United States Patent [19]

Hoffsommer et al.

[11] **3,743,202**

[45] **July 3, 1973**

[54] **SPEED AND TENSION CONTROL FOR YARN WINDER**

[75] Inventors: **Walter A. Hoffsommer**, Ridley, Pa.; **Wieslaw J. Bartnicki**, New Castle, Del.

[73] Assignee: **Enterprise Machine and Development Corporation**, New Castle, Del.

[22] Filed: **June 14, 1972**

[21] Appl. No.: **262,655**

[52] **U.S. Cl.** **242/45**, 28/1.4

[51] **Int. Cl.** **B65h 59/38**

[58] **Field of Search** ..... 242/45, 18 DD, 65, 242/66, 67.1, 75.5, 75.53; 28/1.4, 1.6, 1.7

[56] **References Cited**

UNITED STATES PATENTS

2,026,155	12/1935	Abbott	242/45 UX
2,825,118	3/1958	Soussloff et al.	28/1.4
3,685,755	8/1972	King et al.	242/45

FOREIGN PATENTS OR APPLICATIONS

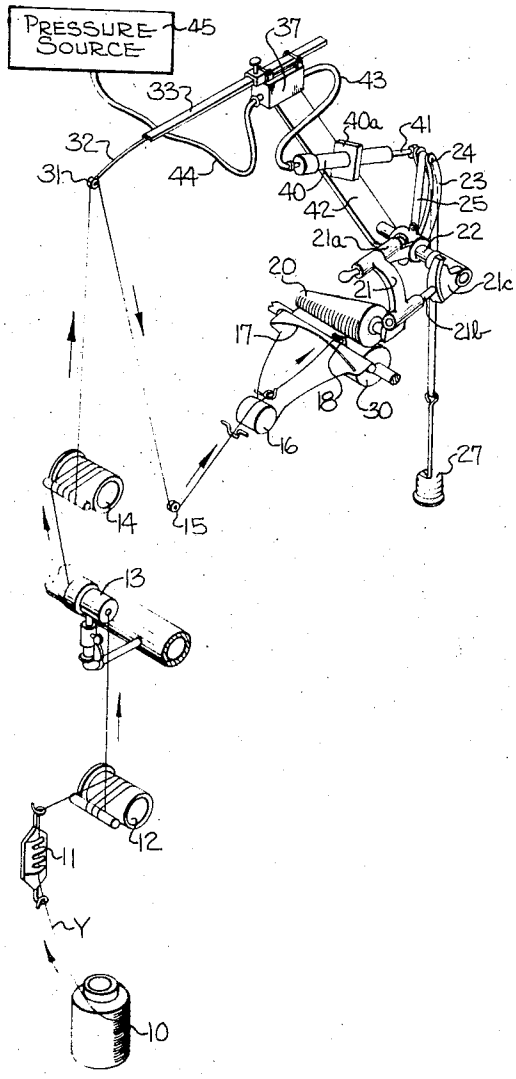
1,923,847	11/1969	Germany	242/45

Primary Examiner—Stanley N. Gilreath
Attorney—Paul B. Bell

[57] **ABSTRACT**

The speed control includes a tension sensing element which is positioned in advance of the wind-up package to detect variations in tension of the yarn as it approaches the package. The rotational speed of the wind-up package is varied in response to a variation in tension in the yarn to thereby maintain uniform linear speed in the yarn being wound onto the wind-up package. A drive roll is positioned beneath and rotates the wind-up package by surface contact with the yarn and the wind-up package is normally maintained against the drive roll with a predetermined driving force and the control means operates to reduce the pressure and the driving point of the wind-up package against the drive roll and thereby decrease the rotational speed of the wind-up package in response to any increase in tension in the yarn approaching the wind-up package.

