Nov. 15, 1955 J. S. CHAYA ET AL 2,723,561

TENSIOMETER

Filed Nov. 28, 1952 2 Sheets-Sheet 1

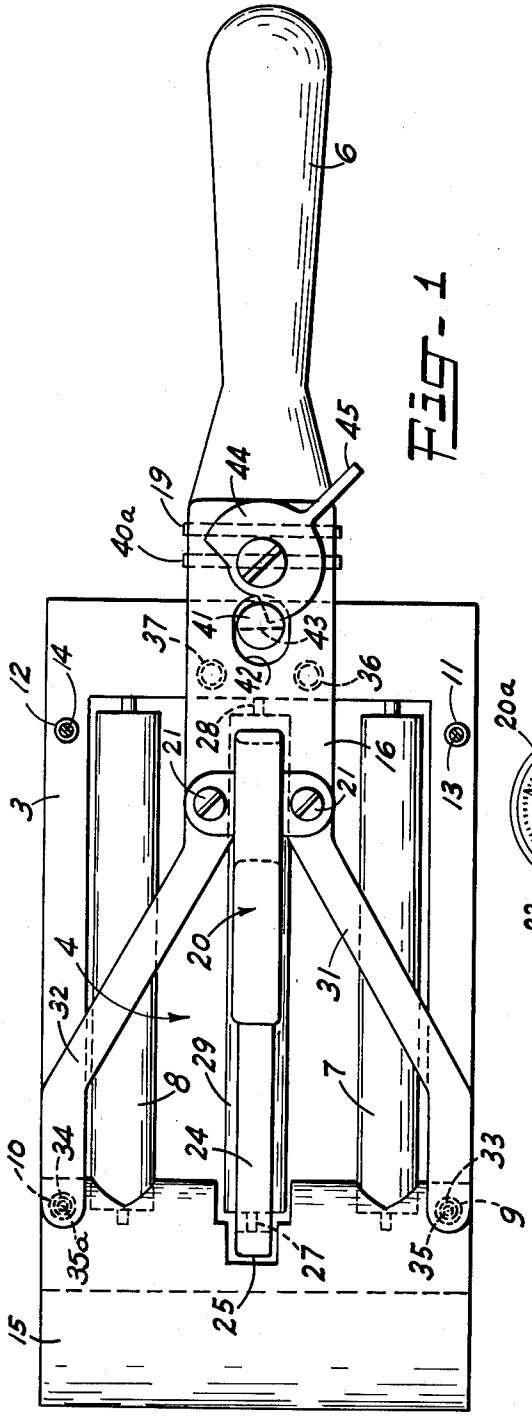


FIG. 1

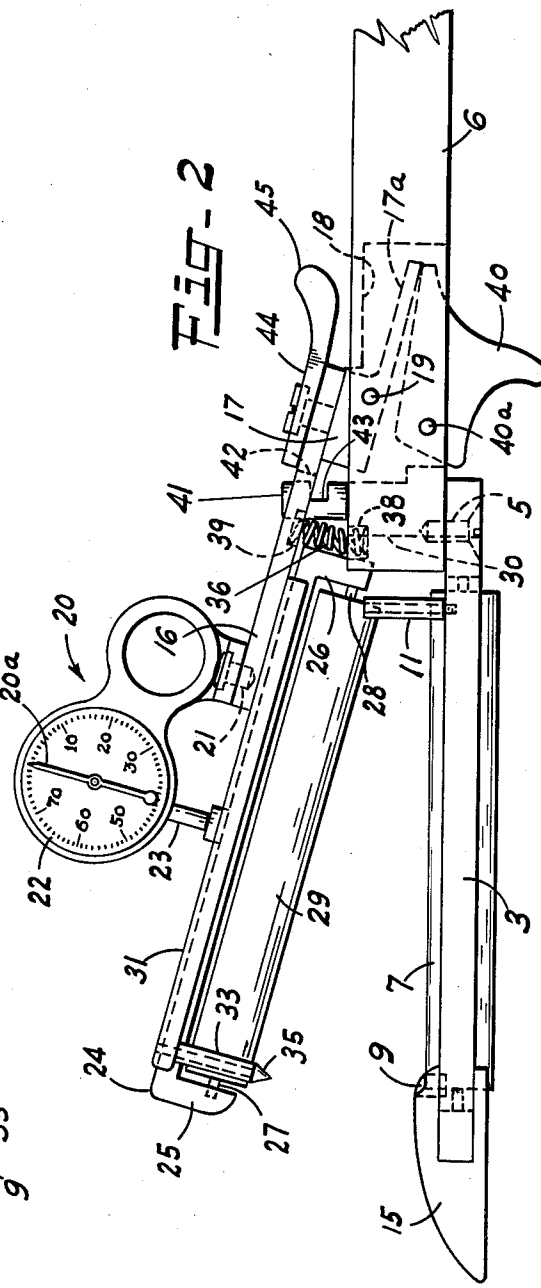


FIG. 2

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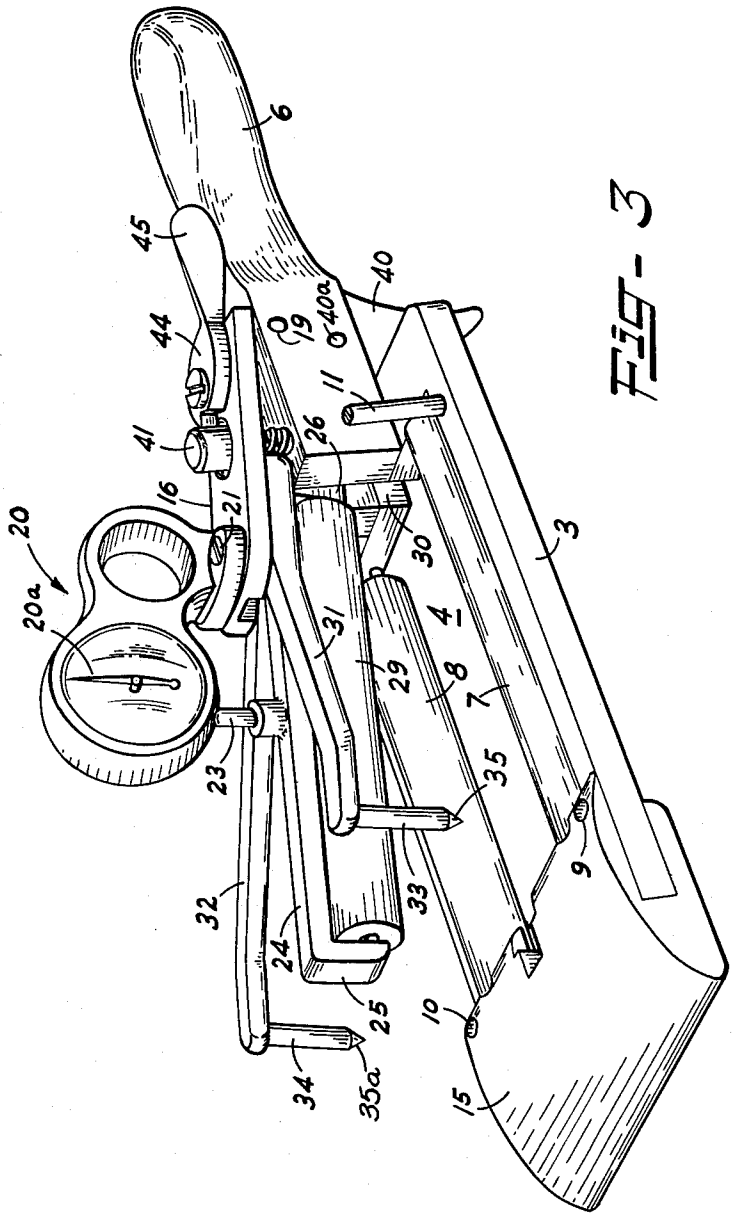


FIG. 3

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TENSIOMETER

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13 Claims. (Cl. 73—144)

The present invention relates to apparatus for indicating the degree of tension which is applied to one or more filamentary strands or the like. More particularly it relates to a novel and improved tension measuring device which is readily constructed and which is conveniently used and operated.

In the manufacture of various types of textile fabrics and other similar materials, it is often necessary to carefully adjust and control the relative tension upon the various individual strands thereof. Thus, for example, in preparing a warp for a textile fabric, particularly where the component strands thereof are selected from a plurality of warp beams, it is oftentimes necessary to substantially equalize the tension placed upon the strands which emanate from each of the warp beams. Moreover, it is ordinarily desirable to substantially equalize the tension applied to the strands under normal operating conditions as they continuously advance and form the warp pattern of the fabric. Otherwise it has been found that defects and other irregularites in the fabric are apt to appear during the subsequent drying and other conventional processing operations.

It is a principal object of the present invention to provide a novel and improved device for indicating the degree of tension which is applied to one or more filamentary strands.

It is a further object of the present invention to provide a novel and improved filamentary tension measuring device which is particularly adapted for use as the strands being tested continue to advance to form the warp pattern or the like.

Other objects and advantages of the invention will be apparent from the following description.

