May 5, 1970 SHIN TSUKUMA ET AL 3,510,078

MECHANISM FOR CONTROLLING WINDING PRESSURE OF PRECISION WINDER

Filed Jan. 9, 1967 4 Sheets-Sheet 1

FIG. 1

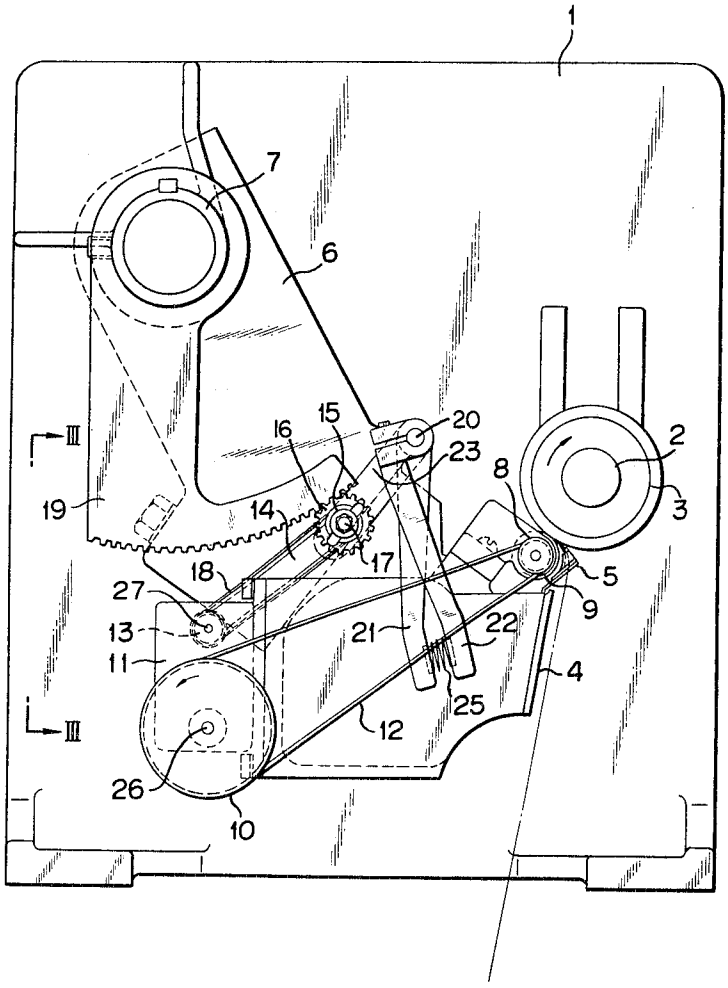
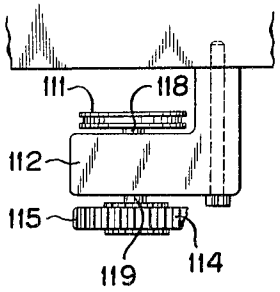


