8-14-1951

Tensiometer

Hugh M. Brown

Aug. 14, 1951 H. M. BROWN 2,564,150

TENSIOMETER

Filed March 14, 1949

Fig. 2.

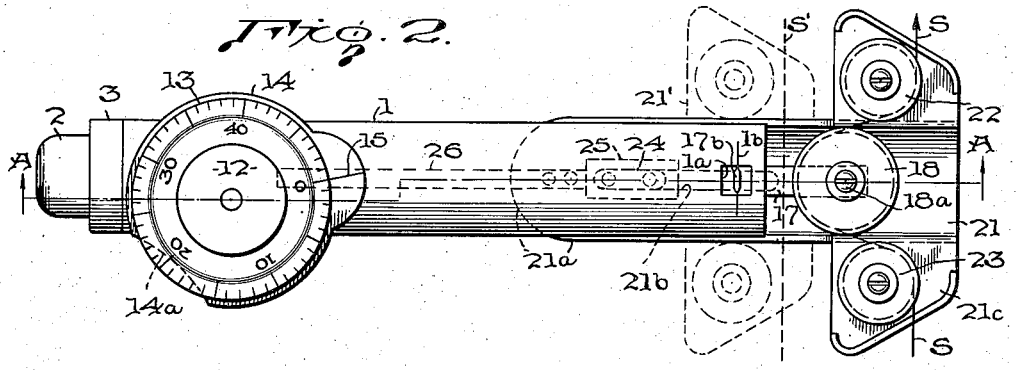

Fig. 1.

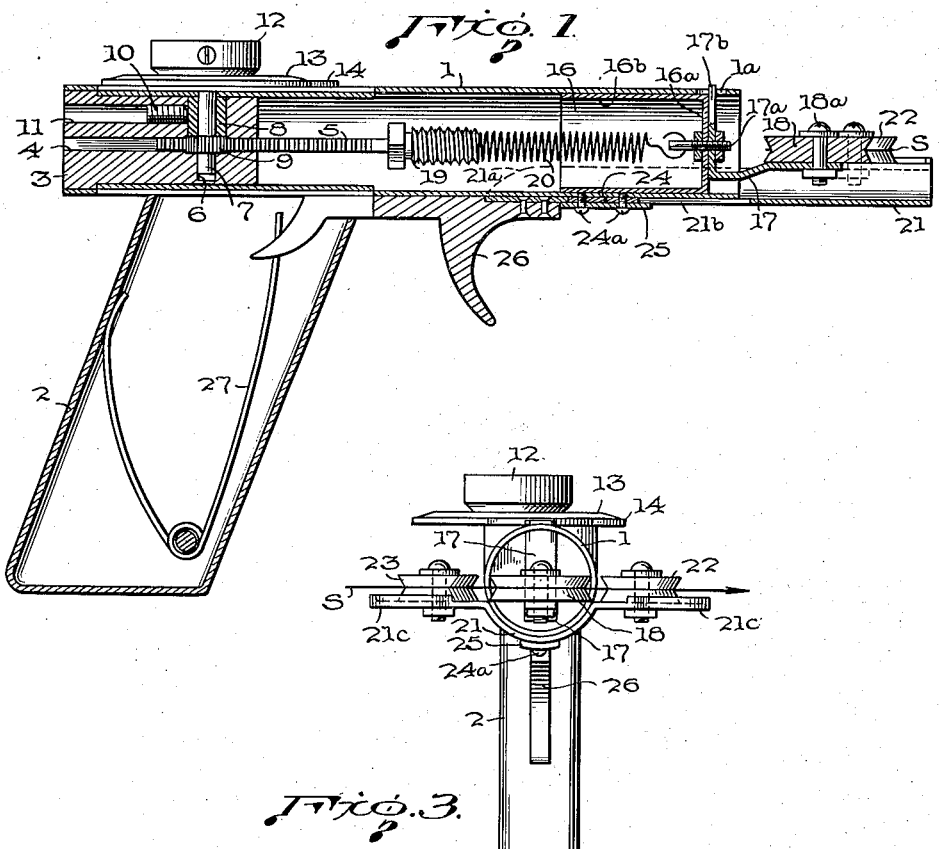

Fig. 3.

