon in the container. A binding in the container, for example, would cause an increase in the initial tension T_1 and hence a decrease in the internal flow rate. This immediately results in causing the linkage and its weights to move upwardly and the pressure on the floating loop *a* and the angle of wrap of the strand about the successive drag bars to decrease, which in turn causes a transfer of additional pull on the strand in the container. If complete release of pressure and wrap on the loop is insufficient to free the binding, that is, the resistance of the strand to leave the container, the link and weights continue to rise and to decrease the angle of wrap of the remaining bars until the links are in their wide open position, as shown in Fig. 4. In most devices the drag bar diameter to the link span ratio is large, hence an appreciable angle of wrap still exists on the bars even in the wide open position. Under certain circumstances, however, it may be desirable to reduce the angle of wrap so as to further reduce the frictional resistance to movement, hence as shown in Fig. 5, the ends of the lower bars **16***a*, **18***a*, **16***b*, and **18***b*, the four lowermost shown in that figure, may be offset from the link centers with the result that there is even less angular contact of the strand with the bars when the linkage is in its open or extended position. In Fig. 2, the strand has little more than tangential contact with the successive bars.

In order to prevent the links of the toggles from falling over to the wrong side of the guide slots, that is, to keep all of them in the same plane and on the same side of the guide slots, stops are mounted on the toggles at their knees. These stops are in the form of lugs **30** (Fig. 9) welded or otherwise fastened to the upper ends of the toggle links **20***a*, **20***b* and **20***c*, for engagement with the lower ends of the toggle links **22***a*, **22***b* and **22***c*.

If in the extended position of the linkage there is a sudden release of tension from the container **14**, it is al-

most instantaneously taken up by the rapid collapse of the linkage and no large overfeed or tension loss occurs. This self-adjusting to the resistance of the strand to be pulled from the container and the ability to transfer some of its internal energy to the container is of great practical importance as it prevents minor ingoing disturbances from growing exponentially into large percentage changes in the output. Any disturbance at the ingoing end which causes even small amounts of overfeed will cause the toggle links to move downwardly and thus reduce the internal flow rate. This takes place by downward movement which first increases the wrapping angle and pressures on the loop *a* which passes about the drag bar **28**, the lowermost floating bar **18***a* and the pivotally fastened bar **16***a*. If this is insufficient to reduce the flow rate to the desired value, then the bar **18***a* drops into contact with a final stop or snub bar **33** which provides a pinching action on the counter-flowing portions of the strand. If at this point the controlling action is still insufficient to bring the flow back to normal, then the next higher pair of links successively begin to fold and increase the angle of wrap. When all of the bars of the linkage are completely collapsed the maximum restraining value of the device is reached. This condition has proved to be more than ample to prevent any further overfeed. When collapsed, the device has been able to stand for weeks without loss of tension in the strand.

If desired the extent of opening of the uppermost toggles, that is, separation of the two uppermost drag bars **16***c* and **16***d* may be limited by means of cords **36** connected between these bars. These cords, of course, do not interfere with collapse of the linkage. By limiting the separation of the upper drag bars a certain amount of adjustment for the total drag is provided.

A better way of obtaining the adjustment however, in a way which is easier to set up for making the device useful for various tension ranges, is to place at the input end a pair of parallel guide or drag bars **38—38** (Fig. 6). These bars, as seen in Fig. 7, are fixed in spaced parallel relation to each other by end plates **40—40**, and the latter have extending therefrom trunnions **42—42** journaled in the frame uprights, so that the device may be rotated about a horizontal axis. One of the trunnions **42** has a crank **44** extending from it so as to enable rotation of the bars **38—38** to any angular position and a thumb screw **45** for fixing it at the desired position of adjustment. With this arrangement the strand is drawn upwardly over the outermost of the bars **38**, and thence inwardly under the second of the bars **38** and from thence upwardly about the fixed guide **28**. This arrangement is especially useful for keeping the device working in its most sensitive zone as the level of the incoming strand drops in its container.

