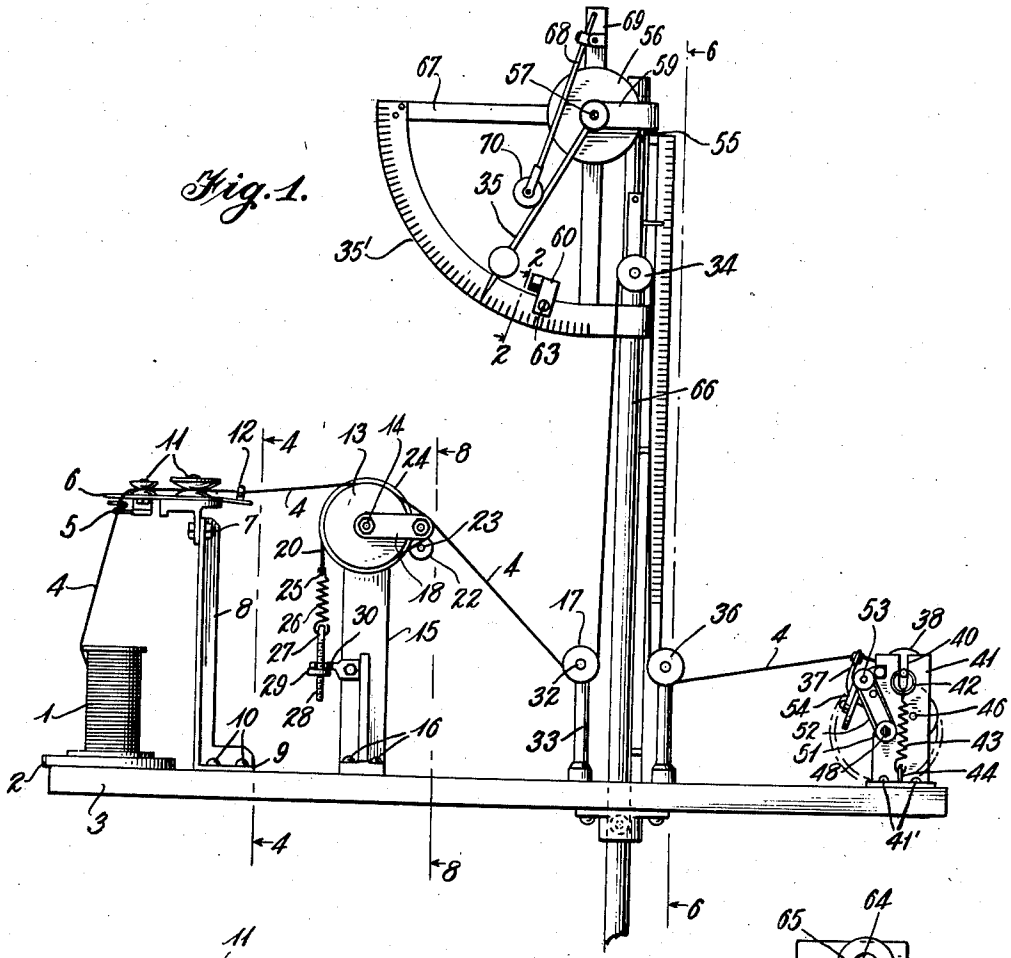
Sept. 7, 1937. A. G. BOUHUYS 2,092,439

APPARATUS FOR TESTING YARNS, THREADS, FILAMENTS, AND THE LIKE

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Fig. 1.



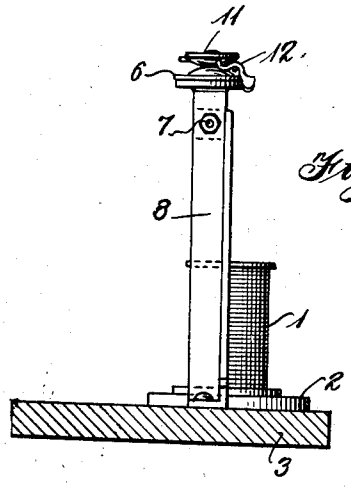


Fig. 4.

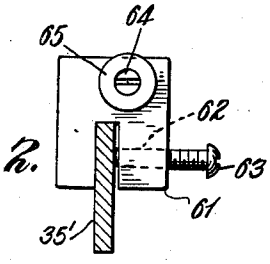


Fig. 2.

