Nov. 5, 1968 F. POSPISIL ETAL 3,409,237

REVERSIBLE WINDING ARRANGEMENT

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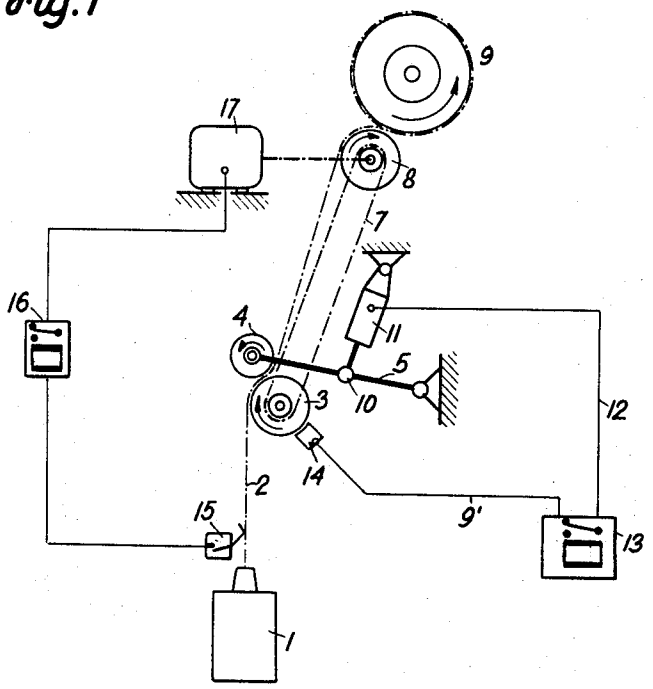
Fig. 1



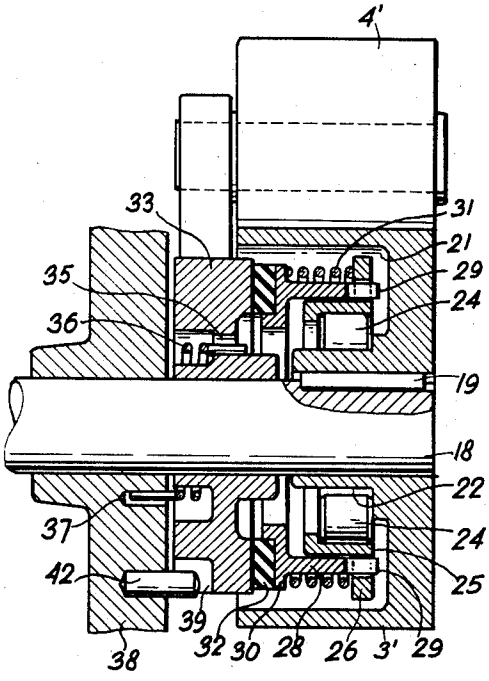


Fig. 3

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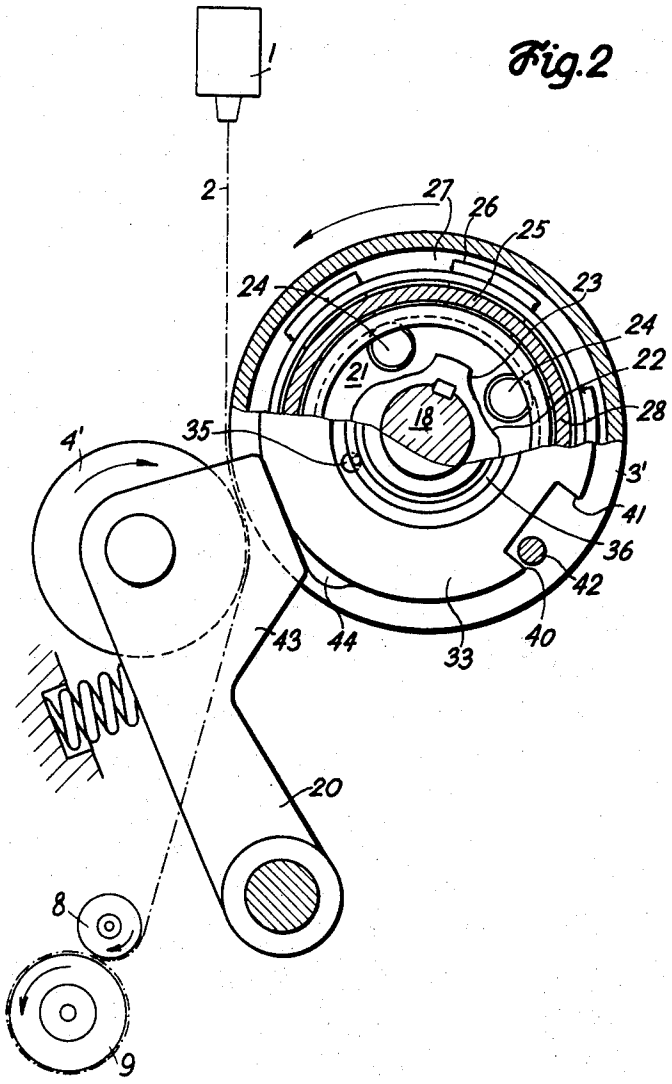
Fig.2



