Dec. 13, 1966 I. V. HITT 3,290,932

DEVICE FOR TESTING MULTIFILAMENT YARNS

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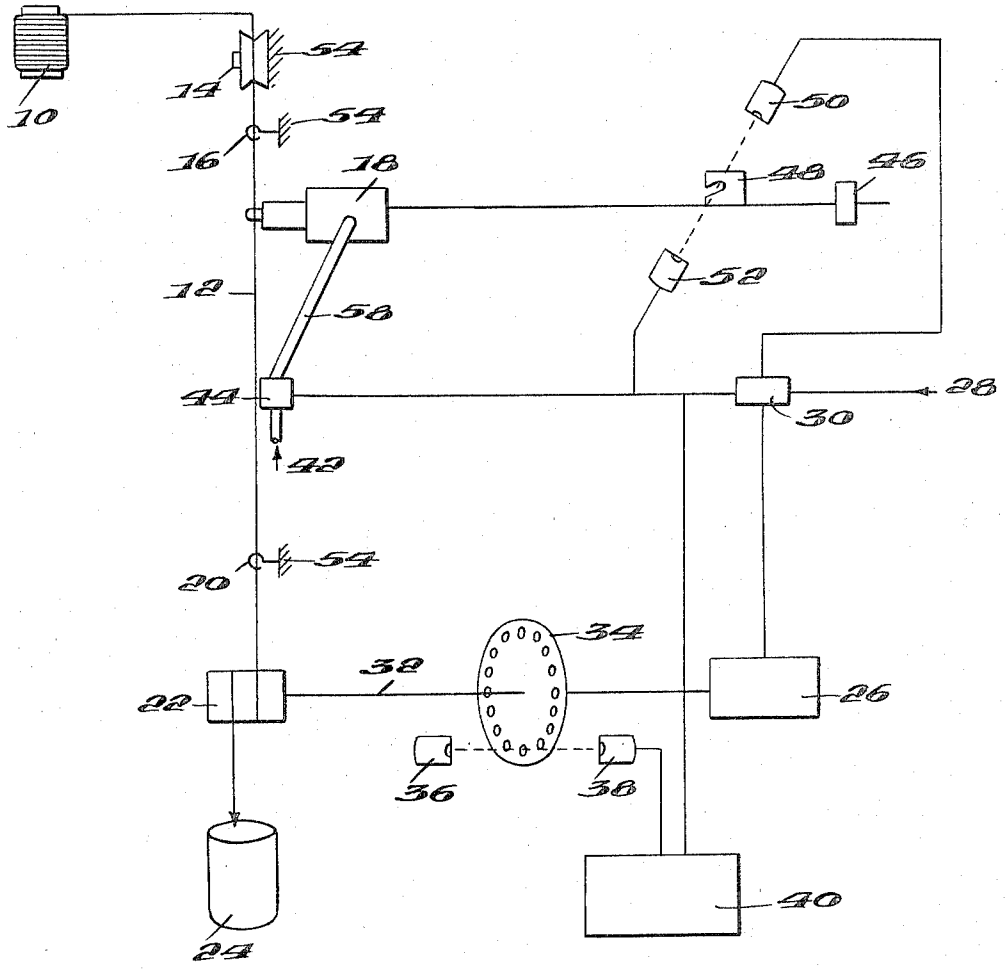


Fig. 1.

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Fig. 2.

