Jan. 26, 1960 J. W. I. HEIJNIS 2,922,598

THREAD TENSIONING DEVICE

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Fig. 1.

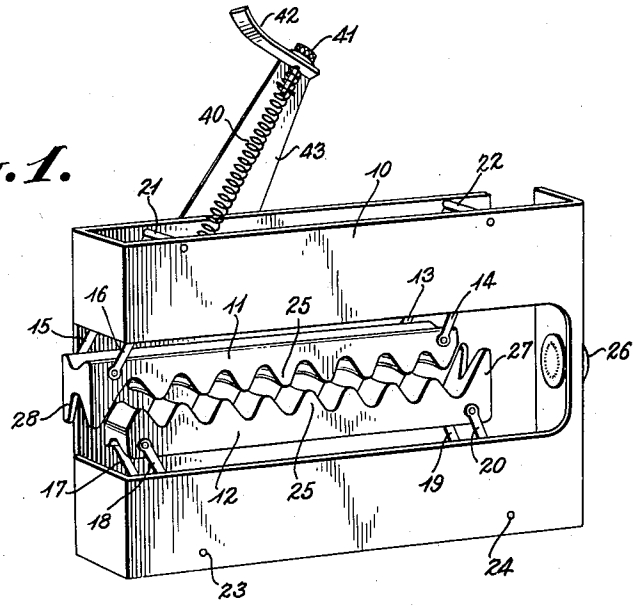

Fig. 2.