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REVERSIBLE WINDING ARRANGEMENT

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10 Claims. (Cl. 242—18)

ABSTRACT OF THE DISCLOSURE

Yarn produced in a spinning chamber and transported by a pair of transporting rollers to a windup roller, is moved back into the spinning chamber for attachment to the spun yarn only by the reversed windup roller while the transporting rollers are moved apart and do not transport the yarn in the reversed direction.

Background of the invention

The present invention relates to a winding arrangement in which an elongated flexible element, such as a yarn spun and twisted in a rotating spinning chamber, is transported by a pair of rollers, one of which is a transporting roller and the other a pressure roller, toward a windup roller which forms a bobbin package.

It is known to reverse the transporting rollers and the windup roller when the yarn breaks so that the broken yarn is reintroduced into the spinning chamber and there attached to the newly spun yarn end, whereupon the direction of rotation of the transporting roller and winding roller is again reversed, and the repaired yarn is transported out of the spinning chamber and wound up.

The reversal of the direction of rotation of both the transporting rollers and the windup roller causes great tension in the yarn portion between the same since the transporting rollers have a far smaller mass than the windup roller and the wound up yarn package so that the transporting rollers already rapidly transport the yarn in the reversed direction before the windup roller has started its turning movement. The operator of the machine must then manually repair the yarn breakage between the transporting rollers and the windup roller which increases the cost of labor and reduces the useful time of operation of the machine.

Summary of the invention

It is one object of the invention to overcome the disadvantages of winding apparatus according to the prior art, and to provide an automatically reversible winding arrangement in which a yarn breakage of the reversed yarn is prevented.

Another object of the invention is to automatically reverse the windup roller of a newly spun yarn when the same breaks while rendering the transporting means of the yarn inoperative.

With these objects in view, the present invention relates to a reversible winding arrangement for a flexible elongated element, such as a yarn, and the term "yarn" will be used in the present application to define any flexible elongated element which can be wound up.

The yarn is supplied to the winding apparatus by supply means, such as a rotary spinning chamber in which fibers are combined to form a strand which is twisted.

One embodiment of the invention comprises a windup unit rotatable in a windup direction for winding up a yarn, and a transporting unit having an inoperative condition and an operative condition for transporting the yarn from a supply means to the windup unit. Preferably, the transporting unit includes a transporting roller connected with a windup roller, and a pressure roller mounted on a support for movement between a position cooperating with a transporting roller and a spaced position in which the transporting unit is inoperative.

Feeler means sense the yarn supplied to the transporting unit and control reversible drive means for the windup roller so that the same is reversed when the yarn breaks.

Operating means include sensing means for sensing the direction of rotation, and actuating means acting on the support of the pressure roller to move the same to the inoperative position spaced from the transporting roller when the direction of rotation is reversed.

As a result, only the reversed windup roller moves the broken yarn toward the spinning chamber for attachment to the newly spun yarn end so that a yarn breakage between the transporting unit and the windup unit is prevented. The sensing means may be constructed as a magnet having a winding and cooperating with the transporting roller or the winding roller to produce different voltages when the rollers are reversed. An electromagnetic actuating means is controlled by the reversed voltage to move the pressure roller to the inoperative position.

In another embodiment of the invention, a one-way clutch has one clutch part connected with a transporting roller or with the windup roller for rotation and another clutch part which rotates only during reverse rotation of the respective roller. A cam is driven through a friction coupling by this part of the clutch to shift the pressure roller to the inoperative position spaced from the transporting roller.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

Brief description of the drawing

FIG. 1 is a schematic and partly diagrammatic view illustrating a reversible winding arrangement according to one embodiment of the invention;

FIG. 2 is a fragmentary elevation, partially in section, illustrating another embodiment of the invention; and

FIG. 3 is a fragmentary axial sectional view of the embodiment of FIG. 2.

Description of the preferred embodiments

Referring first to FIG. 1, a spinning apparatus **1** which includes a rotary spinning chamber produces a spun and twisted yarn **2**. The spinning chamber is of the conventional rotary type to which fibers are supplied so that the fibers are deposited on an annular inner surface of the spinning chamber and twisted when drawn by the transporting unit **3**, **4** out of the outlet of the spinning chamber.