7 Claims, 3 Drawing Figures



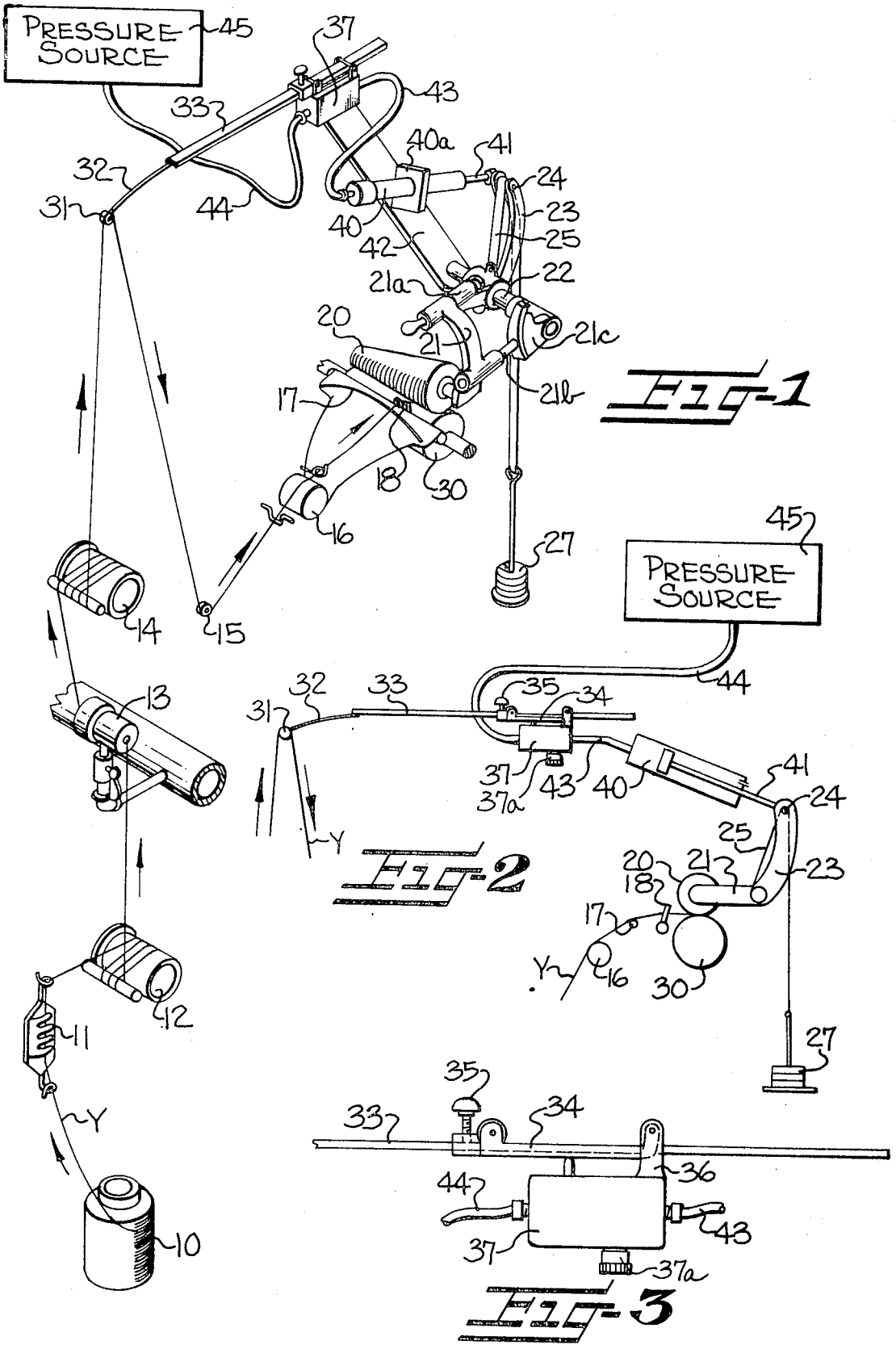


Fig-1

Fig-2

Fig-3

SPEED AND TENSION CONTROL FOR YARN WINDER

This invention relates generally to speed and tension controls for yarn winders and more particularly to a speed and tension control for the wind-up or take-up package of a yarn texturing machine to maintain uniform linear speed and tension in the textured yarn as it is being wound onto the take-up package.

In various types of winders, it is desirable to wind the yarn onto the take-up package under uniform conditions of speed and tension. This is particularly critical in the winding of textured yarn since the bulky characteristics of the textured yarn are affected by a variation in tension in the yarn. If uniform tension is not maintained in the take-up packages, from one yarn texturing position to another and from one machine to another, variations in the bulky characteristics of the yarn will be imparted to the yarn and these variations will be apparent in any fabric woven or knitted of this yarn.

In the formation of take-up packages on surface driven winders, the pressure with which the take-up package engages the drive roll gradually increases as the size of the take-up package increases and this tends to increase the speed at which the package is rotated, thereby gradually increasing the tension in the yarn from the beginning of the package to its full size. Also, in winding cone-shaped take-up packages, the average circumference of opposite ends of the cone do not remain constant as the yarn builds on the cone so that there is a slightly different surface speed at every point along the cone from one end to the other. Thus, there is only one point at which there is a positive frictional contact and this is usually referred to as the driving point and shippage occurs at every other point along the line of contact. As a cone-shaped take-up package is wound, there is usually a gradual change in the angle of the cone with a corresponding change in the location of the driving point so that the winding speed of the yarn is varied throughout the winding of the package and the degree of bulkiness of the yarn correspondingly varies as it is wound onto the package under various rates of speed and at different degrees of tension.

Winders have been provided with counterweight devices in an attempt to overcome the problem of the increasing weight of the take-up package. Winders have also been provided with a take-up package support which includes cam means to change the angle of the take-up package on the drive roll as the package increases in size. However, these features still do not completely solve the problem of tension variation in the yarn as the package increases in size.