The device has a tendency to surge when the feeding rate is rapid which results in repeated bouncing of the linkage and accordingly it is desirable to add to the device a drag bar **46** (Fig. 6), supported between a pair of arcuate arms **48**, which in turn are fast to the lowest pair of toggle links **22***a*. The bar **46** is parallel to the linkage bars and at the opposite side of the pivotally fastened bar **16***a* from the bar **28**. When the bar **46** is employed, the strand S is looped from the bar **28** about the bar **46** rather than the bar **16***a* so as to provide a relatively larger loop *b*. Its action is such that at any time the linkage is rising the stored up loop of relatively large size can quickly be given up in the direction of flow of the strand without having to drag it out of the container, thus eliminating shock by resistance of the strand to feed from the container until it has had a chance to pick up motion. During the collapse of the linkage the motion of the bar **46** is such as to tend to pull back and take out of the flow a length of the strand. This behavior is always out of phase with any vertical disturbance and tends to dampen it.

It is evident that each successive tension zone has a progressively higher tension in it and this adds another desirable feature to the device which is especially useful in handling rubber strands which have a natural tack. Ribbon rubber and especially that which is rebonded merely by taking advantage of its natural tack suffers from two distinct types of splitting difficulties when being split by a simple wire or rod, such a wire being shown at **50** in Figs. 6 and 7. One is that when the ribbon is being split at a too low tension roll-over results, that is, the carrying over and eventual breaking of one strand to the wrong side of the splitter bar. This can be cured by raising the tension value before attempting to split it. The other difficulty appears when the splitting is attempted at an extremely high tension, for example, at approximately maximum elongation. Under these conditions the rebonding seems to lock the individual strands together so tenaciously that the strands tear and break instead of splitting. In between the two extremes of too little or too much tension an ideal splitting condition can be obtained. It is evident that such a condition may readily be found at one of the tension zones of the device and that the splitter bar may then be arranged next to the bar in that zone. One alternate position of the splitter bar is shown in broken lines **50***a* (Fig. 7).

While the term "strand" has been employed herein in the description of the operation of the device, it is to be understood that it is equally useful for reducing and regulating tension in any flexible elongate element, whether it is in ribbon, strip or sheet form. Furthermore, while textile machines have been mentioned as the place of delivery of the strand, it is to be understood that the delivery may be made to any machine or operation to which a continuous strip is to be fed.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. In a device for producing a substantially uniform tension in an elongate element travelling continuously from a place of storage to a place of use, a plurality of spaced parallel drag bars through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, said bars being comprised of a first set of parallel bars, a base supporting said first set of bars for translatory movement thereon, to increase their spacing, and a second set of parallel bars, means pivotally supporting each bar of the second set of parallel bars between a pair of adjacent bars of the first set, so that an extension of the first set of bars to increase their spacing moves the bars of the second set toward the plane of the first set, and contraction of the first set to decrease the spacing moves the bars of the second set away from the plane of the first set, said bars in the first set being moved away from each other by an increase in tension between the entrance and exit ends of the element, and toward each other by a decrease in the tension between the entrance and exit ends of the element.

2. In a device for producing substantially uniform tension in an elongate element travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel drag bars, through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between bars may be increased by straightening the links and decreased by folding the links, means pivotally fastening an end bar to the base, and guide means on the base with which every other bar commencing with the pivotally fastened bar is engaged and constrained for translatory movement in a predetermined path, the intermediate bars being free to move to and from the plane of the guided bars as the latter are moved in translation in one direction to increase their

linear spacing and decrease their lateral spacing, and in the other direction to decrease their lateral spacing and increase their linear spacing.

3. In a device for producing substantially uniform tension in an elongate element travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel bars through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between bars may be increased by straightening the links and decreased by folding the links, means pivotally fastening one end bar to the base and vertically disposed guide means on the base with which every other bar is engaged for translatory movement in a predetermined path perpendicular to the base, the intermediate bars being unconstrained except where the links join them to the alternate bars, and being free to move to and from the plane of the alternate bars as the latter are spread apart along said path to increase their spacing and moved toward each other along said path to decrease their spacing.

4. In a device for producing substantially uniform tension in an elongated element travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel bars, through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between bars may be increased by straightening the links and decreased by folding the links, means pivotally connecting an end bar to the base, a track on the base with which the alternate bars are engaged and constrained to move along a predetermined path, the intermediate bars being unconstrained except by the links connecting them to the alternate bars, and free to move to and away from the path of the alternate bar, and means operating on the other end bar to move the alternate bars toward each other to increase the lateral spacing of the intermediate bars with reference to the plane of the alternate bars.

