United States Patent

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[54] **YARN PACKAGE PRESSURE CONTROLLER FOR YARN WINDING APPARATUS**
7 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** ..... **242/18 R,** 242/43
[51] **Int. Cl.** **B65h 54/00**
[50] **Field of Search** ..... 242/18, 18 G, 18 B, 43

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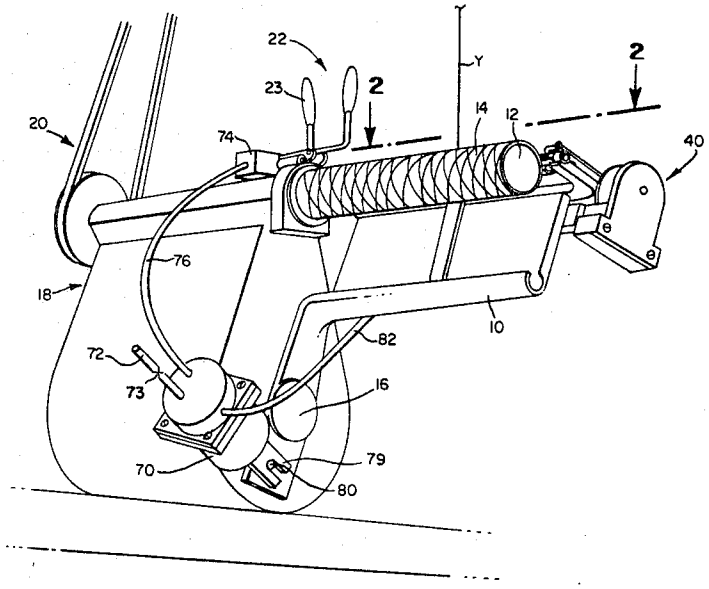
ABSTRACT: A closed-loop servosystem for a yarn winder to maintain a controlled preselected transverse force on the surface of the yarn package. The preselected force is maintained by a spring-loaded damped roller or button guide. The small perturbations in the position of this same roller or button guide are simultaneously used to control the pneumatic positioning of the roller with respect to the winding spindle during the package build.