The transporting unit includes a transporting roller **3** connected by a chain transmission to a windup roller **8** which forms a rotating bobbin package **9**.

A reversible drive motor **17** is connected to the shaft of windup roller **8** and rotates the same so that transporting roller **3** is also rotated during the normal operation of the apparatus. Pressure roller **4** is rotatably mounted on a support lever **5** which is turnable about a stationary pivot on the frame of the machine, as schematically indicated. An electromagnetic actuating means **11** has an armature connected to support lever **5** by a pivot, while the main part of the electromagnetic actuator **11** including the winding is pivotally mounted on the frame of the machine, as schematically indicated. When elec-

tromagnetic actuator means **11** is energized, support lever **5** is turned in clockwise direction so that pressure roller **4** is moved to a position spaced from the driven transporting roller **3** so that the transporting unit **3**, **4**, is inoperative and cannot transport the yarn.

A sensing means **14** includes a magnet and a winding that is located in proximity of transporting roller **3** so that during rotation of the same, a voltage is produced which is supplied through a line **9** to an electric circuit means **13**. When transporting roller **3** rotates in clockwise direction for transporting yarn to the winding roller **8**, the voltage produced by the electromagnetic sensing means **14** has a certain polarity to which the circuit **13** responds to de-energize electromagnetic actuating means **11**, so that a spring, not shown, biases support lever **5** to the operative position in which pressure roller **4** cooperates with the rotating transporting roller **3** to transport the yarn toward the windup roller **8**. Circuit **13** may include a relay opening a switch in line **12** when receiving the voltage produced by electromagnetic sensing means **14**.

The portion of yarn **2** located between the spinning machine **1** and the transporting unit **3**, **4**, is sensed by feeler means **15** which responds to a yarn breakage with an impulse supplied to control means **16** which cause reversal of the direction of rotation of drive motor **17**. Sensing means **15** may include a switch closed upon a yarn breakage and completing the circuit of a relay in control means **16** shifting a reversing switch in control means **16** by which motor **17** is reversed.

When motor **17** starts to rotate in the reversed direction, the direction of rotation of windup roller **8** is reversed, and since transporting roller **3** is connected with windup roller **8** by the chain transmission **7**, the direction of rotation of the transporting roller **3** is also reversed.

If pressure roller **4** would remain in its operative position, another yarn breakage may occur due to the different masses and inertias of transporting roller **3** and windup roller **8**.

As soon as transporting roller **3** starts to rotate in the opposite direction, the voltage produced by the electromagnetic sensing means **14** is reversed, causing the relay in circuit means **13** to close a switch and to energize electromagnetic actuating means **11** which moves support lever **5** in clockwise direction so that pressure roller **4** assumes a position spaced from transporting roller **3** in which the transporting unit is inoperative. Consequently, the yarn is moved in the reverse direction only by the reversed windup roller, and the broken yarn end is pushed back into the spinning chamber where it is automatically attached to the newly formed and spun yarn end. When feeler means **15** senses a continuous yarn portion between the spinning chamber and the transporting unit, control means **16** again reverse drive motor **17** to its normal direction of rotation so that windup roller **8** and transporting roller **3** are reversed and start to rotate in the normal clockwise transporting and winding direction.

The electromagnetic sensing means **14** responds to produce a voltage having the normal polarity so that the relay of circuit means **13** opens the switch in the line **12** and electromagnetic actuating means **11** is de-energized so that the spring of support lever **5** turns the same until pressure roller **4** again cooperates with transporting roller **3** and is driven by the same. The transporting unit is again operative, and the yarn is transported from the spinning chamber to the windup roller and wound up.

Referring now to the embodiment of FIGS. 2 and 3, a transporting roller **3'** cooperates with a pressure roller **4'** mounted on a support **20** which is pivotally supported on a pivot **6** on the frame of the machine. Transporting roller **3'** is connected by a chain drive **7** with a windup roller **8** which winds a bobbin package **9**, and is driven by a motor **17** which can be reversed by control means **16** including feeler means **15** for a yarn **2** supplied by a spinning machine **1**, as described with reference to FIG. 1, and these parts of the apparatus which are common to both embodiments are not illustrated. The embodiment of FIGS. 2 and 3 differs from the embodiment of FIG. 1 by the construction of the operating means by which pressure roller **4** or **4'**, respectively, is moved to an inoperative position when the direction of rotation of the windup roller **8** and of transporting roller **3**, or **3'**, respectively, is reversed due to a yarn breakage sensed by feeler means **15**.