FIG. 6



MECHANISM FOR CONTROLLING WINDING PRESSURE OF PRECISION WINDER

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FIG. 2

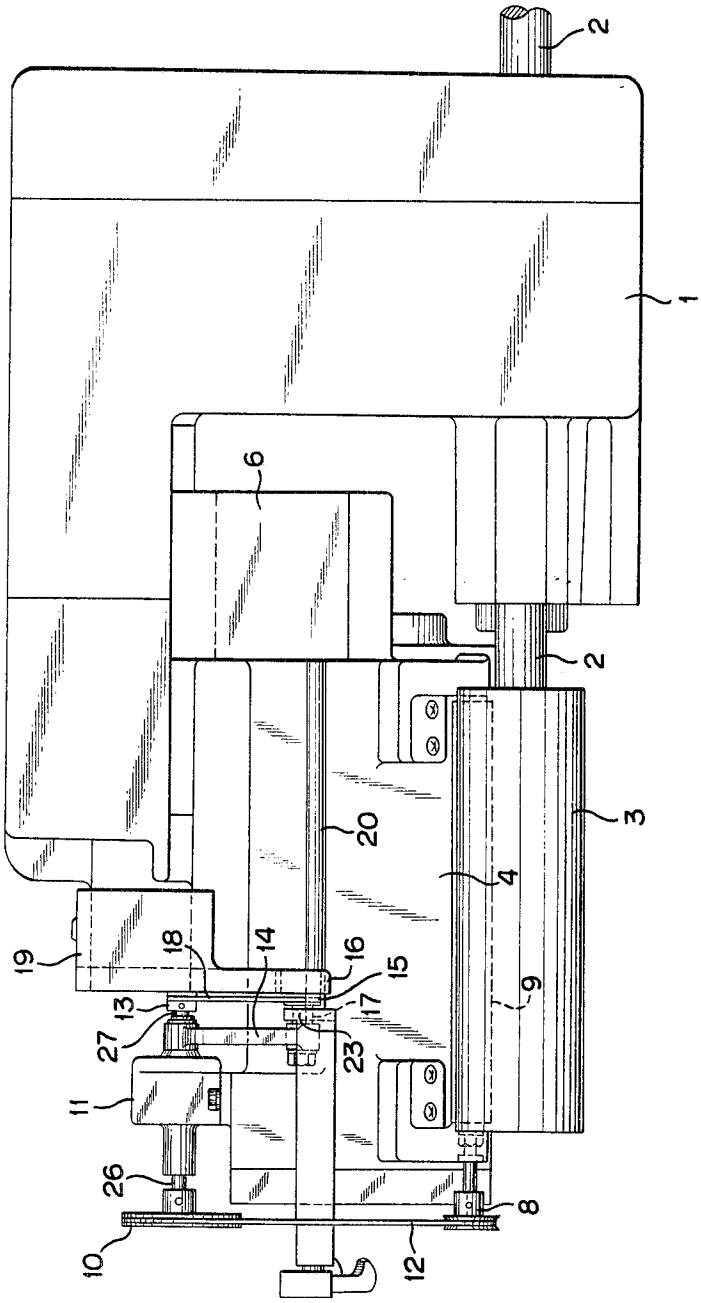


FIG. 4

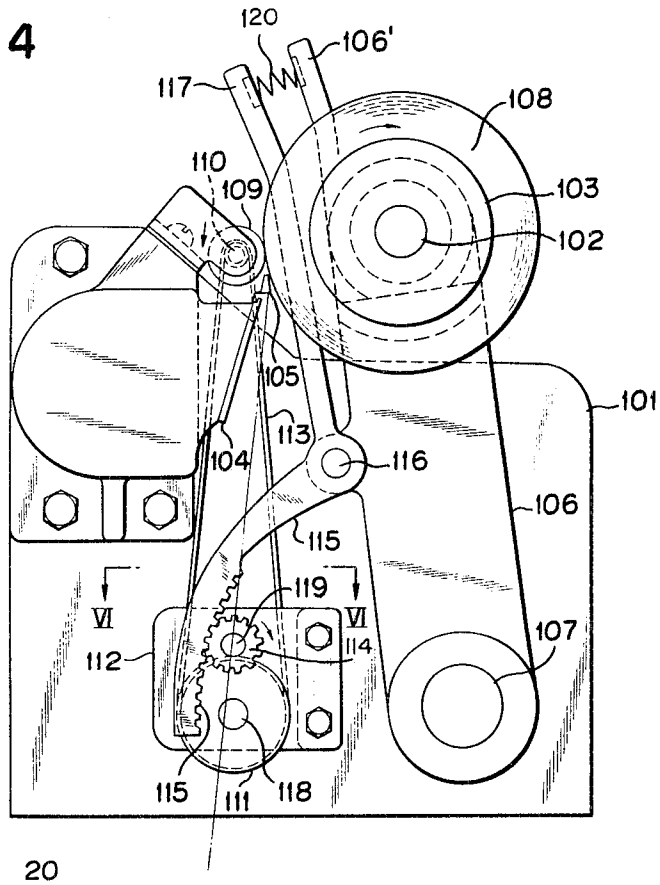
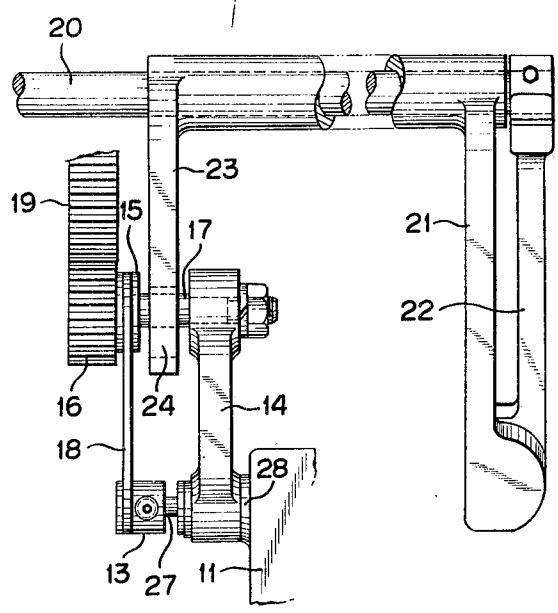