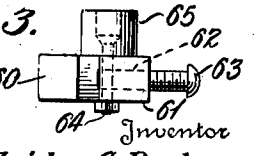


Fig. 3.

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APPARATUS FOR TESTING YARNS, THREADS, FILAMENTS, AND THE LIKE

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Fig. 5.

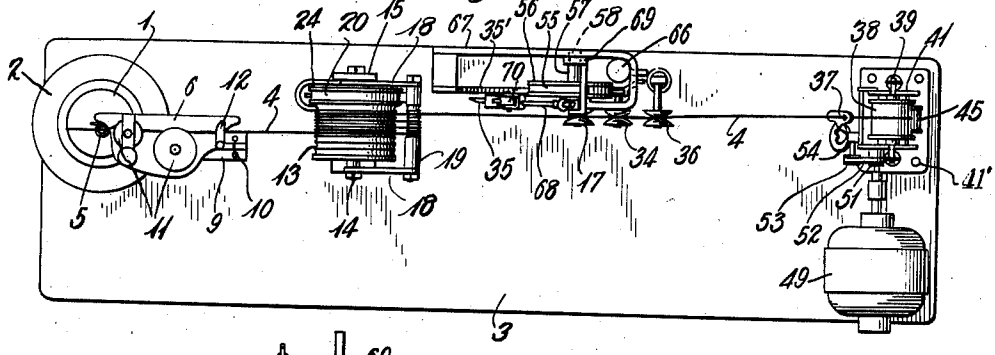


Fig. 6.

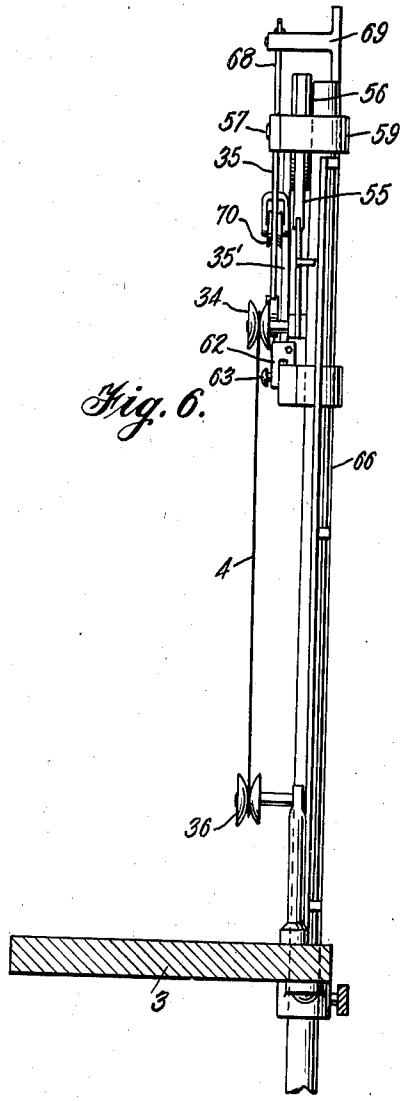


Fig. 7.

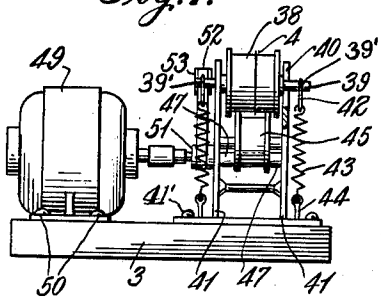


Fig. 8.

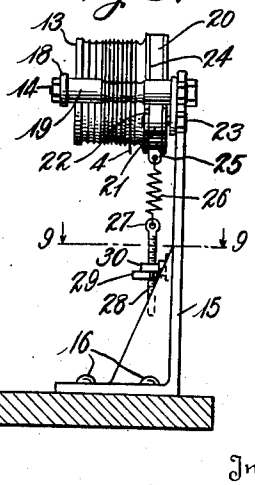
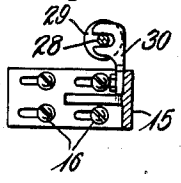


Fig. 9.



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2,092,439

APPARATUS FOR TESTING YARNS, THREADS, FILAMENTS, AND THE LIKE

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Application August 17, 1935, Serial No. 36,735

5 Claims. (Cl. 265—17)

This invention relates to apparatus for testing yarns, artificial silk, or the like, hereinafter referred to as yarns, and more particularly to apparatus for detecting flaws in the yarn having sub-normal tensile strength, which apparatus consists of means for continuously feeding the yarn through adequate guide and tensioning means under predetermined tension to a point of test from which it is passed through adequate traverse guide means to a spool on which it is wound.