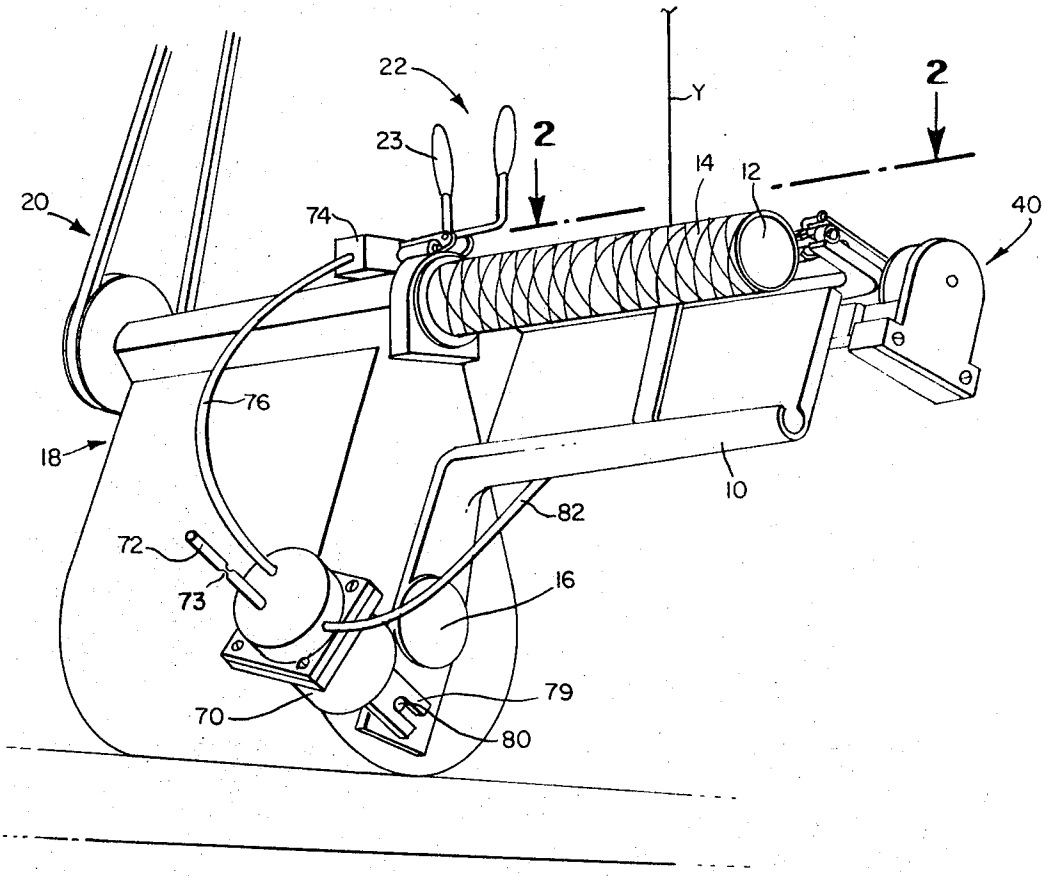


Fig. 1

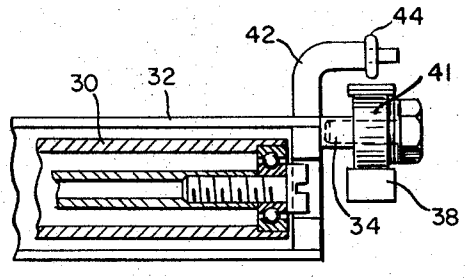


Fig. 4

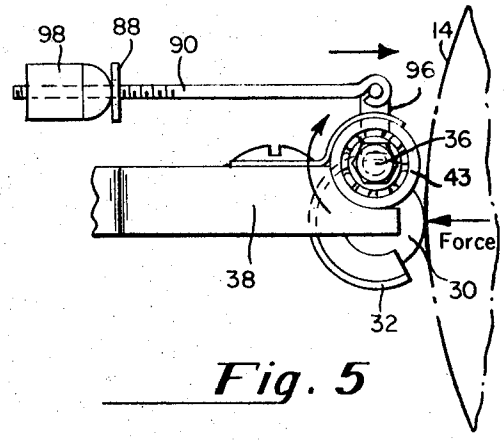