With the foregoing in mind, it is an object of the present invention to provide a speed and tension control for yarn winders which includes a sensor positioned in advance of the take-up package for detecting variations in tension of the yarn and for activating the control means to vary the take-up speed of the package and thereby maintain uniform linear speed and tension in the yarn as it is being wound onto the take-up package.

In accordance with the present invention, the sensor of the present speed control is in the form of a lever having a flexible outer end portion and a pulley engaged by a loop of the yarn as it travels toward the take-up package. The other end of the control lever operates an air valve to permit air under pressure to be passed to an air cylinder for lifting some of the weight of the take-up package from the drive roll and to thereby slow

the rate at which the yarn is wound onto the take-up package, thereby lengthening the yarn loop and reducing the tension in the yarn. The drive roll is rotated at a rate which is normally higher than the rate at which the yarn is textured so that the rotational rate of the take-up package may be slowed by the required amount by means of the present control so that the wind-up speed of the yarn is uniformly maintained.

Other objects and advantages of the invention will appear as the description proceeds when taken in connection with the accompanying drawings, in which

FIG. 1 is a somewhat schematic isometric view of one station of an air jet texturing apparatus and illustrating the present speed control operatively associated therewith;

FIG. 2 is a somewhat schematic vertical sectional view through the upper portion of the apparatus illustrated in FIG. 1 and showing the manner in which the sensor is operated by the yarn loop to reduce the weight of the take-up package on the drive roll, when necessary; and

FIG. 3 is an enlarged fragmentary side elevational view of the portion of the sensor lever which operates the air valve.

The speed and tension control of the present invention is illustrated in FIG. 1 as being associated with the winder of an air jet texturing apparatus. However, it is to be understood that the present speed and tension control may be used with other types of yarn winding apparatus and other types of yarn texturing machines. As shown in FIG. 1, the yarn Y is withdrawn from a suitable yarn supply source in the form of a yarn package **10**. The yarn is drawn through a suitable tension device, such as a tension fork **11**, and is then wound around first yarn feed roll means, in the form of a positive feed roll **12**.

The yarn Y then enters a fluid bulking jet **13** and passes around second yarn feed roll means, in the form of a positive feed roll **14**. The yarn is looped and engaged by the sensor means of the present invention, in a manner to be presently described. The yarn then passes beneath a fixed guide pulley **15**, over an oil conditioning roller **16**, over a bale **17**, through a yarn traversing guide **18** and is then wound onto a wind-up or take-up package **20**. The take-up package **20** is supported at one end for rotation in the lower end of an arm **21** of a pivoted support bracket **21a** which is pivotally supported adjacent its rear end on a pivot shaft **22**. A control pin **21*b*** extends rearwardly from the lower end of the arm **21** and rides on a cam **21*c***, fixed on the shaft **22**. The cam **21*c*** changes the angular position of the take-up package **20** as it increases in size.

Counterweight means is provided to counter the increase in weight of the take-up package as it increases in size. The counterweight means includes an upstanding lever **23** fixed at its lower end to the support bracket **21a** and having a counterweight shaft **24** at its upper end. One end of a flexible band **25** is connected to the support bracket **21a** and extends upwardly and over the shaft **24**. The band **25** then extends downwardly with its lower end suitably supporting counterweight **27**. The take-up package **20** normally rests by gravity, subject to the action of the counterweights **27**, on a cone drive roll **30** which is normally driven at the same speed as the speed at which the yarn is textured, i.e., the speed at which the yarn is withdrawn from the jet **13** by the positive feed roll **14**.

In accordance with the present invention, the drive roll **30** is driven at a slightly faster speed than the yarn is withdrawn from the jet **13** by the feed roll **14** and sensor means is positioned between the second feed roll **14** and the take-up package **20** and is engaged by a loop of the continuously moving yarn. The sensor means is movable in response to any increase in tension and linear speed of the yarn traveling between the second feed roll **14** and the take-up package **20** and operates to reduce the speed of the take-up package and to maintain the wound yarn under uniform tension. The sensor means includes an idler pulley **31** which is rotatably supported on the free end of an outer leaf spring end portion **32** of a sensor control lever **33**. The sensor lever **33** is supported for longitudinal adjustment adjacent its opposite end in a bracket **34** (FIG. 3) and held in adjusted position by a set screw **35**. The bracket **34** is pivotally supported on upstanding arms **36** of switch means in the form of a miniature air valve **37** which forms a part of the operator means for reducing the weight of the take-up package **20** against the drive roll **30** to thereby change the driving point and to decrease the driving force applied to the take-up package **20** by the drive roll **30** and to thereby reduce the rotational speed of the take-up package **20** and to maintain uniform linear speed and tension in the yarn being wound on the take-up package.