The point at which an average section of non-defective yarn will break depends upon the denier of the thread to be tested, i. e., a great deal less force is required to break a fine yarn than is required to break a coarse yarn. Therefore, it has been a simple matter to determine standards of breaking strength for different kinds of yarn by running a series of tests for breaking strength on a conventional single strand testing machine. Accordingly, if a sample of a particular grade of yarn breaks below its normal breaking strength the reason is laid to a defect in the yarn. The yarn can be studied at the point of breakage and the causes thereof determined.

Further, it is well known that artificial silk yarns of a particular denier may be stretched up to a point considered normal for that denier, without damaging the yarn, although beyond said point the yarn will be abnormally stretched and broken. If no defect occurs in the yarn, the yarn under test will break at the point which is considered normal for that particular denier. Therefore, I have provided an apparatus whereby tension may be imposed on the yarn prior to its reaching the testing device, the tension so applied being sufficient to set the indicating device at the position indicating the extent to which the yarn may normally be stretched without breaking or otherwise injuring the filaments. Under such circumstances, when a weak spot occurs in the yarn, the normal tension so applied to it will cause it to break. Upon the breakage of the yarn the ends are tied together and the machine is again set in motion. Thus, it is possible, continuously, quickly and efficiently to test an entire body of yarn for defects as may exist at any point therein.

The invention further contemplates a novel combination and arrangement of elements which form a portable auxiliary machine capable of use in combination with a single strand breaking strength testing machine so that the breaking strength testing machine is converted into a continuous running single strand testing machine without permanently modifying the same. Such a device as is contemplated by this invention causes the breaking strength testing machine to be convertible at will by the simple expedient of moving the table on which the auxiliary machine is mounted to a position adjacent the single strand breaking strength testing machine and then after detaching the upper clamp by which the thread is normally held, replacing the clamp with a grooved fiber roller and bearing assembly. Such conversion of the machine eliminates the necessity of maintaining two individual units, one for testing a single strand for breaking strength and the other for continuously testing a running strand for points of subnormal tensile strength.

A type of single strand breaking strength testing machine with which this auxiliary machine is adapted to be used is marketed by Goodbrand & Co., Ltd. This machine comprises generally an upright steel column having a thread clamping means slidably mounted thereon, the upward or downward movement of which is controlled by a manually operated weight and release lever. An upper clamp is attached to a band wound about the circumference of a roller which controls the movements of an indicator directed to a quadrant shaped scale. In operation, this type of machine has the section of yarn to be tested secured at one end in the lower clamp which is slidably mounted on the upright support, while the other end thereof is secured in the upper clamp which is attached to the band wound about the circumference of the roller controlling the indicating device. The initial distance between the two clamps is ordinarily about 50 centimeters. The operator customarily selects a section of yarn of sufficient additional length to make sure the section is long enough to allow for clamping the ends. The operator then releases the weight controlling the movement of the lower clamp, causing the lower clamp to move downward. As the thread is stretched, the indicator is displaced and moves along the quadrant scale until the yarn breaks. Therefore, it can be seen that the elongation of the yarn as well as the force applied to the yarn is indicated.

Testing by a single strand breaking strength machine is indeed a tedious procedure since to test individual sections of the yarn taken from representative parts throughout the length of the spool of yarn would require considerable time. Accordingly, it is impracticable to test all parts

of yarn body with the single strand breaking strength testing machine. For this reason it has been customary to confine tests on said type of machine to the outermost and innermost layers of the yarn. Although the tested samples of thread be found to be satisfactory, yet a defective and subnormal section of yarn may exist in those sections of yarn which have not been tested.

This invention further contemplates a machine by which yarns having a broad range of tensile strengths may be tested accurately. To accomplish this, a pendulum type indicator is used. Pivoted on an axis immediately above the axis of the indicator is a second pendulum, the mass of which is in the form of a grooved roller that is adapted to roll along the stem of the indicator. Thus these two pendulums cooperate to add to the capacity of the machine and yet give maximum deflections of the indicator for loads applied in testing relatively light yarns.

A further object is the provision of a simple device or combination of devices to convert a single strand breaking strength testing apparatus into an apparatus with which to detect spots of lower breaking strength in the yarn being tested by applying a constant load that may be regulated in proportion to the total average breaking load of the yarn under test.