Fig. 5

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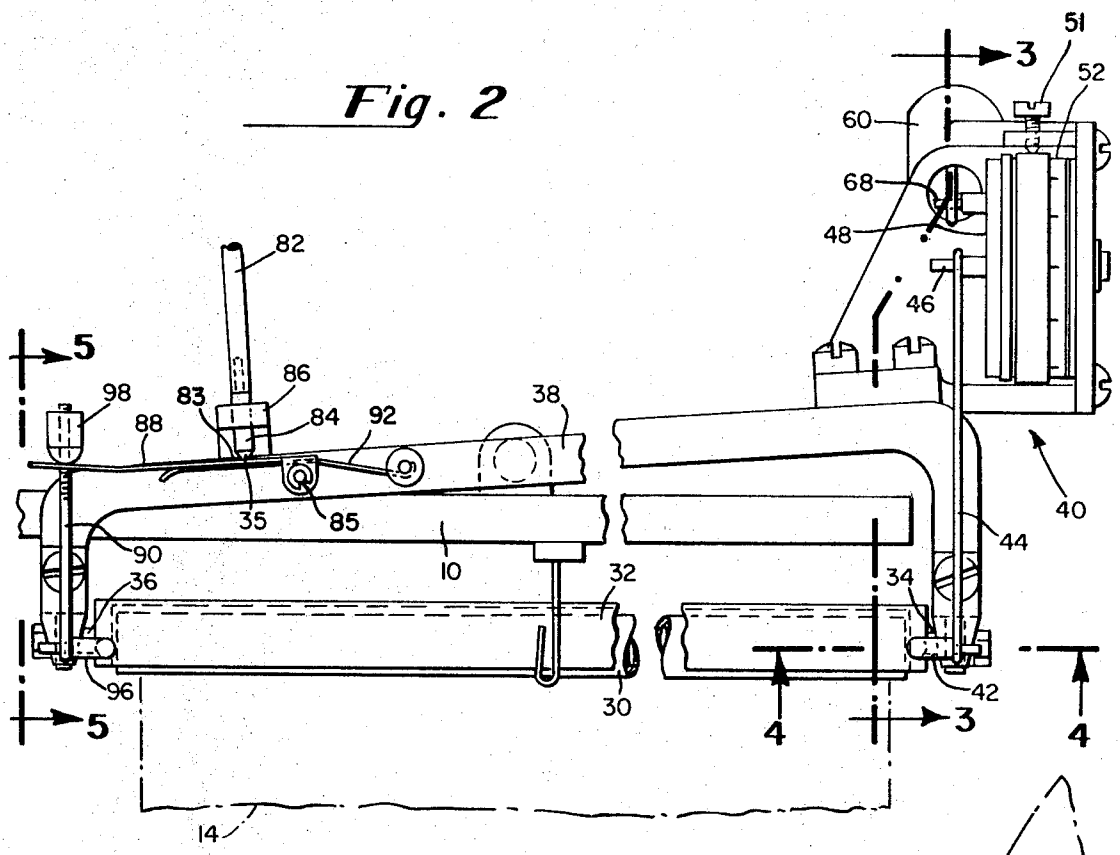
Fig. 2