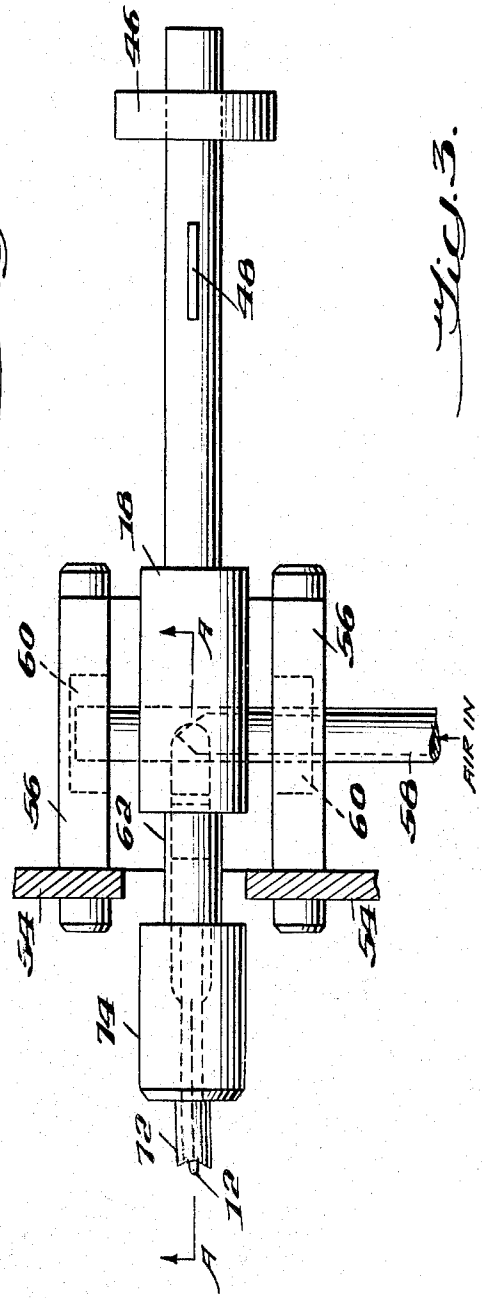
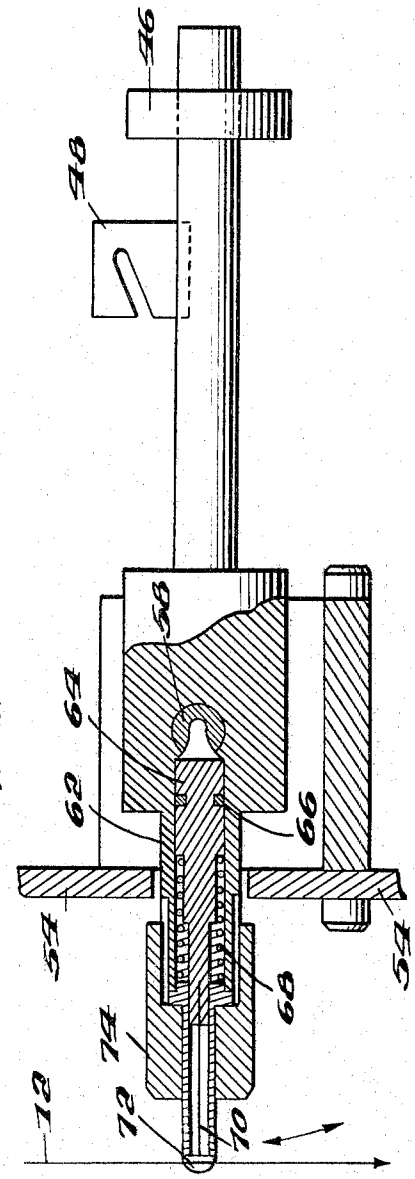


Fig. 3.



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DEVICE FOR TESTING MULTIFILAMENT YARNS

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This invention relates to a system for determining the degree of interlacing in multifilament yarns wherein the individual filaments and groups of filaments are randomly intermingled with adjacent filaments and groups of filaments along the length of the yarn.

For control or test purposes it is desirable to determine the degree of filament entanglement for defining the structure of these yarns such as the type described in Bunting and Nelson's U.S. Patent 2,985,995 and Breen's U.S. Patent 2,783,609. The utility of these yarns have been demonstrated in commercial textile operations, but the nature of the yarn is so different from previously known yarns that it has been necessary to devise unique methods of evaluating the useful characteristics of these yarns.

Bunting and Nelson's U.S. Patent 2,985,995 teaches a manual method for defining the structure of an interlaced yarn known as the "hook-drop test." This test is based on the distance a weighted hook inserted through a yarn bundle can be lowered before the weight of the hook is supported by the resistance of the yarn to further passage of the hook down the yarn. The result is expressed as a coherency factor. Since filament interlacing is random in nature a large number of samples must be obtained to provide representative results. This manual operation is both tedious and time consuming.

It is an object of this invention to provide an improved apparatus that automatically determines the "coherency factor" of interlaced yarns and the like.