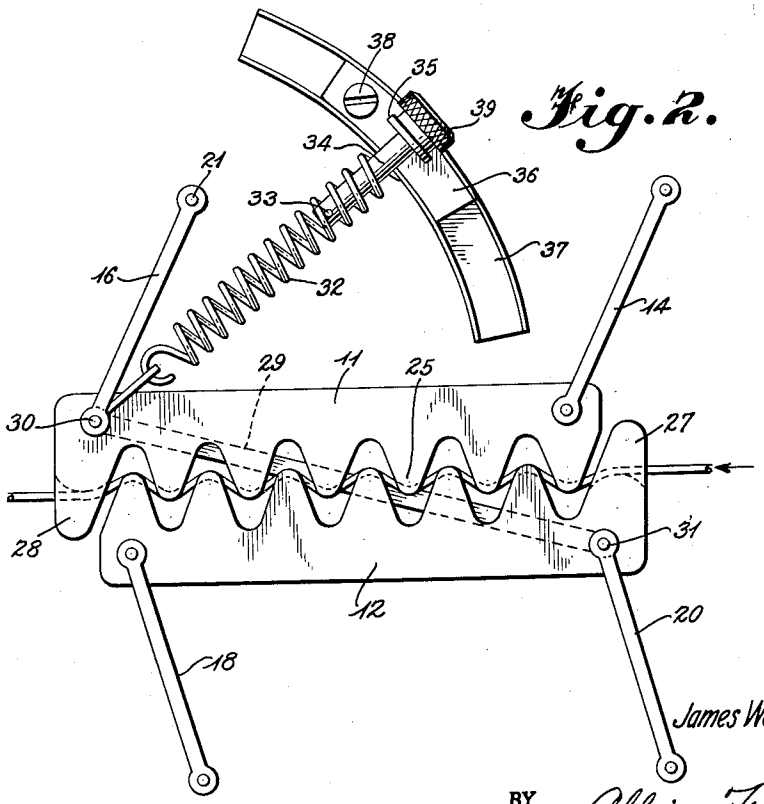

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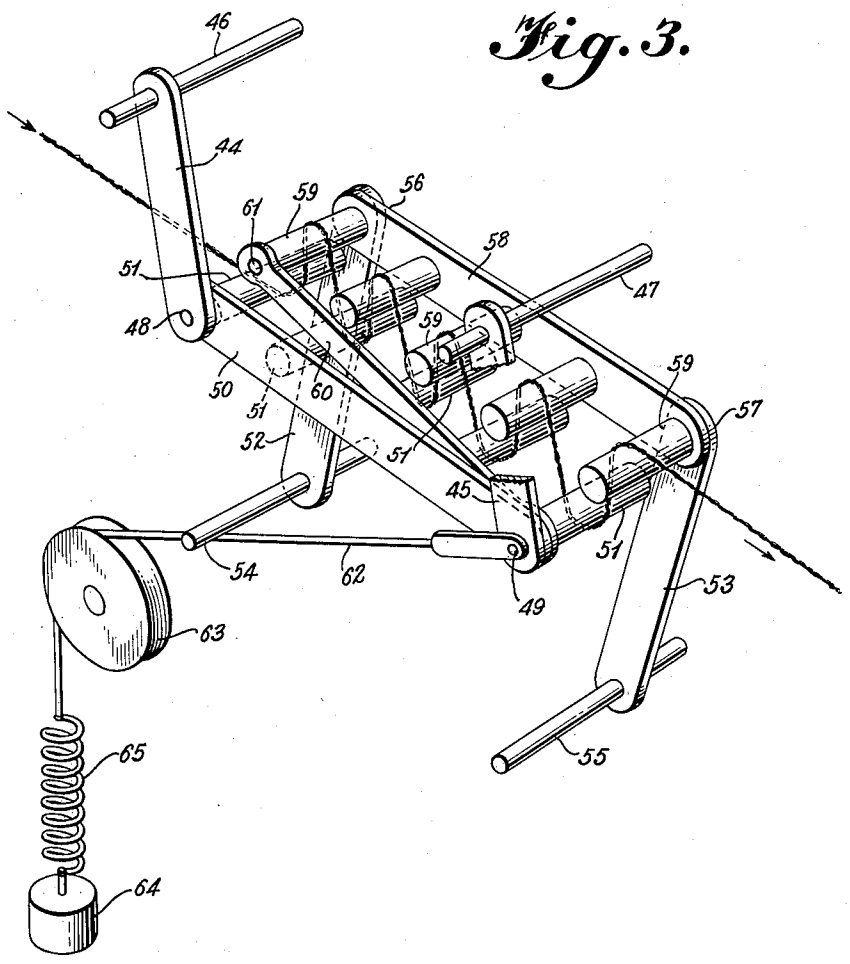
Fig. 3.



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THREAD TENSIONING DEVICE

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7 Claims. (Cl. 242—154)

This invention relates to thread or yarn tensioning devices and more particularly to devices which will impose a substantially constant drag on a running thread irrespective of the tension of the yarn entering the device.

In the art relating to the tensioning of yarns or threads various devices are known for the purpose of imparting drag or resistance to the thread. Usually these devices are employed in order to impose a desired drag on a running thread but unfortunately, drag devices of the type heretofore known have been characterized by inability to maintain a constant resistance in the presence of differences in the tension of the running thread. Thus most of the prior art drag devices actually tend to add drag in varying amounts to the existing tension rather than to establish a resistance at a predetermined level and maintain it there irrespective of variations in the tension of the thread entering the system.

It is an object of the present invention to overcome the difficulties of prior art tensioning devices and to provide a device which will impose a constant drag on a running thread irrespective of variations in the tension of the thread coming to the device.

It is proposed according to the present invention to employ elements defining a tortuous thread passageway and to mechanically interconnect the elements in such a way that they move tangentially relative to the direction of movement of the thread so that when an incoming thread tension is high the degree of tortuousness is reduced and the drag surface is decreased while the drag pressure is increased thus to maintain a constant overall effect on the thread.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of several embodiments thereof in conjunction with the annexed drawings wherein:

Figure 1 is a perspective view of a thread tensioner according to the present invention;

Figure 2 is a view in side elevation of a somewhat modified version of the thread tensioner of Figure 1, the housing being removed for convenience of illustration; and

Figure 3 is a perspective view of another modified type of thread tensioner also shown with the housing removed for convenience of illustration.