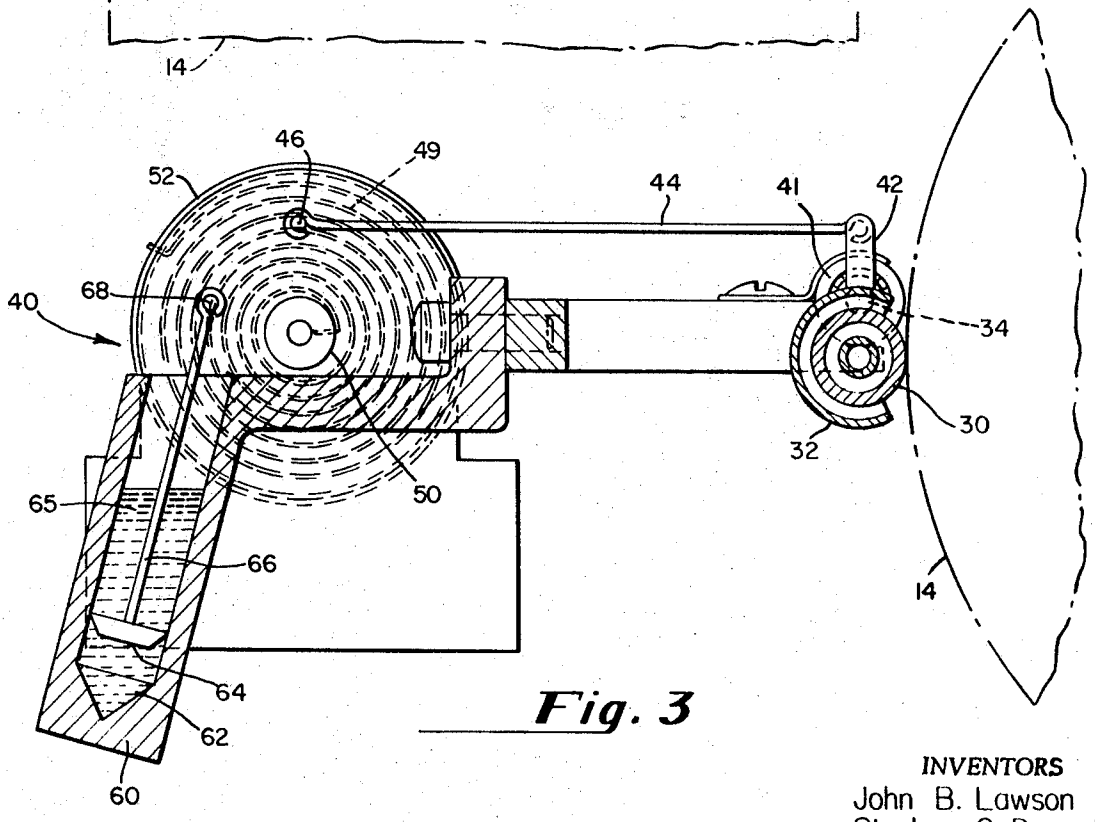


Fig. 3

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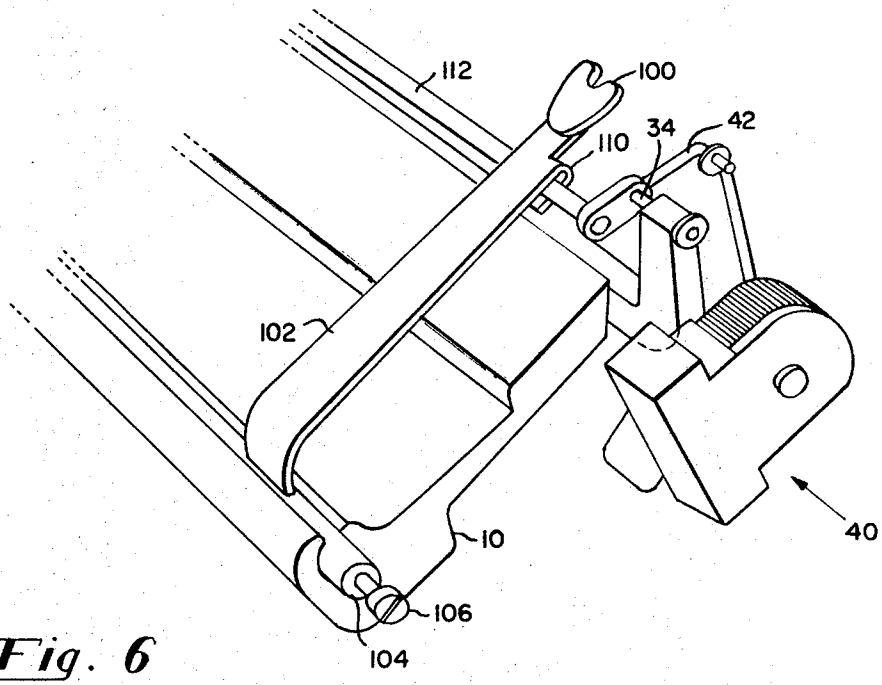

Fig. 6

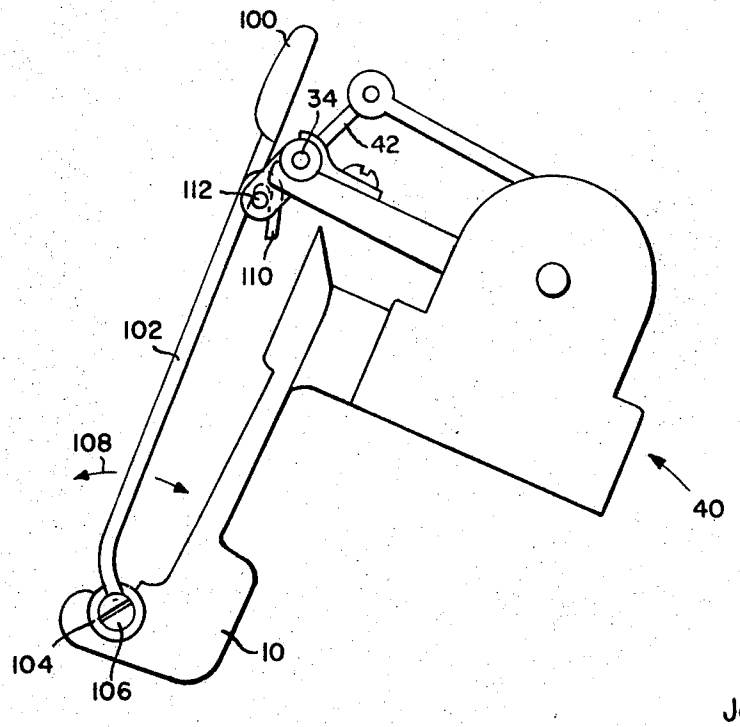

Fig. 7

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YARN PACKAGE PRESSURE CONTROLLER FOR YARN WINDING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to yarn-winding apparatus, and more particularly, to the apparatus which imparts a contact on the yarn package as it is wound.