5. In a device for producing substantially uniform tension in an elongate element travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel bars, through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between bars may be increased by straightening the links and diminished by folding the links, means pivotally fastening an end bar to the base, a track on the base, with which the alternate bars are engaged and constrained to move along a predetermined path, the intermediate bars being unconstrained except by the links connecting them to the alternate bars and free to move to and away from the path of the alternate bars, and means connecting the other end bar and the alternate bar next to it which limits separation of said bars.

6. In a device for producing substantially uniform tension in an elongated element travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel drag bars, through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between bars may be increased by straightening the links and decreased by folding the links, means pivotally connecting one end bar to the base, guides on the base with which the alternate bars are engaged and constrained to move along a predetermined path, the intermediate bars being unconstrained except by the links connecting them to the alternate bars and being free to move to and from the path of the alternate bars, and a snubbing bar fixed to the base on a radius extending from the center line of the one end bar, parallel thereto, and spaced therefrom by a distance which is greater than the length of the link joining the one end bar and the adjacent intermediate bar, by an amount substantially equal to twice the thickness of the element, said snubbing bar supporting a length of the element extending about it from a source of supply, and from it to the underside of the one end bar in a position to be engaged by a length of the element passing in an opposite direction about the lowermost of the intermediate bars when the lowermost links are partially folded.

7. A device for producing substantially uniform tension in an elongate element travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel drag bars, through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between the bars may be increased by straightening the links and decreased by folding the links, means pivotally connecting one end bar to the base, a guide on the base with which the alternate bars are engaged and constrained to move along a predetermined path, the intermediate bars being unconstrained except by the links connecting them to the alternate bars and free to move to and from the path of the alternate bars, and a pair of vertically spaced snubbing bars fixed to the base on different radii extending from the center line of the one end bar, one of said snubbing bars being spaced from one end bar by a distance which is greater than the radial distance between the one end bar and the adjacent intermediate bar by an amount at least equal to twice the thickness of the element and the other by a distance corresponding to the radial distance between the one end bar and the adjacent intermediate bar, said snubbing bars being situated above and below a horizontal plane passing through the axis of the one end bar, the upper one of the snubbing bars supporting a length of the element extending about it from a source thereof, and from it to the underside of the one bar in a position to be engaged by a length of the element travelling in the opposite direction about the lowermost one of the intermediate bars, and said lower one of the snubbing bars supporting the intermediate bar in its lowermost position, and pinching the oppositely travelling lengths of the element therebetween.

8. In a device for producing substantially uniform tension in an elongate element, comprised of a plurality of strands adhering edge to edge in sheet form, travelling continuously from a place of storage to a place of use, a base, a plurality of spaced parallel drag bars, through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, links pivotally connecting the bars so that the spacing between bars may be increased by straightening the links and decreased by folding the links, means pivotally connecting an end bar to the base, a track on the base with which the alternate bars are engaged and constrained to move along a predetermined path, the intermediate bars being unconstrained except by the links connecting them to the alternate bars and free to move to and from the path of the alternate bars and a splitting bar removably attachable to one of the alternate bars between any pair of alternate bars for intercepting the element and separating it into its constituent strands.

9. In a device for producing substantially uniform tension in an elongate element, comprised of a plurality of strands adhering edge to edge in sheet form, traveling continuously from a place of storage to a place of use, a frame, a plurality of spaced horizontal alternate and intermediate drag bars through which the element is woven so that successive courses of the element alternate between the bars from one side of one bar to the opposite side of the next, means mounting said intermediate bars for movement toward and away from said alternate bars, said mounting means being pivoted so

that the weight of said intermediate bars and mounting means moves said intermediate bars away from said alternate bars to increase the contact area between the element and each bar, said weight-induced movement being opposed by tension developed in the element as it travels from one end to the other in its course between the bars, a splitter bar adapted to be disposed transversely of the direction of travel of the element at different positions of tension developed in the element along its course for intercepting and separating the alternate strands of the element, an auxiliary weight operating on the bars to augment the weight of said intermediate bars and mounting means to move said alternate and intermediate bars apart, and a snubbing bar fixed to said frame supporting one of said intermediate bars at a

predetermined position and pinching the elongate element therebetween to maintain tension on the element in said position.

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