Another object of the invention is to provide an improved yarn contact element for determining the degree of filament interlacing.

Other objects will become apparent hereinafter.

The objects of this invention are accomplished by a system that automatically measures multifilament yarn coherency which includes: means passing yarn along a path; probe means operatively engaging the interlaced portions of the yarn and movable therewith and means responsive to the movement of said probe means a predetermined distance for indicating the length of yarn along passing said path before the probe moves said predetermined distance.

A system for carrying out the objects of this invention is shown by way of example in the attached drawings in which:

FIGURE 1 is a diagram showing the main elements of a preferred system embodiment.

FIGURE 2 is a view of the probe means.

FIGURE 3 is a section view of FIGURE 2 taken at A—A.

Referring in more detail to FIGURE 1, a yarn threadline 12 is withdrawn from package 10, through a tension device 14 and past a probe 18 by a feed roll 22. The yarn is then deposited in a waste receptacle 24. Feed roll 22 and apertured disc 34 mounted on the motor shaft 32 are driven by motor 26 with the motor receiving its power from a voltage source 28. Probe 18 is pivotally mounted to support 56. The probe pivots about shaft 58 so that the probe engages the threadline 12 and pivots in the plane defined by the probe and threadline. A flag 48 is attached to the probe 18 so that the flag normally interrupts the path of light between light source 50 and photocell 52 allowing light to pass only when probe 18 pivots a predetermined distance. A balance weight 46 is slidably mounted to the probe 18 to maintain the probe

in a horizontal position. Threadline guides 16 and 20 are mounted to the support frame 54 to maintain threadline alignment relative to tension device 14, probe 18, and feed roll 22. Thread guide 16 also serves to bundle and flatten the multifilament yarn prior to passing over probe 18. Counter 40 registers the number of impulses received from photocell 38. These impulses occur as apertured disc 34 is rotated by motor 26 through the beam of light from light source 36. A solenoid valve 44 admits air from supply 42 to the probe 18. The operation of the solenoid valve is controlled by a photocell 52 so that when the photocell is energized by light source 50 the solenoid is energized thus admitting air to probe 18, and oppositely when light source 50 is interrupted by flag 48 the photocell is de-energized and in turn de-energizes the solenoid 44 thus cutting off air to probe 18.

A timing device 30 comprising circuitry that is well known in the art is connected to power supply 28 and the circuitry of photocell 52, light source 50, and motor 26. This timing device controls both the number of samples to be run and the length of yarn threadline disposed between samples.

The probe means as shown in FIGURES 2 and 3 is the device that determines the degree of filament interlacing of the multifilament yarn. This is determined by the length of yarn that passes the probe with the probe in operative engagement with the yarn coupled with a predetermined deflection of the probe. Structurally the probe 18 consists of a housing 62 with a shaft 58 attached intermediate and perpendicular to the housing. The shaft 58 is bored partially through its longitudinal axis with the bore opening into the internal cavity of the housing. A pair of bearings 60 are attached to shaft 58 on opposite sides of the housing and the shaft and bearing assembly is conventionally mounted in a pair of pivot blocks 56 which serve as bearing housings. The blocks are attached to support 54. A piston 64 is reciprocally mounted in housing 62. The piston has a piston ring 66 mounted in an annular groove at the back end to provide a close sliding fit between the piston and the internal cavity of the housing. A contact element or needle 70 is attached to the front end of piston 64 in line with the longitudinal axis of the piston for engagement with the interlaced portions of the yarn when reciprocated outwardly therefrom by the air supply and for releasing the interlaced portions of said yarn when reciprocated inwardly. A probe tip 72, having a bore through it to accept the needle 70 and the front end of the piston 64, is V-shaped on one end to serve as a guide for threadline 12 and has a shoulder formed on the other end to internally engage probe head 74. Probe head 74 is attached to the housing 62 and is removable to permit disassembly of the probe for repairs and inspection. A spring 68 is displaced between the piston 64 and the probe tip 72 to reciprocate the piston inwardly when the air supply to the probe is cut off thus releasing the contact element from the interlaced portions of said yarn.