120
106'
117
108
110
109
103
102
105
101
113
104
116
106
115
VI
119
VI
114
112
107
115
111
118

FIG. 3

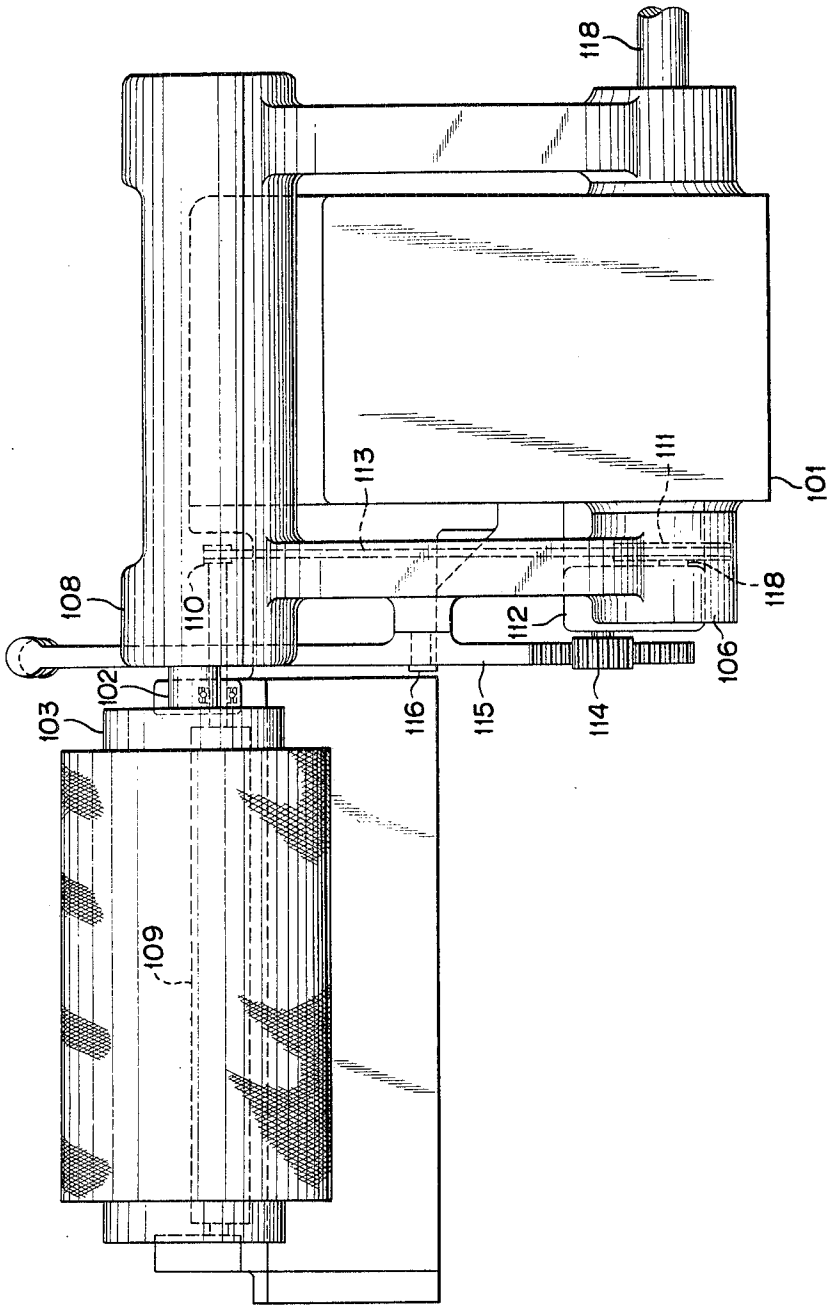

20
23
19
15
17
21
22
16
24
14
18
28
13
27
11

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MECHANISM FOR CONTROLLING WINDING PRESSURE OF PRECISION WINDER

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FIG. 5



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MECHANISM FOR CONTROLLING WINDING PRESSURE OF PRECISION WINDER

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U.S. Cl. 242—18 6 Claims

ABSTRACT OF THE DISCLOSURE

A device for controlling winding pressure on a package used in a precision winder having a roller bail extending along the whole length of a package. Increases in the diameter of the winding package causes the contacting of a roller bail with the package and rotation of the roller bail. This rotation of the roller bail is transmitted in a reduced speed condition to a roller bail receding means and actuates receding means and actuated receding motion thereof. Thus, contacting pressure between the package and the roller bail is maintained very low on account of the slight contact between the two. The package obtained has relatively uniform and low hardness and is suitable for package dyeing.

The present invention relates to a device in a precision winder for controlling the winding pressure on a winding package. In the case of the conventional precision winders, the traverse guide or the roller bail is generally maintained in a contacting condition with the peripheral surface of the winding package and the relative position of the yarn guide and a spindle supporting the package is shifted by a contact pressure between the traverse guide and the peripheral surface of winding package in accordance with increase in the diameter of the package during winding operation. On account of the above-described mechanical arrangement, the hardness of the package is mainly dependent upon the contacting pressure and this fact results in difficulty in the winding of soft packages. As is well-known, soft packages are generally favored in the process of package dyeing of cheeses or cones. So, it was difficult or almost impossible to produce soft packages suitable for package dyeing by utilizing the precision winders of the conventional type.