A still further object of this invention is the provision of a novel combination and arrangement of elements to cooperate with a single strand breaking strength tester to form a continuous and running strand testing machine in which all the elements thereof are mounted on a table, or like structure, whereby the machine is rendered portable.

A still further object of this invention is the provision of a continuous running strand testing machine with a capacity for testing yarns having a broad range of tensile strengths which will in all cases give indications which can be easily and accurately read.

Other objects and advantages will appear from the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a front elevation of the machine with the motor therefor being shown in broken lines to permit the unobstructed illustration of the parts therebehind;

Fig. 2 is a sectional view of the indicator scale taken along the line 2—2 of Fig. 1 showing the stop for the indicator clamped in position on the scale;

Fig. 3 is a detail bottom view of the stop as shown in Fig. 2;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1;

Fig. 5 is a plan view of the entire machine;

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 1;

Fig. 7 is an end view of the machine showing only the prime mover and the winding mechanism;

Fig. 8 is a sectional view along the line 8—8 of Fig. 1 showing the primary tensioning means in detail; and

Fig. 9 is a sectional view of the support for the primary tensioning means along the line 9—9 of Fig. 8, showing in detail its adjustable features.

The numeral 1 designates a spool or cone of yarn to be tested which is placed upon a felt pad 2. Pad 2 is secured to the top surface of one end of the table 3. Yarn 4 from the cone is then brought upwardly through a conventional pigtail guide member 5 which is secured to the edge of a horizontal table or platform 6 that is mounted upon and secured to a vertical support 8 by a suitable bolt 7. The vertical support 8 having its bottom end formed in the shape of a flat foot member 9 is secured to the table 3 by suitable screws or bolts 10. Mounted on the horizontal table 6 are small and large conventional disk type rotatable members 11, around which the yarn 4 is brought from the pigtail guide 5. The rotation of these members by the yarn effects a preliminary tension thereon. The yarn is then passed under a conventional porcelain guide 12 to the main tension element.

The main or principal tension element is formed with a stepped, circumferentially grooved roller 13 preferably made of hard rubber, which is journaled on, and adapted to turn about, a central shaft 14. Shaft 14 is secured at one end to a vertical support 15 which support is in the form of a bracket. The arm of the bracket which provides the support for the roller 13 is of sufficient length to give the roller its necessary relative elevation while the other arm of the bracket is provided with elongated holes or slots and is secured to the table 3 by suitable screws or bolts 16 which pass through the slots. Such construction provides for transverse adjustment of the main tension element so that the part of the grooved roller last contacted by the yarn is in alignment with a roller 17. Secured to the shaft 14 and vertical support 15 by link members 18 is a roller 19 having grooves which correspond to the circumferential grooves in the roller 13. Roller 19 which may be formed of steel, glass or other material is disposed in a manner such that its axis is parallel to and in substantially the same horizontal plane as that of the stepped grooved roller 13.

Yarn from the porcelain guide 12 is passed over both the grooved roller 13 and the grooved roller 19 then back under the grooved roller 13 thus completing one turn. Sufficient turns are taken about these members to substantially prevent slippage on the grooved rollers. In order to retard the turning of the grooved roller 13 and thereby apply tension to the strand of yarn being tested, a flexible steel brake band 20 having one of its ends 21 secured to the anchor member 22, carried by an arm 23 projecting from the vertical support 15, is brought over and in contact with the surface of the stepped portion 24 of the roller 13. End 25 of the brake band is secured to a spring 26 which is in turn connected to the eyelet 27 of the threaded rod 28. This rod 28 cooperates with the nut 29 and the anchor member 30 to form adjustment means for the brake 20.

Beyond the point just referred to the yarn 4 is passed from the main tensioning element under a fiber roller 17 journaled on a shaft 32 which is secured to a suitable vertical support 33. The yarn is then carried upwardly and over the grooved fiber roller 34 which is attached to and actuates a testing machine indicator 35 for the purpose hereinafter more fully described. From the roller 34 the yarn is brought downwardly and passed under the grooved roller 36 which is mounted in a manner similar to the roller 17 and the yarn is then carried through a conventional traverse guide 37 to a spool or cone 38 on which it is wound.