In the prior art various devices have been used for supplying yarns to winding machines under controlled conditions. Yarn packages having yarn wound thereon under controlled conditions are desired in the textile industry as it is often important to have uniform density yarn packages in many dyeing, weaving and knitting processes.

In conventional winding machines operating with driven spindles, the density within a package being wound is a function of such variables as the tension in the yarn to the winding package and any dragging on the package due to a contacting system or pressure system. A significant amount of work has been published on the control of yarn tension to the winding package; however, to date disclosures of contact pressure controls lack adequate dynamic response. The inadequate response leads to density variations within the packages.

Surface contact imposes a drag on the package to cause movement of the yarn within the package as new yarn is continuously wound thereon. The contact can also serve to flatten imperfections in the package if it has adequate dynamic response thus inhibiting accumulation of yarn in those areas where a small lump locally increases the diameter of the yarn package.

SUMMARY OF THE INVENTION

The present invention provides a means for effecting control of the package density as the package builds in the winder. The pressure control comprises a yieldable contacting system disposed against the surface of the package and means connected to the contacting system to control the pressure of the contact on the package surface.

An object of this invention is to provide a device to control both the average density of a yarn package and the local density as it is being wound.

A further object is to provide a means for applying a controlled pressure to the surface of the yarn package as it is being wound.

A still further object is to provide a means for flattening imperfections in a yarn package as it is being wound and inhibiting the buildup of yarn in localized areas which would otherwise cause an out-of-round package.

These and other objects of this invention will become apparent from the description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of a yarn-winding device equipped with a preferred embodiment of this invention;

FIG. 2 is a view taken as indicated by the lines and arrows 2—2 in FIG. 1 with certain parts foreshortened or shown in phantom for the sake of clarity;

FIG. 3 is a view taken as indicated by the lines and arrows 3—3 in FIG. 2;

FIG. 4 is a view taken as indicated by the lines and arrows 4—4 in FIG. 2;

FIG. 5 is a view taken as indicated by the lines and arrows 5—5 in FIG. 2

FIG. 6 is a partial perspective view of an embodiment showing a button guide; and

FIG. 7 is an end view of the traverse frame with the button guide.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claims.

Referring to FIG. 1, a yarn Y is drawn from a source of supply (not shown) and passes through a reciprocating traverse guide eye (not shown) mounted on a traverse frame 10 and thence is wound onto the spindle 12 about which the yarn package 14 is built. The traverse frame 10 is swingable, that is pivotable, about its axis 16, and forms a part of a conventional winding apparatus designated generally 18 (well known in the art) wherein the spindle is driven at a selected constant speed by the usual winding machine drive represented generally by the V-belt and pulley designated 20. The controls for operating this winder and drive are shown by the handles designated 22.

In prior art devices, the traverse frame 10 was extended through the pivot point or axis 16 and the lower portion thereof included a counterweight to urge the upper portion thereof towards the package. In accordance with the present invention, the counterweight is unnecessary. Rather a piston and cylinder arrangement, preferably operated pneumatically, is attached to the winder and the traverse frame to urge the frame in a counterclockwise direction about the axis 16 when viewed as in FIG. 1. The pneumatic system for controlling the movements of the piston and consequently the movements of the traverse frame will be more fully explained hereinafter following a more detailed description of the yieldably contacting means.

As shown in FIG. 2, roller 30 is mounted in a frame or housing 32 on bearings disposed at both ends so that it is freely rotatable about a fixed axis within the housing. The housing itself is supported on mounting pins 34 and 36 which are offcenter from the axis of the roller 30 and is urged counterclockwise when viewed as in FIG. 3 by the spring-biased linkage 44 and 42. The pins 34 and 36 pass through fixed bearings 41 and 43 mounted on a mounting brace 38; the brace being rigidly attached to the traverse frame 10. Thus the roller and housing can move as a unit about the axis of the pins 34 and 36 when force of the yarn package is applied to the roller 30, as shown in FIG. 5. The roller 30 will be rotated about its axis as the package winds and at the same time the roller and housing 32 is free to move about the axis of the pins 34 and 36.