Referring in detail to Figure 1, the numeral **10** indicates a housing which is hollow and in which two brake shoes **11** and **12** are suspended on pivoted parallel links **13, 14, 15, 16, 17, 18, 19** and **20**. The links **15** and **16** are pivoted at **21** to the top of the housing and the links **13** and **14** are similarly pivoted at **22**. At the bottom of the housing pivots **23** and **24** accommodate pairs of links **17—18** and **19—20** respectively. The links are pivotally connected to the respective shoes. The facing surface of the brake shoes or elements **11** and **12** are provided with teeth **25** which are staggered so that they interdigitate more as the shoes **11** and **12** swing toward one another and less as the elements swing away from

one another. At one end of the housing there is provided an aperture at **26** through which thread is admitted to the drag device. This thread is led through a forked tooth **27** at the right hand end of the shoe **12** in between the teeth **25** which define a tortuous passageway coaxial with the aperture at **26** and normal to the axes **21** to **24** inclusive and then out through a notch in the tooth **28** at the left hand end of the shoe **11**.

The suspension of the shoes **11** and **12** can perhaps be better understood by reference to Figure 2 in which the housing **10** is omitted for convenience of illustration. It can be seen that in addition to the parts already described there is a strap **29** interconnecting the pivot **30** for the links **15** and **16** to the pivot **31** for the links **19** and **20** so that movement of one causes movement of the other in the same direction along the axis of a thread passageway defined therebetween. It is to be understood that all of the links **13** to **20** inclusive are pivoted at both ends and are of equal length so that the space defined among the pivots is always a parallelogram. Thus, the shoes **11** and **12** are always in parallelism irrespective of the degree of arcuate or swinging movement which they may make both toward one another and along the axis of the thread passageway extending between the respective braking surfaces. It will be evident of course from the use of an interconnecting strap such as shown at **29** that the shoes **11, 12** always shift an equal amount and in the same direction longitudinally, as well as an equal amount but in opposite directions laterally.

With continued reference to Figure 2, it can be seen that a spring **32** is connected to the pivot **30** and acts to bias the pivot for movement in a counterclockwise direction about the pivot **21**. This has a tendency to move the shoes together so that the teeth **25** are resiliently biased toward maximum interdigitation. The spring **32** is mounted for adjustment of its tension. To this end the spring **32** is held at its end opposite to the end engaging the pivot **30** by an anchor pin **33** projecting diametrically through a threaded bolt **34** which is held in a threaded anchor collar **35**. The collar **35** is attached to and projects from a shoe **36** which is mounted for arcuate movement in a slot **37**. The shoe is provided with a set screw **38** for locking it in a desired position of adjustment. A knurled head **39** is provided at the end of the bolt **34**. It can be seen that by loosening the set screw **38** and moving the shoe **36** in the track **37** that the effective thrust of the spring **32** on the pivot **30** can be altered. In addition to that the number of coils of the spring **32** that are available to work may be changed by turning the bolt **34** to change the position of the pin **33** so that more or less coils of the spring are included in the thrust pattern. While it is not shown in the drawing, the track **37** is intended to be mounted on an appropriate part of the housing such as an inner wall thereof.

In the arrangement of Figure 1, the spring **40** is held by a bolt **41** similar to the bolt **34**. Bolt **41** is held by a plate **42** which is secured to an arm **43**. The arm **43** is adjustably mounted on the housing **10** and hence can be moved to impose greater or lesser tension on the links **15, 16** as may be required.

It can now be seen that a thread entering the tensioner from the right as indicated in Figure 2 will pass through a tortuous passageway, the tortuousness of which is the function of the tension of the spring **32** against the tension of the thread. If the thread tension is very high, the shoes **11** and **12** will be moved apart, the path will become less tortuous and the area of the surface imposing a braking effect will decrease even though the pressure exerted by the spring **32** will increase. Thus the total drag will remain constant. If the entering tension is low, spring **32** will bias the shoes together so that

the interdigitation of the teeth **25** will increase and the drag surface will increase. This surface even with a smaller pressure will maintain a drag equal to that of the high pressure-small drag surface which results from high thread tensions.