INVENTOR.
HUGH M. BROWN
BY Ralph B. Stewart
ATTORNEY

Patented Aug. 14, 1951

2,564,150

UNITED STATES PATENT OFFICE

2,564,150

TENSIOMETER

Hugh M. Brown, Clemson, S. C., assignor to Clemson Agricultural College of South Carolina, Clemson, S. C., a corporation of South Carolina

Application March 14, 1949, Serial No. 81,273

7 Claims. (Cl. 73—144)

1

This invention relates to deflection tensiometers and in particular to tensiometers for use in measuring the tension in yarns as they run through the various processing machines.

An object of the invention is to provide a tensiometer for measuring the tension in yarns wherein the yarn is deflected a predetermined amount and the force required to deflect the yarn is determined as a measure of the yarn tension.

Another object of this invention is to provide a tensiometer having a simple and effective damping mechanism.

Another object is to provide a tensiometer having tension indicating means that will remain fixed after the indicator has been set to the proper adjustment, thus permitting the operator to remove the instrument from the yarn being tested and move it to a position having better light before observing the reading.

Still another object is to provide a tensiometer that may readily be inserted between yarns that are running close together.

A preferred embodiment of my invention is shown in the accompanying drawing in which:

Figure 1 is a side sectional view taken along the line A—A of Figure 2;

Figure 2 is a top plan view of the instrument; and

Figure 3 is an end elevational view of the instrument as viewed from the right of Figure 2.

Referring to the drawing a tubular member 1, preferably round in section, is mounted on a hand-grip 2 and has the end nearest the hand-grip and facing to the rear closed by plug 3. This plug has an opening 4 extending throughout its length and approximately centered therein and is of such cross-section as to allow a rack 5 to slide therein. A second hole 6 is formed in the plug 3 at right angles to and slightly offset from the hole 4. This hole 6 serves as a journal for the lower end of shaft 7, the upper portion of hole 6 being enlarged to receive a bearing sleeve 8 and pinion 9, the latter being mounted on shaft 6 and rotatable therewith. A set screw 10 is threaded into a third hole 11 in plug 3 for holding bearing sleeve 8 in position. Preferably sleeve 8 is formed of deformable material, such as fiber, wood or plastic, so that by tightening screw 10 the sleeve will be deformed and will apply an adjustable frictional drag on the shaft 7; however, sleeve 8 may be of rigid material and other means may be used to frictionally hold shaft 7 in adjusted position. The shaft 7 extends upwardly through the wall of tubular

2

member 1 and has an adjusting knob 12 mounted on the upper end thereof. Secured to the lower end of knob 12 is a circular dial 13 having radial graduations scribed around the circumference thereof, and a generally circular plate 14 is secured to tubular member 1 below dial 13 and is provided with a radial index mark 15 scribed thereon. A portion of the edge of fixed plate 14 is cut away as at 14a to expose the edge of dial 13 at a point where the edge of the dial may be engaged and operated by the thumb.

The other, or front, end of the tubular member 1 has a piston 16 slidably mounted therein. This piston has a circular face portion 16a and a relatively long cylindrical skirt portion 16b which extends toward the rear of the tubular member 1. Mounted on the front face of piston 16 is a generally L-shaped bracket 17, one leg of which is secured to the face 16a of the piston by means of a screw 17a, and the other leg of which extends parallel with the axis of the tubular member 1. The leg secured to the face 16a projects through an opening 1a in the top of tubular member 1 near the front end. The edges of this leg are beveled and the projecting end portion of the leg serves as a pointer 17b which is to be aligned with index marks 1b during the operation of the tensiometer. Near the end of the other leg of bracket 17 a tension pulley 18 is mounted upon a screw 18a for rotation in a horizontal plane. Attached to the end of rack 5 is a calibration screw 19 and threaded thereon is a spring 20. The other end of this spring extends into piston 16 and is attached to the inner end of screw 17a. The calibration of the instrument is accomplished by threading the spring 20 on screw 19 a greater or less amount as required to position indicator 17b opposite line 1b when there is no load on the tension pulley 18 and with dial 13 set at zero. Instead of using rack 5 and pinion 9 to adjust the tension in spring 20, a cable might be wrapped around shaft 7 and attached to calibration screw 19.