In the drawing which is illustrative of the present invention,

Figure 1 is a top view of a preferred embodiment of the present invention;

Figure 2 is a side view of the structure of Figure 1; and

Figure 3 is a perspective of the structure of Figures 1 and 2.

In general the improved tensiometer of the present invention includes a frame having a pair of separated generally parallel strand engaging members positioned thereon, means pivotally secured to the frame for at times engaging and deflecting a filamentary strand which is positioned between the strand engaging members, and means for indicating the amount of deflection. It has been found that a unique and improved filamentary tension measuring device may be constructed in this way.

A preferred embodiment of the present invention is shown in Figures 1 and 2 of the drawing. As illustrated therein the generally rectangular frame member or jaw 3 having the enlarged centrally located opening 4 is secured in any suitable manner such as by the cap screws 5 to the handle member 6. The elongated rolls 7 and 8 which may be formed from any conventional wear-resistant light weight material are mounted in conventional bearings and are parallel to inner lateral edges of the opening in the frame member 3. For reasons which will be more apparent hereinafter an appreciable portion of the periphery of each of the rolls extends above the upper surface of the jaw 3.

For reasons which will also be more apparent hereinafter, the apertures 9 and 10 in the jaw 3 are preferably respectively positioned as shown adjacent one extremity of the roller members 7 and 8 while the sleeve-like abutments 11 and 12 are rotatably mounted on the upright posts 13 and 14 which are respectively positioned adjacent the opposite extremities of the roller members 7 and 8.

The shroud or the like 15 which is secured in any suitable manner to the leading edge of the jaw 3 is preferably characterized by a smooth sloping contour which extends over and beyond the leading edge of the jaw and which thereby encloses the adjacent extremities of the roller members 7 and 8. In this way as will be more apparent hereinafter the strand or strands which are to be tested are less apt to became snagged or caught on the extremities of the roller members and damaged thereby while being positioned in the tensiometer.

The upper jaw assembly 16 together with the rectangular block 17 which is secured thereto adjacent one extremity is preferably pivotally positioned in the aperture 18 in the handle 6 by the pin 19. The conventional indicator assembly which is generally designated by the reference numeral 20 is preferably positioned adjacent the opposite extremity of the upper jaw 16 on the upper surface thereof by the cap screws 21 and extends as shown upwardly and outwardly therefrom.

As the particular structure of the indicator assembly might take a great variety of forms and as it involves no part of the present invention, it is not believed necessary or expedient to disclose it in detail. Preferably, however, it is to be understood that the position of the index needle or pointer 20*a* with respect to the suitably calibrated dial 22 accurately indicates the vertical disposition of the operating shaft 23 which is preferably connected adjacent its upper extremity to the pointer 20*a* in any suitable manner such as by a conventional rack and gear mechanism not shown on the drawing. The elongated bar bracket 24 which is secured to the lower extremity of the operating shaft 23 in any suitable manner includes the downwardly extending lug portions 25 and 26 adjacent its opposite extremities in which the pin members or the trunnions 27 and 28 of the movable roll 29 are journalled.

As best shown in Figure 2 of the drawing the adjacent extremity of the handle 6 is preferably slotted as at 30 to slidably receive and guide the lug portion 26 of the bracket 24 as it moves with respect to the upper jaw 16 and the handle 6. The diverging arms upper jaw extensions 31 and 32 which are preferably disposed adjacent opposite sides of the movable roll 29 are preferably secured to and extend outwardly from the lower surface of the jaw 16 as best shown in Figure 1. The sleeve-like abutments 33 and 34 are respectively rotatably mounted on the downwardly extending pointed posts 35 and 35*a* which are secured to the outer extremities of the arms 31 and 32. Thus, when the pivoted assembly is moved downwardly into its lowermost position the pointed posts 35 and 35*a* which cooperate with the apertures 9 and 10 in the jaws together with posts 11 and 12 determine the number of warp strands which are to be tested.

As best shown in Figure 2 of the drawing, the jaw 16 is preferably normally biased about the pivot pin 19 in a clockwise direction by the springs 36 and 37 which are preferably positioned as shown in the bores 38 and 39

respectively formed in the upper surface of the handle 6 and in the lower surface of the jaw 16.

The trigger or the like 40 which is pivoted on the pin 40a in the cavity 18 in the handle 6 and which extends downwardly therefrom is preferably adapted to engage the extended portion 17a of the rectangular block 17 when the trigger is depressed and to thereby rotate it together with the jaw 16, the indicator assembly 20 and the movable roll 29 in a counterclockwise direction against the bias of the springs 36 and 37.