An object of the present invention is to provide a device for controlling winding pressure on a package to a remarkably low one or for maintaining the pressure at almost no pressure during the winding operation on a precision winder.

Another object of the present invention is to provide a device for controlling winding pressure on a winding package to produce a very soft package having uniform hardness which is suitable for package dyeing of cheese or cone.

Still another object of the present invention is to provide a novel device for controlling winding pressure on a winding package used for precision winders which has relatively simple mechanical construction assuring easy maintenance control and suitability for a variety of yarns.

Still another object of the present invention is to provide a novel device for controlling winding pressure on a winding package used for precision winders which requires no special power source such as an electric motor for receding a traverse yarn guide away from the package but only rotation of the package itself.

In order to attain the above-described objects, the device of the present invention comprises a roller bail rotatably disposed to a cam box containing mechanism for actuating the traverse yarn guide along at least the whole length of the package and adapted to contact a peripheral

surface of the package, means for receding the roller bail away from the package and vice versa and means for transmitting rotation of the roller bail to the receding means in a reduced speed condition in order to actuate the receding means.

In this respect, the term "receded condition" of the roller bail away from the package and vice versa as hereinafter used refers to a condition wherein the surfaces of the two are mutually contacted with a contacting pressure substantially equal to zero. Such receded condition between the two is the most outstanding feature of the present invention.