The movement of the housing 32 about the axis of the pins is resisted by a spring-biased linkage system designated generally 40. A doglegged pin 42 extends upwardly from the housing 32. A rod 44 connects pin 42 with another pin 46. The pin 46 is rigidly attached to the plate 48. The plate 48 engages a clock spring 49 via a post 50. The other end of the spring is fixed to a drum 52. The clock spring is adjustable by rotating the drum 52, to various positions to select a desirably force level. The spring drum 52 can be locked by means of a setscrew 51 against rotation when a suitable setting has been attained. The plate 48 is connected to the spring so as to be rotated with it as it attempts to unwind. As the tension in the spring is increased there will be an increased force causing the plate to rotate about the axis of the post 50. This force will be transmitted through the pin 46 to the rod 44 and thence through the dogleg 42 to the housing 32. The clock spring and casing are so arranged that they tend to move the housing 32 and the roller about the axis of the pin 34 in a counterclockwise direction when viewed as in FIG. 3, against the action of the package 14. The clock spring adjustment housing 52 can be calibrated for different roll pressures exerted against the yarn package.

In accordance with the most preferred embodiment of this invention a fluid dashpot 60 is provided for use in conjunction with the clock spring to dampen the effects of the otherwise sudden movements of the casing 32 in response to lumps appearing on the outer surface of the yarn package as it is wound. The dashpot comprises a wall of fluid and a piston 64 connected to a piston rod 66 which in turn is pivotally connected to a pin 68 extending from the plate 48. The piston is

fitted within the well 62 so that fluid 65 can flow slowly about the peripheral surface of the piston as it is moved upwardly or downwardly within the well. If a lump appears on the package surface, the roller 30 would normally tend to bounce. This tendency would be counteracted by the dampening effect of the dashpot mechanism. Thus the spring-biased roller not only tends to flatten the lump in the package but also tends to prevent the lump from forming as a result of excessive yarn buildup in a localized area eliminating out-of-roundness which would otherwise occur.

As the yarn package builds from an empty cone to a full package, it is necessary that the traverse frame swing outwardly to accommodate it. As previously stated the traverse frame is located by the air cylinder and piston mechanism.

Referring to FIG. 1, the air cylinder 70 is constantly supplied with air under pressure through a small orifice 73 in line 72 from a suitable source (not shown) so that the air pressure would normally drive the piston (not shown) and a piston yoke 79 fastened to the piston toward pin 80.

To control the position of the traverse frame 10 to maintain the preselected pressure (as set by spring 49) against the yarn package, a line 82 from the air cylinder 70 terminating in a nozzle 84 which is larger than orifice 73 bleeds the cylinder 70 in response to movement of the bar 88 which is pivotally mounted at 85 on brace 38 and is loaded by spring 92 against the nozzle 84 mounted to the brace 38 by the nozzle holder 86. The opening of the annular orifice 35 created by the nozzle 84 and the bar 88 is adjusted by the movement of the roller housing 32 about pins 34 and 35, through the doglegged pin 96, link 90, and the bar 88 which is retained by the adjusting nut 98 on the link 90. The controlling action of the annular orifice 35 maintains a pressure inside the cylinder 70 such that the force of the yoke 79 on pin 80 maintains the contact pressure of the roller on the yarn package 14, as preselected by the setting of the spring drum 52 regardless of any other forces on the frame 10 (e.g., gravity).

When the winding machine is turned off by means of the handle 23, the handle linkage also operates a valve 74 to open a line 76 connected to the cylinder 70, so that the air exists from the cylinder through an opening three or more times larger than the input orifice 73. The entire traverse frame 10 will drop away from the package by gravity. When the machine is restarted by the handle 23, the valve 74 is closed and pressure begins to build up in the cylinder. This pressure causes the piston yoke 79 to move the pin 80 in the extended portion of the traverse frame 10 to the right. This causes the traverse frame to rotate counterclockwise when viewed as in FIG. 1, thereby urging the roller 30 into engagement with the yarn package on the winder and the sensing function of the roller housing reestablishes the preselected pressure condition without overshoot. The yarn being fed through the guide eye which traverses the yarn package holder will make a few foreshortened wraps around the spindle before the roller 30 actually comes up to the yarn package being formed. This eliminates the need of an operator from positioning the frame 10. Control of the density of the yarn package being would is provided by the drag created by the rolling contact of the yarn package and the roller 30 on the outer layer of the yarn package. This drag applied to the outer layer tends to tighten the inner layers of the yarn by tightening the spiral build.