Slidably mounted beneath member 1 and extending beyond the front end thereof is a T-shaped slide 21. The shank 21a of this slide is arcuate in cross section so as to closely conform to the exterior surface of member 1 and a guiding slot 21b is formed longitudinally thereof; the two wings 21c of the T-slide extend horizontally and have a pair of guide pulleys 22, 23 rotatably mounted thereon in the same plane as tension pulley 18. Disposed within slot 21b and mounted on member 1 is an elongated slide guide block 24 which in conjunction with slide

guide cap 25 allows the slide 21 to slide back and forth to an extent determined by the length of slot 21b while preventing movement in other directions. The guide block 24 and the cap 25 are secured to the tube 1 by suitable means such as a pair of screws 24a. Attached to the rear end of shank 21a of slide 21 is a trigger member 26 which extends into the hand-grip 2 through a slot formed therein; a spring 27 being provided within the grip 2 to bias the trigger member 26 and the T-slide 21 to the most forward position it can assume. This is the normal operating position of the slide.

To use the tensiometer the instrument is held by hand-grip 2 and the trigger member 26 is pulled back toward the grip until the wings of the slide 21 are in the position shown by the dotted lines 21' in Figure 2. With the slide in this position the instrument is placed so the strand to be tested (see dotted line S' in Figure 2) passes in a straight line between the tension pulley 18 and the guide pulleys 22, 23. The trigger member 26 is then released and the spring 27 causes the slide 21 to return to its normal operating position, thus threading the strand about the pulleys as shown by the solid line S in Figure 2. The tension on spring 20 is then increased by turning the knob 12 until the indicator 17b is aligned with the mark 1b. If desired the trigger 26 may then be pulled back once more and the instrument removed from the strand before reading the dial 13 since friction sleeve 8 prevents the shaft 7 from being rotated by spring 20. It is to be noted that the slide 21 is quite shallow and may be readily inserted between yarns or strands that are running fairly close together.

In operation the piston 16, being a sliding fit in a substantially air tight cylinder exerts a damping force on the vibrations caused by variable tension in the yarn being tested, and prevents excessive vibratory movement of the pointer 17b.

If it is desired to obtain a reading of the minimum strength observed over a period of time, the tension in spring 20 may be adjusted by knob 12 until the indicator 17b only occasionally moves from the front edge of the opening 1a; conversely, a reading of maximum strength may be obtained by adjusting the tension until the indicator only occasionally moves away from the back edge of opening 1a.

From the foregoing it will be understood that the tubular member 1 constitutes a base or main supporting element of the tensiometer, and the two spaced guide pulleys 22 and 23 are mounted on this supporting element by a slide 21 arranged to shift guide pulleys 22 and 23 in their common plane at right angles to the direction of separation of the two pulleys. The guide pulleys are movable between a position where the tension pulley 18 is positioned substantially between the guide pulleys to another position where the guide pulleys are moved entirely clear of the tension pulley. Also, the tension pulley 18 is supported on a piston element slidably mounted within tube 1, the piston serving the dual function of supporting the tension pulley for sliding movement along a line passing midway between the two guide pulleys and also serving to damp the vibratory motion of the tension pulley. The sliding movement of the tension pulley is limited by the projecting pointer 17b positioned within the aperture 1a formed in the tube 1.

In the form of my invention disclosed herein, the guide pulleys 22 and 23 are arranged in a plane at right angles to the plane of the grip 2, but it will be understood that these pulleys may be arranged in the same plane as the grip 2. Also, the dial 13 need not be arranged in a plane at right angles to the grip 2 but could also be arranged on the side of the tube 1 in a plane parallel with the plane of grip 2 and in a position where the dial may be operated by the thumb of the hand holding the tensiometer.