Further objects and advantages of the present invention will be apparent from the following description, reference being made to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

FIG. 1 is a front view of an embodiment of a device for controlling the winding pressure between a winding package and a traverse device of a winding machine according to the invention,

FIG. 2 is a plan view of the device shown in FIG. 1,

FIG. 3 is an enlarged view of the device of the invention shown from III—III in FIG. 1,

FIG. 4 is a front view of another embodiment of the device for controlling the winding pressure between a winding package and a traverse device of a winding machine according to the invention.

FIG. 5 is a plan view of the device shown in FIG. 4,

FIG. 6 is an elevation of a reduction gear part shown from VI—VI in FIG. 4.

Referring to FIGS. 1, 2 and 3, a spindle **2** is supported by a winding unit **1**, and a bobbin **3** for holding yarn layer is mounted on the spindle **2**.

An arm **6** is pivoted at its one end to a shaft **7** mounted on the winding unit **1** and to another end of the arm **6** a cam box **4** is secured. In the cam box **4**, a cam mechanism for actuating a traversing motion of a traverse yarn guide **5** is contained.

The spindle **2** is driven by a power transmission mechanism (not shown) in a direction shown by an arrow in FIG. 1, while the spindle **2** is related to the cam mechanism of the cam box **4** so as to wind the yarn around the bobbin **3**.

At the portion adjacent to the bobbin side of the cam box **4**, a roller bail **9** is disposed. The disposition of the roller bail **9** is so designed as is adapted to contact the peripherical surface of the winding package and extends along the whole length of the package. A pulley **8** of a small diameter is secured to an end of the roller bail **9**, and a reduction device **11** is secured to the cam box **4** on the side opposite to the roller bail **9** in such a way that the reduction device **11** can swing with the cam box **4**, a pulley **10** of a large diameter is mounted on an input shaft **26**, of the reduction device **11**. Rotation of the large pulley **10** is caused by the rotation of the roller bail **9**, to one end of which is the small pulley **8** disposed, by way of a belt drive **12**. On account of the difference in diameters in the both pulleys, the rotating speed of the input shaft **26** is reduced from that of the roller bail **9**.

Another small pulley **13** is mounted on an output shaft **27** of the reduction device **11**. In a coaxial condition with the output shaft **27**, a further projection **28** is formed on the reduction device and a lever **14** is turnably disposed to the projection **28**. At another end of the lever **14**, is a pulley **15** rotatably disposed and a small gear **16** is secured to the pulley **15** in a coaxial condition. The rotation of the pulley **15** is actuated by the rotation of the small pulley **13** by a belt drive **18**. Consequently, the rotation of the small pulley **13** causes the rotation of the small gear **16**.

A lever **21** is turnably mounted on a shaft **20** secured to the arm **6**, another shaft **17** is passed through an oblong aperture **24** disposed to a top end portion of a connecting lever **23** which is formed as one body with the lever **21**. A lever **22** is also secured to the shaft **20** and a spring **25** is disposed between the free end of both levers **21** and **22**. In the drawing, the expanding force of the spring **25** tends to turn the lever **21** in the clockwise direction around the shaft **20** and this clockwise turning of the lever **21** accompanies clockwise turning of the lever **23** which is formed as a body with the lever **21**. Consequently, the small gear **16** is urged against the large gear **19** which is fixed to the winding unit **1**.