In Figure 3 there is shown a modification of the invention in which the members which define the tortuous passageway reduce the tortuousness of the passageway by moving toward rather than away from one another. In this case, pivoted links **44** and **45** are suspended from rods **46** and **47**. At their lower ends, links 44 and 45 are pivoted at **48** and **49** and are interconnected by a strap **50** from which there project five cantilever rods **51**. A pair of links **52** and **53** extend upwardly from pivots **54** and **55** to pivots **56** and **57**. The pivots **56** and **57** are interconnected by a strap **58** from which five cantilever rods **59** project and extend toward the strap **50**. These rods are parallel to the rods **51**. An interconnecting member or strap **60** connects the pivot **49** to the end of a rod **59** which is similar to the other rods **59** except that it is coaxial with the pivot **56** and is not cantilever in that it is pivotally connected at **61** to the end of the piece **60** opposite to the pivot at **49**. A cable **62** extends from the pivot **49** over a sheave **63** to a weight **64**. Between the end of the cable **62** and the weight **64** there is interposed a coil spring **65**. The weight **64** and the coil spring **65** tend to swing the links **44** and **45** clockwise about their pivots as viewed in Figure 3. This movement tends to rock the links **52** and **53** anticlockwise about their pivots with the effect of moving the rods **59** away from rods **51**. If the thread is passed through the system as indicated in Figure 3, it will be seen that the further apart that the rods **59** are moved from the rods **51** the more tortuous will be the passageway and the more drag surface will be in contact with the thread. On the other hand, excessive entering tension of the thread tends to close the rods **59** toward the rods **51** thereby to reduce the overall drag surface presented by the device.

In all species of the invention there is present the concept of normal pressure and braking surface being so correlated that when pressure increases it is exerted in a smaller braking surface and when the pressure decreases a larger braking surface is available.

Inasmuch as other modifications will become apparent to those skilled in this art, it is intended that the scope of this invention be limited only to the extent set forth in the following claims.

What is claimed is:

1. A thread tensioning apparatus comprising first and second elements, said elements including co-acting braking surfaces defining therebetween a thread passageway through which thread is passed, the magnitude of the braking surfaces being a function of relative element position, means mounting said first element for swinging movement both toward and along the axis of said passageway, means mounting said second element for swinging movement both toward and along the axis of said passageway in parallelism with said first element, means interconnecting said elements whereby movement of one causes movement of the other in the same direction along the axis of said passageway, and means resiliently biasing said elements toward a maximum braking position to tension thread passed through said passageway.

2. A thread tensioning apparatus as set forth in claim 1 and further comprising means for varying the tension of said biasing means.

3. A thread tensioning apparatus as set forth in claim 1 and further comprising means for altering the effective thrust of said biasing means.

4. A thread tensioning apparatus as set forth in claim 1 wherein said braking surfaces are formed by interdigitating teeth projecting from each of said elements.

5. A thread tensioning apparatus as set forth in claim 1 wherein said braking surfaces are formed by rods extending from each of said elements.

6. Thread tensioning apparatus comprising a first element, parallel links mounting said first element for swinging movement, a second element, parallel links mounting said second element for swinging movement in parallelism with said first element, a strap interconnecting said elements so that the movement of one will be tracked by a movement of the other, said elements including co-acting means defining a tortuous thread passageway thereamong normal to the axis of swing of said elements, the degree of tortuousness being a function of relative element position, and means acting on one of said elements resiliently to bias said elements toward the position of maximum tortuousness for tensioning thread running in said passageway.

7. Thread tensioning apparatus comprising a housing, a first element, parallel links mounting said first element for swinging movement, a second element, parallel links mounting said second element for swinging movement in parallelism with said first element, a strap interconnecting said elements so that movement of one tracks movement of the other, a thread guiding aperture in said housing, said elements including co-acting means defining a tortuous thread passageway thereamong normal to the axis of swing of said elements and coaxial with the axis of said aperture, the degree of tortuousness of said thread passageway being a function of relative element position, and means acting on one of said elements resiliently to bias the said elements toward the position of maximum tortuousness for tensioning thread running in said passageway.

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