I claim:

1. A tensiometer comprising a tubular member closed at one end thereof, a piston slidably fitted within the said tubular member at the other end thereof, a spring disposed internally of said tubular member and having one end attached to said piston, means mounted adjacent said closed end of said tubular member for anchoring the other end of said spring and for varying the force exerted by said spring upon said piston, a tension pulley mounted on said piston on the opposite side thereof from said spring and being rotatable about an axis perpendicular to the axis of said tubular member, a slide mounted for sliding movement on said tubular member, and two guide pulleys mounted on said slide member on opposite sides of the axis of said tubular member with their axes parallel with the axis of said tension pulley and positioned in the same plane as said tension pulley, said guide pulleys being spaced apart a distance greater than the diameter of said tension pulley and said slide being movable from a normal forward position where said guide pulleys are in guiding relation to said tension pulley to a rear position where said guide pulleys are clear of said tension pulley.

2. A tensiometer according to claim 1 wherein said means for anchoring the end of said spring comprises a shaft mounted on said tubular member for rotation on an axis transversely of the axis of said tubular member, and means connecting the free end of said spring to said shaft to translate rotary movement of the shaft into translatory movement of the attached end of said spring.

3. A tensiometer according to claim 1 having a pistol-type grip attached to said tubular member adjacent the closed end thereof, and including a slide-actuating member having a trigger-like portion thereon disposed immediately in front of said grip with a portion of said slide-actuating member extending into said pistol-type grip and the opposite end fastened to said slide, and a spring disposed within said grip and engaging said slide-actuating member and biasing said slide-actuating member and said slide to said normal position.

4. A tensiometer according to claim 1 in which said means for varying the force exerted by said spring comprises a rack disposed internally of said tubular member and parallel therewith and having one end attached to said spring, a shaft disposed transversely of said tubular member near said closed end and having an operating knob and calibrated dial on one end thereof, and a pinion mounted on said shaft intermediate the ends thereof and engaging the teeth of said rack.

5. A tensiometer according to claim 1 in which said tubular member is provided with an aperture adjacent said piston and having a pointer attached to said piston and positioned within said aperture.

6. In a tensiometer, the combination of an elongated support member having a handle portion at its rear end, a slide mounted on the forward end of said support and having limited sliding move-

ment along said support, a single pulley mounted on said slide for rotation about an axis perpendicular to the axis of said support, a second slide member carried by said support near its forward end and being slidable along said support through a greater range than said first slide, a pair of guide pulleys mounted upon said second slide for rotation in the same plane as said single pulley and being positioned on opposite sides of the axis of said support and spaced apart a distance sufficient for said single pulley to pass between them, and spring means normally maintaining said second slide in a forward position where said pair of pulleys are in guiding relation to said single pulley, said slide being movable against the force of said spring means to a rear position where said guide pulleys are clear of said single pulley, and adjustable means for applying a yieldable force to said first slide in a direction opposed to the force of tension applied to said single pulley.

7. A tensiometer comprising an elongated support member having a grip portion adjacent one end thereof and a slide carried by said support member at the other end thereof and having limited sliding movement along said support, a single pulley mounted on said slide and rotatable about an axis perpendicular to the axis of said support member, a second slide carried by said support member at the same end as said single pulley, a trigger member attached to said second slide and operable by a finger of the hand grasping said grip portion to move said second slide toward said grip portion, a pair of pulleys mounted on said second slide and positioned in the same plane as said single pulley but on opposite sides thereof so that when said second slide is moved toward said grip portion a strand under tension may be inserted between said single pulley and said pair of pulleys without deflection and when said second slide is moved away from said grip portion said pair of pulleys will thread said strand about said single pulley, and adjustable means for applying yieldable force to said first slide in a direction opposed to the force of tension applied to said single pulley.

HUGH M. BROWN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,400,776	Smith	Dec. 20, 1921
2,372,434	Krouse	Mar. 27, 1945

FOREIGN PATENTS

Number	Country	Date
313,564	Germany	July 11, 1919
242,348	Great Britain	Nov. 6, 1925
199,152	Great Britain	June 20, 1923