As mentioned above, the rotation of the roller bail **9** is transmitted to the small gear **16** with the speed considerably reduced, consequently, the small torque of rotation of the roller bail **9** is transmitted to the small gear **16** with increased torque of rotation. As the roller bail **9** is rotated counterclockwise by the frictional contact with the spindle **2** rotating clockwise in FIG. 1, the small gear **16** is rotated clockwise. As is already mentioned, the large gear **19** is mounted stationary on the winding unit **1** and the clockwise rotation of the small gear **16** causes leftwards traveling of the small gear **16** along the periphery of the large gear **19** in the drawing of FIG. 1. In order to permit this leftwards traveling of the small gear **16**, the arm **6** is forced to turn in the clockwise direction around the shaft **7**. As is already mentioned, the cam box **4** is secured to another end of the arm **6**, and recedes away from the package wound on the bobbin **3** with the clockwise turning of the arm **6**. That is, when the diameter of the winding package on the bobbin **3** increases and the package begins to contact with the roller bail **9**, a slight rotation is bestowed to the roller bail **9** and when the roller bail **9** rotates, the rotation of the roller bail **9** is transmitted to the small gear **16** and then the cam box **4** recedes from the package as described above, and the contact between the package **3** and the roller bail **9** is released. As is well known, a relatively long time is required for the diameter of the winding package to become large and the receding motion of the cam box **4** is therefor extremely slow.

When the full packaged cheese or cone is to be doffed, the movable lever **21** is pulled toward the fixed lever **22** by grasping it by hand so as to compress the spring **25**, thereby the meshing of small gear **16** with the large gear **19** is released and the cam box **4** can be moved by manual operation.

Referring to FIGS. 4, 5 and 6 showing another embodiment of the device of the present invention, a spindle **102** is supported by a winding unit **101**, and a bobbin **103** for winding yarn thereon is mounted on the spindle **102**. A cam mechanism for traversing a traverse yarn guide **105** is contained in a cam box **104**, an arm **106** is turnably disposed to a shaft **107** secured to the winding unit **101** and the cam box **104** is secured to the winding unit **101**. The spindle **102** is mounted on the arm **106** and is turned together with the arm **106**.

At the portion adjacent to the bobbin side of the cam box **104**, a roller bail **109** rotatably is disposed. A pulley **110** of a small diameter is secured at an end of the roller bail **109**, a reduction device **112** is secured to the winding unit **101**, and a pulley **111** of a large diameter is secured to an input shaft **118** of the reduction device **112**. The pulley **111** is driven by the pulley **110** by means of belt **113** by the rotation of the roller bail **109**, consequently, the rotation of the input shaft **118** is reduced. A small gear **114** is secured to an output shaft **119** of the reduction device **112**.

A shaft **116** is secured to the middle portion of the arm **106** and a lever **115** is turnably mounted on the shaft **116**. The lever **115** is provided with an internal sector gear **115'** adapted to mesh with a small gear **114** mounted on the output shaft **119**. The lever **115** is formed as to have a curvature whose center of curvature falls

on the center of the shaft **107**. A branch lever **117** of the lever **115** is extended upward as shown in FIG. 4. The arm **106** is provided with a branch lever **106'** extended upward as shown in FIG. 4. A spring **120** is disposed between the branch levers **106'** and **117** and the expanding force of the spring **120** tends to turn the branch lever **117** in the counterclockwise direction around the shaft **116**, thereby the small gear **114** being always urged to mesh with the internal sector gear **115'** of the lever **115**. Separation of the small gear **114** away from the internal sector gear **115'** can be achieved by compressing the spring **120** by tightly gripping the branch lever **106'** and **117** by hand.

As mentioned above, the rotation of the roller bail **109** is transmitted to the small gear **114** with the rotation speed considerably reduced, consequently, small torque of rotation of the roller bail **109** is transmitted to the small gear **114** with increased torque of rotation. As the roller bail **109** is rotated counterclockwise due to the frictional contact with the periphery of a package **108** rotating clockwise in FIG. 4, the small gear **114** is rotated clockwise. Then, the lever **115** is required to move rightwards so as to permit rotation of the small gear **114** meshing with the internal sector gear **115'**, and this rightwards movement of the lever **115** accompanies a clockwise turning of the arm **106** around the shaft **107** in FIG. 4. That is, when the diameter of the winding package **108** increases and the package **108** contacts the roller bail **109**, a slight rotation is bestowed to the roller bail **109**. Then the rotation of the roller bail **109** is transmitted to the small gear **114** and the arm supporting the spindle **102** recedes from the roller bail **109** as is described above, and the contact between the package **103** and the roller bail **109** is released.