The lateral periphery of the generally cylindrical post 41 which is secured to and extends upwardly from the upper surface of the handle 6 and through the aperture 42 in the jaw 16 is preferably notched as at 43 so as to cooperate with the cam 44 when the same is properly positioned by means of the associated operating lever 45 with respect to the other rolls 7 and 8. Accordingly when no strands are being tested and when the trigger 40 is fully depressed and locked in that position by the cam 44, the roll 29 is pivoted downwardly between the rolls 7 and 8 a predetermined distance beyond the upper peripheries thereof. In this way in the absence of any strands being conducted through the tensiometer the initial position of the movable roll 29 with respect to the rolls 7 and 8 may be accurately zeroed such that as will be more apparent hereinafter a reliable indication of the relative tension of the strands from a plurality of sources is assured.

In using the improved tensiometer of the present invention, the cam 44 is first rotated out of engagement with the notched post 41 so as to permit the springs 36 and 37 to urge the jaw 16 together with the roll 29 and the various elements secured thereto upwardly away from the rolls 7 and 8. The filamentary strand or strands which are to be tested are then positioned between the rolls of the tensiometer, the trigger 40 is depressed, and the cam 44 is turned to engage the notch 43 in the post. In so doing, as indicated heretofore, the jaw is rotated downwardly a predetermined and constant amount so that the roll 29 associated therewith engages the strands and, depending upon the tension applied thereto, is urged upwardly against a suitable biasing device in the indicator assembly 20 not shown on the drawing to accurately indicate the strand tension.

While preferred embodiments of the invention have been disclosed, the description is intended to be illustrative only and it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A device for measuring the tension of a continuously advancing filamentary material comprising a frame; a pair of separated generally parallel elongated rolls rotatably mounted on the frame; shroud means which is secured to one end of the frame and which shields the adjacent extremities of the elongated rolls; means pivotally secured to the opposite end of the frame for at times engaging and deflecting a filamentary strand positioned between the elongated rolls; and means for indicating the amount of said deflection.

2. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a pair of elongated rolls positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of said rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to one end of the frame and which shields the adjacent extremities of the elongated rolls; means pivotally secured to the opposite end of the frame for at times engaging and deflecting a filamentary strand which is positioned between the elongated rolls; and means for indicating the amount of deflection.

3. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a handle which is secured to and extends outwardly from one end of the frame; a pair of elongated rolls positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to the opposite end of the frame and which shields the adjacent extremities of the elongated rolls; means pivotally secured to the handle which at times is adapted to engage and deflect a filamentary strand positioned between the elongated rolls; and means for indicating the amount of said deflection.

4. A device for measuring the tension of a continuously advancing filamentary material comprising a frame; a first and second separated generally parallel elongated roll rotatably mounted on the frame; shroud means positioned on the frame so as to shield one extremity of the said elongated rolls; a member pivotally secured to the frame adjacent the opposite extremity of the rolls; a third elongated roll supported by and vertically movable with respect to the member; means for indicating the vertical disposition of the third elongated roll with respect to the member; and means for pivoting the member together with the said third elongated roll such that it engages and deflects a filamentary strand which is positioned between the first and second elongated rolls.

5. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a handle which is secured to and extends outwardly from one end of the frame; a first and second elongated roll positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; a member which is pivotally secured to the handle and which extends outwardly above the opening in the frame; an indicator assembly which is secured to and extends outwardly beyond the projected end of the member; an operating element for the indicator assembly; a third elongated roll connected to the operating element such that when no strand is being tested and when the plate is pivoted downwardly to its lowermost position, the lower periphery of the third elongated roll extends between and a predetermined amount below the upper peripheries of the first and second elongated rolls; means for pivoting the member together with its associated indicator assembly downwardly toward its lowermost position.

6. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a handle which is secured to and extends outwardly from one end of the frame; a first and second elongated roll positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to the opposite end of the frame and which shields the adjacent extremities of the elongated rolls; a member which is pivotally secured to the handle and which extends outwardly above the opening in the frame; an indicator assembly which is secured to and extends outwardly beyond the projected extremity of the member; an operating element for the indicator assembly; a third elongated roll connected to the operating element such that when no strand is being tested and when the plate is pivoted downwardly to its lowermost position, the lower periphery of the third elongated roll extends between and a predetermined amount below the upper peripheries of the first and second elongated rolls; and means for pivoting the member together with its associated indicator assembly downwardly toward its lowermost position.

7. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular open-

ing; a handle which is secured to and extends outwardly from one end of the frame; a first and second elongated roll positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to the opposite end of the frame and which shields the adjacent extremities of the elongated rolls; a member which is pivotally secured to the handle and which extends outwardly above the opening in the frame; an indicator assembly which is secured to and extends outwardly beyond the projected extremity of the member; an operating element for the indicator assembly; means for normally biasing the member and its associated indicator assembly upwardly away from the frame; a third elongated roll connected to the operating element such that when no strand is being tested and when the plate is pivoted downwardly to its lowermost position, the lower periphery of the third elongated roll extends between and a predetermined amount below the upper peripheries of the first and second elongated rolls; and means for pivoting the member together with its associated indicator assembly downwardly toward its lowermost position.

8. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a handle which is secured to and extends outwardly from one end of the frame; a first and second elongated roll positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to the opposite end of the frame and which shields the adjacent extremities of the elongated rolls; a member which is pivotally secured to the handle and which extends outwardly above the opening in the frame; an indicator assembly which is secured to and extends outwardly beyond the projected extremity of the member; an operating element for the indicator assembly; means for normally biasing the member and its associated indicator assembly upwardly away from the frame; a third elongated roll connected to the operating element such that when no strand is being tested and when the plate is pivoted downwardly to its lowermost position, the lower periphery of the third elongated roll extends between and a predetermined amount below the upper peripheries of the first and second elongated rolls; diverging arms which are secured to and extend outwardly from the member over the frame; pointed post members which are secured to and extend downwardly from the outer extremities of the diverging arms and which cooperate with aligned apertures formed in the shroud means when the member occupies its lowermost position; sleeve members rotatably positioned about the periphery of the post members between their pointed extremities and the diverging arms; and means for pivoting the member together with its associated indicator assembly downwardly toward its lowermost position.

9. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a handle which is secured to and extends outwardly from one end of the frame; a first and second elongated roll positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to the opposite end of the frame and which shields the adjacent extremities of the elongated rolls; a member which is pivotally secured to the handle and which extends outwardly above the opening in the frame; an indicator assembly which is secured to and extends outwardly beyond the projected extremity of the member; an operating element for the indicator assembly; means for normally biasing the member and its associated indicator assembly upwardly away from the frame; a third elongated roll connected to the operating element such that when no strand is being tested and when the plate is pivoted downwardly to its lowermost position, the lower periphery of the third elongated roll extends between and a predetermined amount below the upper peripheries of the first and second elongated rolls; and a trigger pivotally secured to the handle for rotating the member together with its associated indicator assembly downwardly toward the frame.

10. A device for measuring the tension of a continuously advancing filamentary material comprising a frame having an elongated centrally located rectangular opening; a handle which is secured to and extends outwardly from one end of the frame; a first and second elongated roll positioned in the opening in the frame along opposite lateral edges thereof, the upper periphery of the rolls projecting above the plane which defines the upper surface of the frame; shroud means which is secured to the opposite end of the frame and which shields the adjacent extremities of the elongated rolls; a member which is pivotally secured to the handle and which extends outwardly above the opening in the frame; an indicator assembly which is secured to and extends outwardly beyond the projected extremity of the member; an operating element for the indicator assembly; means for normally biasing the member and its associated indicator assembly upwardly away from the frame; a third elongated roll connected to the operating element such that when no strand is being tested and when the plate is pivoted downwardly to its lowermost position, the lower periphery of the third elongated roll extends between and a predetermined amount below the upper peripheries of the first and second elongated rolls; a trigger pivotally secured to the handle for rotating the member together with its associated indicator assembly downwardly toward the frame; and means for locking the member and its associated indicator assembly in its lowermost position.

11. In a tension indicator of the type having a pair of jaws pivoted with respect to each other and adapted to engage a layer of parallel filaments, the improvement which comprises a framework forming a first one of said jaws, a pair of laterally spaced elongated rolls journaled in the framework with their axes parallel, a single elongated center roll journaled in the second jaw and mounted so that the axes of the rolls are all parallel to each other when the jaws are pivoted to a fixed closed position in which the roll in the second jaw has passed through the framework to deflect the layer of filamentary material, an abutment on the framework of the first jaw positioned adjacent the inner end of the rolls to guide a preselected amount of filamentary material over said rolls, at least one abutment on the outer end of the second jaw for selecting the number of filaments in the layer to be measured and for guiding said filaments over the rolls, means for limiting pivotal movement of the jaws and defining said fixed closed position, and means responsive to the deflection force exerted on the center roll by the layer of filamentary material when the jaws are pivoted to said fixed closed position for obtaining a reading proportional to the tension in said layer.

12. A tensiometer in accordance with claim 11 having means for locking the jaws in said fixed closed position.

13. A tensiometer in accordance with claim 11 in which the means for obtaining the reading comprises a dial indicator.

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