As described the system is a closed-loop system. Since the movement of the nozzle-control plate is governed by the roller-housing reaction to the clock spring 49 the average pressure exerted by the roller 30 against the package is affected only by the setting of the clock spring.

Another embodiment of this invention is depicted in FIGS. 6 and 7 where the element contacting the surface of the package is a button guide 100 rather than the roller 30. The button guide 100 is mounted is an arm 102 which is pivotally held in the reciprocating traverse rod 104 by screw 106 all contained in the traverse frame 10. The arm 102 has a small hook 110 over rod 112. During winding the arm 102 will oscillate about its pivot in rod 104 as shown by the arrows 108 causing a movement of the rod 112 about the pivots 34 and 36 (not shown). Movement of the rod 112 simulates the movement of the axis of the roller 30, so that all of the same pressure-control functions described above will apply to this embodiment.

It is to be noted that all the embodiments disclosed herein refer to a stationary spindle winder with a movable traverse frame. It is recognized by the inventors that the important feature of this invention is to control the relative positions of the package and the contacting element, be it a roller, a button guide, or other. This invention could be readily adapted to other types of winders.

It will be understood that various changes in the details, materials, and arrangements of parts which have been herein described and illustrated in order to explain the nature of this invention made by those skilled in the art will be within the principles and scope of the invention as expressed in the following claims.

It will further be understood that the "Abstract of the Disclosure " set forth above is intended to provide a nonlegal technical statement of the contents of the disclosure in compliance with the Rules of Practice of the U.S. Patent Office, and is not intended to limit the scope of the invention described and claimed herein.

What is claimed is:

1. In a yarn package winder having a traverse frame and spindle means for winding a yarn package, and means providing for relative movement between said spindle means and said traverse frame as a yarn package builds in said winder, the improvement comprising:

a. movable contacting means mounted in said traverse frame to yield in response to yarn package buildup when said traverse frame and said spindle means are positioned so that said movable contacting means contacts said package;

b. adjustable means connected to said contacting means for adjusting the force exerted by said contacting means against the package being wound; and

c. positioning means interconnecting said spindle means and said traverse frame and coacting with said adjustable means to control the relative position of said spindle means and said traverse frame in response to the yielding movement of said contacting means; said positioning means comprising a pneumatic system having a piston and cylinder the relative position of which determines the relative position of said spindle means and said traverse frame, said cylinder being mounted in said winder and being normally continuously pressurized during operation of said winder, and a bleed line connecting said cylinder to a valve, and means connected to said valve and said contacting means to operate said valve in response to the yielding movement of said contacting means.

2. The invention of claim 1 wherein said contacting means is a button guide supported at at least one end, said support being pivotally mounted to said winder.

3. The invention of claim 2 wherein said adjustable means comprises an adjustable spring and linkage means connecting said adjustable spring to said button guide.

4. The invention of claim 1 wherein said contacting means comprises a roller supported at at least one end for a freely running condition and positioned substantially on a parallel axis with said package; said roller being mounted within a housing; pivotal mountings connected to said housing for pivotally mounting said housing in said winder, said roller being positioned eccentrically to said pivotal mountings of said housing whereby said roller and said housing will yield about the pivotal mountings of said housing in response to yarn package buildup.

5. The invention of claim 4 wherein said adjustable means comprises an adjustable spring and linkage means connecting said adjustable spring to said housing.

6. The invention of claim 1 wherein a damping means is connected to said adjustable means to dampen the yielding

movement of said contacting means; said damping means comprising a dashpot means and linkage means connecting said dashpot means to said contacting means.

7. The invention of claim 6 wherein said adjustable means comprises an adjustable spring and linkage means connecting said spring to said contacting means to counteract the force exerted by said package against said contacting means.