In case of doffing the full packaged cheese or cone, the spring **120** is compressed by gripping the levers **106'** and **117** by hand, thereby the meshing of the small gear **114** with the internal sector gear **115'** is released. Then the package is put in a condition ready for rotation by hand.

As is described above, by utilizing the controlling device of present invention, a spindle or a traverse device is positively shifted so as to release the contact between the package and the traverse device as the diameter of the package increases, consequently, the winding pressure on the winding package can be maintained at almost zero pressure and very soft package of cheese or cones having uniform hardness can be obtained.

While the invention has been described in conjunction with certain embodiments thereof it is to be understood that various modifications and changes may be made without departing from the spirit and scope of the invention:

What is claimed is:

1. A device for controlling yarn winding pressure on a package comprising: a rotationally driven spindle for supporting a bobbin on which yarn is wound in the form of a package during a winding operation; a rotatably mounted roller bail extending along the whole length of the bobbin; means mounting said rotatably mounted roller bail in a position lightly contacting a peripheral surface of the package for effecting frictional rotation of said roller bail during the winding operation and for backing away said rotatably mounted roller bail from the package; said means comprising a stationary shaft, an arm rotatably mounted on said stationary shaft, a gear sector fixed on said stationary shaft; support means on said arm for supporting said rotatably mounted roller bail, a speed reduction device connected to said support means including rotatably mounted input and output shafts, a first pulley secured to an end of said rotatably mounted roller bail, a second pulley mounted on said input shaft, a belt drive interconnecting said first and second pulleys, a third pulley mounted on said output shaft, an extension coaxial with and extending from said output shaft, a

first lever having a mounting shaft at one end and rotatably mounted on said extension at its other end, a fourth pulley rotatably mounted on said mounting shaft, a belt drive interconnecting said third and fourth pulleys, and a small gear secured to said fourth pulley and disengagably meshing with said gear sector.

2. A device according to claim 1; further comprising manual means for manually disengaging said small gear from said gear sector.

3. A device according to claim 2; wherein said manual means comprises another shaft secured to said arm, a second lever rotatably mounted on said another shaft, a third lever secured to said another shaft, a spring disposed between said second and third levers normally biasing them apart, and a connecting lever having one end rotatably mounted on said another shaft and having an elongated aperture in its other end through which said mounting shaft protrudes; whereby said small gear is disengaged from said gear sector by manually pressing together said second and third levers.

4. A device for controlling yarn winding pressure on a package comprising: a rotationally driven spindle for supporting a bobbin on which yarn is wound in the form of a package during a winding operation; a rotatably mounted roller bail extending along the whole length of the bobbin; means mounting said rotationally driven spindle in a position wherein a peripheral surface of the package lightly contacts said rotatably mounted roller bail for frictionally rotating said roller bail during the winding operation and for backing away the package from said rotatably mounted roller bail; said means comprising a stationary shaft, an arm rotatably mounted on said stationary shaft, said spindle being supported on said arm, another shaft secured to said arm, a lever rotatably mounted at an intermediate portion thereof on said another shaft and having two arms extending outwardly therefrom, one of said two arms terminating in a gear

sector, a speed reduction device including rotatably mounted input and output shafts, a first pulley secured to an end of said rotatably mounted roller bail, a second pulley mounted on said input shaft, a belt drive interconnecting said first and second pulleys, and a small gear mounted on said output shaft and disengagably meshing with said gear sector.

5. A device according to claim 4; further comprising manual means for manually disengaging said gear sector from said small gear.

6. A device according to claim 5; wherein said manual means comprises another lever secured to said arm which is rotatably mounted on said stationary shaft and positioned adjacent the other of said two arms, and a spring disposed between said another lever and the other of said two arms normally biasing them apart; whereby said small gear is disengaged from said gear sector by manually pressing together said another lever and the other of said two arms.

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