Spool 38 is supported by a shaft 39 which shaft is supported in slots 40 formed in the upper end of two vertical support members 41. The ends of

the shaft 39 are provided with circumferential grooves 39' and they extend through the slots a sufficient distance to receive rings 42 which are secured to one end of the respective coil springs 43. The opposite ends of the coil springs are secured by suitable eye-bolts 44 or other anchor means to the surface of the table. Springs 43 function to hold the driven shaft down in its bearings in such manner that the periphery of the driven spool 38 is maintained in frictional engagement with a soft rubber driving roll 45. The soft rubber driving roll is mounted on a shaft that is journaled in bearings 46 which are formed in the vertical supports 41, the supports being secured to the table by means of suitable screws or bolts 41'. Soft rubber roll 45 which as stated drives the spool 38 is in turn driven by frictional engagement with a shaft 47, the axis of which is parallel to that of the driving roller and the spool. Shaft 47 is journaled in bearings 48 carried by the vertical supports 41 and it is driven through a suitable connection by an electric motor 49. The motor is positioned on the table, and secured adjacent the vertical supports, by suitable screws or bolts 50. Secured to the end of the shaft 47 opposite from that to which the motor is engaged, is a pulley 51 which is adapted to rotate therewith. This pulley, through the medium of a belt, chain, or similar means 52 drives a pulley 53 which actuates a conventional traverse guide mechanism generally indicated at 54.

It will be clear, therefore, that the electric motor, by means of the shaft 47 and the soft rubber roll 45 drives the spool 38 to effect the winding of the yarn, thus drawing the thread through the entire testing machine against the action of the various tension devices described above.

That portion of the table between the two vertical supports for the rollers 17 and 36 is cut out to receive the upright supporting members of a testing machine to an extent which permits alignment of roller 34 with the rollers 17 and 36. The roller 34 and bearing assembly is detachably secured to one end of a flexible band, tape or cable 55, the other end of which is brought over and secured to the periphery of the disk 56 which is keyed to or made integral with a shaft 57 adapted to be supported by and journaled in bearings 58 carried by the yoke member 59. An indicator 35 of the pendulum type is secured to the end of the shaft 57 and is adapted to turn therewith. The indicator cooperates with an arcuate scale 35' to give an indication of the testing force which is applied to the yarn.

To give the machine a greater capacity without detracting from its accuracy in indicating relatively light loads, a second pendulum 68 is pivotally secured to a vertical support 69 immediately above the axis of the indicator 35. Its mass is provided by a grooved roller 70 which is adapted to roll along the stem of the indicator pendulum 35, and produce the effect of adding mass to the indicator pendulum with increased deflections resulting from corresponding increases in load. With this particular arrangement of pendulums, in addition to increasing the capacity of the machine, the calibration curve for the scale will more nearly approach a straight line, and as a result the indications may be more accurately read.

In the preferred embodiment of the invention, a clamp 60 is provided as shown in detail in Figs. 2 and 3. The clamp is adapted to be secured to the arcuate scale member 35' and form a stop for the pendulum indicator. This stop is utilized to prevent the pendulum from swinging into the vertical position when the yarn breaks. A pendulum of such length as is utilized in testing machines of this character is of light construction and is readily bent or deformed with rough usage. Hence the necessity for providing a stop member which can be placed near the point on the scale to which the indicator points when the machine is in operation. As clearly shown by Figs. 2 and 3, the clamp 60 is in the form of a metal yoke and is substantially U-shaped. One arm 61 of the yoke is provided with a tapped hole 62 which communicates with the space between the two members of the yoke and is adapted to receive a set screw 63, by which the yoke is secured to the scale. On one face of the yoke is secured, by a suitable bolt 64, a rubber buffer 65 adapted to contact the pendulum when the pendulum strikes the stop member.

The bottom end of the arcuate scale is secured to the vertical support 66 while the upper and outer end thereof is bolted to one end of a horizontal brace 67 which is secured along with the yoke member 59, to the vertical support 66 at a point near the top thereof.

This invention also contemplates the use of single strand breaking strength testing machines other than the one described in the preferred embodiment of this invention which could be readily converted in a manner taught by this invention.

What I claim is:

1. A continuous running strand testing machine comprising in combination preliminary tension and guide means, a grooved roller, a smaller roller having grooves corresponding to the grooves in said first roller, said grooves being adapted to receive a number of turns of the yarn about both rollers, a brake band positioned on a stepped portion of the first mentioned roller, adjusting means for said brake band whereby the resistance of the roller against turning, to effect a predetermined tension on the thread being tested, may be varied, means for indicating the tension applied to the yarn, and collection means on which the thread is wound continuously at a constant rate while being tested.