In the present instance, the operator means is illustrated as including an air cylinder **40** which is supported in a plate **40***a* which is pivotally supported intermediate the ends of a bracket **42**. The lower end of the bracket **42** is fixed on the shaft **22** and the upper end supports the miniature air valve **37**. The air cylinder **40** is provided with a piston **41** which extends outwardly therefrom and its free end is suitably connected to the counterweight shaft **24**. An air pressure supply line **43** is connected at one end to the air valve **37** and at its other end to the air cylinder **40**. An air pressure supply line **44** is connected at one end to a suitable source of air under pressure, as indicated at **45**, and its other end is suitably connected to the air valve **37**. The air valve **37** is normally closed and when the yarn loop is shortened, because the yarn is being wound onto the take-up package **20** at a speed which is in excess of the speed of the second positive feed drive roll **14**, the free outer end of the lever **33** is lowered to thereby open the air valve **37**. Air then enters the air cylinder **40** and moves the piston rod **41** outwardly to move the lever **23** in a clockwise direction and thereby reduce the pressure of the take-up package **20** against the drive roll **30**. This decreases the driving force applied to the take-up package and reduces the speed at which the yarn is wound onto the take-up package so that the yarn loop will again lengthen and the sensor lever **33** will raise upwardly, closing the air valve **37**. A bleed port adjustment screw **37***a* (FIG. 3) may be provided in the valve **37** to regulate the speed of return of the piston **41**.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

That which is claimed is:

1. In an apparatus for texturing yarn and for winding the textured yarn onto a take-up package at a substantially constant predetermined linear speed and under substantially constant tension conditions, said apparatus including a yarn supply source, a fluid bulking jet spaced from said yarn supply source, first yarn feed roll means positioned between said yarn supply and said jet for feeding yarn into said jet at a given rate, second yarn feed roll means for withdrawing the yarn from said jet at a predetermined lesser rate than said given rate, yarn traversing means for feeding the yarn to and fro across said take-up package, a drive roll positioned beneath and rotating said take-up package by surface contact with the yarn wound thereon, and means rotatably supporting said take-up package against said drive roll with a given pressure whereby the yarn wound on said take-up package is normally maintained against said drive roll with a predetermined driving force, the combination therewith of

a. sensor means positioned between said second yarn feed roll means and said take-up package and being engaged by the continuously moving yarn, said sensor means being movable in response to any increase in tension and linear speed of the yarn between said second yarn feed roll means and said take-up package, and

b. operator means operable in response to movement of said sensor means for reducing said given pressure of said take-up package against said drive roll to thereby decrease the driving force applied to said take-up package by said drive roll and to reduce the rotational speed of said take-up package and to maintain uniform linear speed in the yarn being wound onto said take-up package.

2. In an apparatus according to claim **1** wherein said take-up package support means includes counterweight means for maintaining said predetermined driving force normally applied against said drive roll by the weight of said take-up package, and wherein said operator means (b) is engageable with said counterweight means for reducing said predetermined driving force normally applied against said drive roll by said take-up package.

3. In an apparatus according to claim **1** wherein said sensor means (a) includes a control lever pivotally supported adjacent one end, a yarn guide pulley at the other end of said control lever and over which the yarn passes; and wherein said operator means (b) includes switch means operable by said control lever.

4. In an apparatus according to claim **3** wherein said operator means (b) includes a pneumatic cylinder operatively connected to said counterweight means and being operable by said switch means to decrease said predetermined driving force normally against said drive roll by said take-up package.

5. In an apparatus according to claim **4** wherein said switch means comprises an air valve for selectively permitting air under pressure to enter said pneumatic cylinder in response to movement of said control lever.

6. In a machine for winding yarn at a substantially constant predetermined linear speed and under substantially constant tension conditions, said winding machine including a yarn supply source, a freely rotatable take-up package onto which the yarn is wound, yarn traversing means for feeding the yarn to and fro across said take-up package, a drive roll positioned beneath and rotating said take-up package by surface contact with the yarn wound thereon, and means supporting said take-up package against said drive roll with a given pressure whereby the yarn wound on said take-up package is normally maintained against said drive roll

with a predetermined driving force, the combination therewith of

a. sensor means positioned in advance of said take-up package and engaged by the continuously moving yarn, said sensor means being movable in response to any increase in tension and linear speed of the yarn moving toward said take-up package, and

b. operator means operable in response to movement of said sensor means for reducing pressure of said take-up package against said drive roll to thereby reduce the driving force applied to said take-up package by said drive roll and to thereby reduce the rotational speed of said take-up package and to maintain uniform tension and linear speed in the yarn being wound onto said take-up package.

7. In an apparatus according to claim 6 wherein said take-up package is conical and is normally maintained in contact with said drive roll by the weight of said take-up package and by counterweight means, and wherein said operator means is operatively connected to said counterweight means.

* * * * *