FIGS. 2 and 3 show mechanical operating means for this purpose, as compared with the electric operating means **11**, **13**, **14** of the embodiment of FIG. 1.

A shaft **18** carries the hollow transporting roller **3'** which is connected to shaft **18** by a key **19**. Shaft **18** carries a chain wheel for the chain drive **7**, not shown in FIG. 3, as described with reference to FIG. 1. The periphery of transporting roller **3'** cooperates with the periphery of pressure roller **4'** to transport the yarn in the windup direction during rotation of transporting roller **3'** in clockwise direction. Transporting roller **3'** has an inner cavity **21** between an outer cylindrical wall and an inner hub wall **22** which has a plurality of circumferentially spaced wedge shaped recesses **23** cooperating with small rolls **24** which are surrounded by an annular member **25**. Members **22**, **24**, **25** constitute a one-way clutch which is disengaged during rotation of transporting roller **3'** in counterclockwise direction. When transporting roller **3'** is reversed upon the yarn breakage by control means **15**, **16**, **17**, rolls **24** are clamped in the wedge-shaped recesses **23** between members **22** and **25**, and clutch part **22** which is connected with transporting roller **3'**, rotates the other annular clutch part **25** which has radial projections **26** separated by recesses **27**.

A friction coupling includes a first coupling member **30** having a cylindrical flange **28** slidably mounted on clutch part **25** and having axial projections **29** located in the recesses **27** between radial projections **26** of annular clutch part **25**. A coil spring **31** surrounds the cylindrical flange **28** and abuts projections **26** and a shoulder of coupling part **30**. A ring-shaped friction lining **32** is secured to coupling part **30** and in sliding engagement with a corresponding circular surface of another coupling part **33** which has a cut-out **39** in which a stop pin **42** secured to a stationary frame wall **38** is located. Coupling member **33** also has a projecting cam lug **44** cooperating with a projecting part **43** of support lever **20**. In the normal position of coupling part **33**, a planar face on projection **43** engages a corresponding planar face on coupling part **33**.

A torsion spring **36** is located in an annular recess **34** on the front face of coupling part **33**, and has one end located in a bore **35** of coupling part **33**, and the other end located in a blind bore **37** in the stationary frame wall **38**. Torsion spring **36** is tensioned, and biases coupling part **33** with cam **44** to turn in counterclockwise direction, as viewed in FIG. 2, to the illustrated position in which the shoulder **40** of recess **39** in coupling part **33** abuts the stationary stop pin **42** which is secured to frame wall **38**. This position is maintained during the clockwise rotation of transporting roller **3'** during which the yarn is transported to the windup unit **8**, **9**.

In the embodiment of FIGS. 2 and 3, the spinning unit **1** is assumed to be located above the transporting rollers **3'**, **4'**, and the winding roller **8** is assumed to be located below the transporting unit, as viewed in FIG. 2. During a winding operation, transporting roller **3'** rotates in counterclockwise direction and transports together with pressure roller **4'** the yarn toward the windup roller. When sensing means **15** senses a yarn breakage, control means **16** reverses drive motor **17** so that the direction of rotation of windup roller **8** and of transporting roller **3'** is reversed so that transporting roller **3'** rotates in

clockwise direction. While during the winding operation, the one-way clutch **22**, **24**, **25** was disengaged, clutch portion **22** rotating in clockwise direction wedges rollers **24** in the narrow portions of the wedge-shaped spaces formed by recesses **23** and annular clutch part **25** so that clutch part **25** is also rotated in clockwise direction. The coupling fingers **26**, **29** transmit the clockwise rotation of clutch part **25** to coupling member **30** which by lining **32** frictionally engages coupling member **33** and turns the same in clockwise direction until shoulder **41** abuts stop pin **42** whereupon coupling member **33** cannot further turn in clockwise direction and lining **32** slides on coupling member **33** during further rotation of transporting roller **3'** in clockwise direction.

The angular displacement of coupling member **33** moves cam lobe **44** under the projection **43** so that support lever **20** is turned about pivot **6** in counterclockwise direction and pressure roller **4'** is moved to a position spaced from transporting roller **3'**. The reversed windup roller **8** drives the broken yarn back into the spinning chamber while the transporting unit **3'**, **4'** is in an inoperative condition. When the broken yarn is again attached to the newly spun yarn end in the spinning chamber, sensing means **15** is actuated by the yarn to cause by control means **16** the reversal of drive motor **17** so that windup roller **8** is again rotated in the winding direction and transporting roller **3'** again rotates in counterclockwise direction so that clutch part **22** also rotates in counterclockwise direction which cause the release of the one-way clutch since rolls **24** move to the deeper parts of recesses **23**. Consequently, coupling member **30** is no longer driven by clutch part **25**.