2. An attachment for a standard breaking strength testing machine adapted to convert the same into a continuous running strand testing machine comprising in combination a table, preliminary tensioning and guide means mounted on one end of the table, a grooved roller comprising a main tensioning means, an adjustable support for the grooved roller, the foot of the support being provided with elongated openings through which screws or bolts are passed to permit transverse adjustment of the main tensioning means whereby a strand leaves the last groove of the roller at right angles to the axis of the roller and is in alignment with the groove of the next roller contacted, a second grooved roller and bearing assembly adapted to be secured to an actuating band of a tension indicating mechanism, a pair of spaced grooved rollers, independent supports for said rollers, a spool and a prime mover for driving said spool to effect a constant rate of winding of the yarn thereon whereby the yarn is continuously drawn through the machine.

3. A continuous running strand testing machine comprising in combination preliminary tension and guide means, a grooved roll, a roller having grooves corresponding to the grooves in said roll, said grooves being adapted to receive

a sufficient number of turns of yarn about the roller and roll to prevent slippage on the roll, a brake band positioned on a stepped portion of said roll, adjustable means for said brake band whereby the resistance of the roll against turning, to effect a predetermined tension on the thread being tested, may be varied, a support for said roll, brake band, and roller having elongated openings in the foot thereof, means for adjustably securing the foot of the support to a plane surface whereby the yarn will leave the roll and roller substantially without deflection, means for indicating the tension applied to the yarn, and collection means on which the thread is wound continuously at a constant rate while being tested.

4. An apparatus for testing a continuous running strand of yarn comprising in combination preliminary tension and guide means, an adjustable primary roller tension device whereby predetermined tension may be placed on the yarn to be tested, a vertical support for the primary tension, said support being transversely adjustable with respect to the path of travel of the yarn, a pair of grooved rollers mounted on fixed bearings and in line with the path of travel of the yarn, a third grooved roller having its bearing secured to the lower end of a band and disposed between and a substantial distance above the first two grooved rollers but in the same vertical plane, a disk adapted to be rotated about its axis by the upper end of said band, means by which the band is secured to the disk, a pendulum type indicator adapted to be actuated by the disk, an arcuate scale so disposed that it will cooperate with the indicator to give a reading of testing force applied to the yarn, a second pendulum the mass of which is a grooved roller that is adapted to rest on and roll along the stem of the indicator, said second pendulum having its axis above the axis of the indicator and in vertical alignment therewith, a traverse guide through which the yarn is wound on a spool, a prime mover adapted to rotate the spool to draw the yarn through the testing machine thus overcoming the opposing force to the movement of the yarn imposed by the tension means to effect the testing of the yarn while it is continuously being drawn through the apparatus.

5. An apparatus for testing a continuously running strand of yarn comprising in combination preliminary tension and guide means, a stepped circumferentially grooved roll, a roller having grooves corresponding to the grooves in said roll, said grooves being adapted to receive the yarn whereby a sufficient number of turns taken about the roller and roll will prevent slippage on the roll, a brake band positioned on a stepped portion of said roll, adjustable means for said brake band whereby the resistance of the roll against turning, to effect a predetermined tension on the thread being tested, may be varied, a support for said roll, brake band, and roller having elongated openings in the foot thereof, means carried in said openings for adjustably securing the support to a plane surface whereby the yarn will leave the roll and roller at substantially a right angle to the roller, a pair of grooved rollers permanently mounted on fixed supports in line with the path of travel of the yarn, a third grooved roller having its bearing secured to the lower end of a band and disposed between and a substantial distance above the first two grooved rollers but in the same vertical plane, a disk adapted to be rotated about its axis by the upper end of said band, means by which the band is secured to the disk, a pendulum type indicator adapted to be actuated by the disk, an arcuate scale so disposed that it will cooperate with the indicator to give a reading of testing force applied to the yarn, a second pendulum the mass of which is a grooved roller that is adapted to rest on and roll along the stem of the indicator, said second pendulum having its axis above the axis of the indicator and in vertical alignment therewith, a traverse guide through which the yarn is wound on a spool, a prime mover adapted to rotate the spool to draw the yarn through the testing machine thus overcoming the opposing force to the movement of the yarn imposed by the tension means to effect the testing of the yarn while it is continuously being drawn through the apparatus.

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