In operation a predetermined length of yarn is first stripped from each supply bobbin 10 tested to expose fresh clean undamaged yarn. This is done automatically by timing device 30 which starts motor 26 at stripping speed. Motor 26 in turn drives feed wheel 22 which moves threadline 12 past needle or contact element 70. After stripping a predetermined length of yarn, timing device 30 stops motor 26 and operates solenoid valve 44 which admits air to probe 18 through pivot shaft 58 and into housing 62. The air pressure against piston 64 overcomes the tension of spring 68 and the piston moves forward inserting needle 70 into operative engagement with threadline 12. Timing device 30 then starts motor 26 at operating speed. Signals from photocell 38 are registered on counter 40. These signals are caused by impulses

of light received as the apertured disc 34 rotates through the beam of light from source 36. The number of holes in disc 34 are determined by the diameter of feed wheel 22 in order to provide a direct counter reading of threadline length passing the needle 70. As the threadline 12 passes the inserted probe 18, interlaced portions continually deflect the probe slightly. However, flag 48 only allows passage of light between light source 50 and photocell 52 when there is sufficient resistance by the interlaced portions of threadline 12 to deflect probe 18 a predetermined distance. Upon such a deflection, photocell 52 is energized and in turn causes solenoid 44 to cut off air to the probe 18 thus releasing needle 70 and activates timing device 30 to stop counter 40, stop yarn passage and repeat the cycle described above. That is, contact element 70 is again biased into operative engagement with the threadline 12 by the air supply 42 and timing device 30 activates motor 26 to start yarn passage. The probe 18 is returned to its horizontal position after each deflection by the balance weight 46.

As described above, the apparatus of this invention gives a direct counter reading of the length of threadline 12 that has passed needle 70 before it is moved a predetermined distance by the threadline resistance. Since several readings must normally be averaged to get a good representative sampling of the yarn bundle, the automatic system of this invention provides a far more efficient and reliable method than the manual methods of the prior art.

Whereas the length of threadline passing the needle before deflection may be used as the "coherency factor," it could also be correlated to the "coherency factor" defined in Bunting and Nelson's U.S. Patent 2,985,995 if desired. In testing the apparatus of this invention, it was found with a given weight of the probe that about 500 divided by the length of threadline in centimeters passing the probe gives the same "coherency factor" as the Bunting and Nelson patent. However, the factor used would vary with the weight of the probe. Regardless of how one wishes to express the "coherency factor," it would be a simple matter to adapt the counter to directly give the "coherency factor." Thus it is not necessary to go through any mathematical computations as with manual determinations.

Since many different embodiments may be made without departing from the spirit and scope of this invention, it is understood that the invention is not limited to this

specific illustration except to the effect as defined in the appended claims.

What is claimed is:

1. A system for measuring the degree of filament interlacing in multifilament yarn, comprising means passing the yarn along a path, probe means projecting into the interlaced portions of said yarn and movable therewith, and means responsive to the movement of said probe means a predetermined distance for indicating the length of yarn passing along said path before said probe means moves said predetermined distance.

2. Claim 1 wherein said probe means comprises a contact element for releasable engagement with the interlaced portions of said yarn and means releasing said contact element from engagement with said interlaced portions upon a predetermined movement with said yarn.

3. Claim 2 wherein said contact element is reciprocally mounted in a housing for engagement with the interlaced portions of said yarn when reciprocated outwardly, biasing means within said housing for reciprocating the contact element outwardly therefrom and releasing means within said housing for reciprocating the contact element inwardly upon a predetermined movement of said contact element.

4. Claim 3 wherein the probe means further comprises a probe tip mounted to one end of the housing to serve as a guide for said yarn and has a bore through it to accept said contact element.

5. A system for continuously measuring the degree of filament interlacing in multifilament yarn, comprising means passing the yarn along a path, probe means projecting into the interlaced portions of said yarn and movable therewith, first means responsive to the movement of said probe means a predetermined distance for indicating the length of yarn passing along said path before said probe means moves said predetermined distance, and second means responsive to the movement of said probe means said predetermined distance for releasing said probe means from the interlaced portions of said yarn, stopping yarn passage, biasing the probe means into engagement with the interlaced portions of said yarn and starting the passage of said yarn.

No references cited.

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