The force of torsion spring **36** is now sufficient to turn coupling member **33** with cam lobe **44** back in counterclockwise direction until shoulder **40** again abuts stop **42** and cam lobe **44** releases projection **43** so that support lever **20** is returned by its spring to the operative position in which pressure roller **4'** cooperates with transporting roller **3'** to transport the yarn.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of reversible winding arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in a reversible winding apparatus in which a transporting unit is rendered inoperative when the transported yarn breaks while the windup unit is reversed, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. Reversible winding arrangement, comprising, in combination, supply means for supplying a yarn; a windup unit rotatable in a windup direction for winding up a yarn; a transporting unit having an inoperative condition, and an operative condition for transporting the yarn from said supply means to said windup unit; control means including feeler means for sensing the yarn supplied to said transporting unit, and controlling said windup unit for reversing the direction of rotation of the same upon a yarn breakage; and operating means having a normal position for holding said transporting unit in said operative condition, and being responsive to a reversal of the direction of rotation to place said transporting unit in said inoperative condition so that only the reversed windup unit moves the broken yarn toward said supply means for attachment to a yarn end whereby a yarn breakage between said transporting unit and said windup unit is prevented.

2. Reversible winding arrangement as claimed in claim **1**, including transmission means for connecting said windup unit with said transporting unit for rotation; and wherein said control means include reversible drive means driving one of said units and thereby the other unit, and means for reversing the direction of rotation of said reversible drive means when said feeler means senses a yarn breakage.

3. Reversible winding arrangement as claimed in claim **1**, wherein said transporting unit includes a transporting roller connected with said windup unit for rotation, and a pressure roller having a first position cooperating with said transporting roller for transporting the yarn in said operative condition of said transporting unit, and a secong position spaced from said transporting roller in said inoperative condition of said transporting unit; and wherein said operating means move said pressure roller between said first and second positions.

4. Reversible winding arrangement as claimed in claim **1**, wherein said transporting unit includes a transporting roller connected with said windup unit for rotation, and a pressure roller havng a first position cooperating with said transporting roller for transporting the yarn in said operative condition of said transporting unit, and a second position spaced from said transporting roller in said inoperative condition of said transporting unit; and wherein said operating means include sensing means for sensing the direction of rotation of said transporting roller, and actuating means controlled by said sensing means upon reversion of the direction of rotation of said transporting roller to move said pressure roller to said second position so that said transporting roller does not transport the yarn in the reversed direction.

5. Reversible winding arrangement as claimed in claim **4**, wherein said sensing means includes a magnet and a winding for producing different output signals when said said actuating means includes an electromagnet energized by said signals, and a movable support for said pressure roller operated by said electromagnet to move said pressure roller between said first and second positions.

6. Reversible winding arrangement as claimed in claim **4**, wherein said sensing means includes a magnet and a winding for producing different output signals when said transporting roller rotates in opposite directions, wherein said actuating means includes an electromagnet energized by said signals, and a movable support for said pressure roller operated by said electromagnet to move said pressure roller between said first and second positions; and wherein said control means include a reversible drive motor for driving said windup unit and thereby said transporting roller, and means for reversing the direction of rotation of said drive motor when said feeler means senses a yarn breakage.

7. Reversible winding arrangement as claimed is claim **4**, wherein said sensing means includes a one-way clutch having one clutch part connected with said transporting roller for rotation and another clutch part rotating only during reverse rotation of said transporting roller, and wherein said actuating means includes cam means operated by said other clutch part during rotation of the same, and a support for said pressure roller operated by said cam means to move said pressure roller between said first and second positions.

8. Reversible winding arrangement as claimed in claim **7**, wherein said actuating means include a friction coupling connecting said other clutch part with said cam means, stop means limiting turning movement of said cam means by said other rotating clutch part in a position in

which said cam means acts on said support to hold said pressure roller spaced from said supporting roller, a spring urging said cam means to turn opposite to the direction of rotation of said other clutch part when said one-way clutch is disengaged so that said cam means releases said support whereby said pressure rollers returns to a position cooperating with said transporting roller, said stop means limiting turning movement of said cam means under the action of said spring means.

9. A reversible winding arrangement as claimed in claim **8** wherein said cam means has a recess bounded by two circumferentially spaced shoulders, said stop means being stationary and located in said recess.

10. A reversible winding arrangement as claimed in claim **4**, wherein said windup unit includes a windup roller, and comprising transmission means for connecting said transporting roller with said windup roller.

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