July 10, 1962 J. RABEUX ET AL 3,043,926

CENTRIFUGAL ELECTRIC SWITCHING DEVICE FOR CONTROLLING THE UNWINDING OF YARN IN TEXTILE MACHINES AND THE LIKE

Filed April 3, 1958 2 Sheets-Sheet 1

Fig. 1.

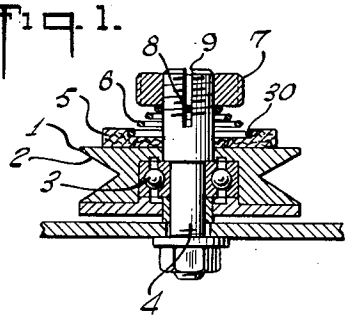


Fig. 2.

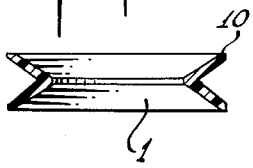


Fig. 3.

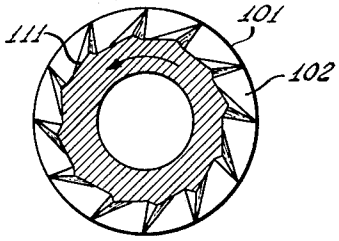


Fig. 4.

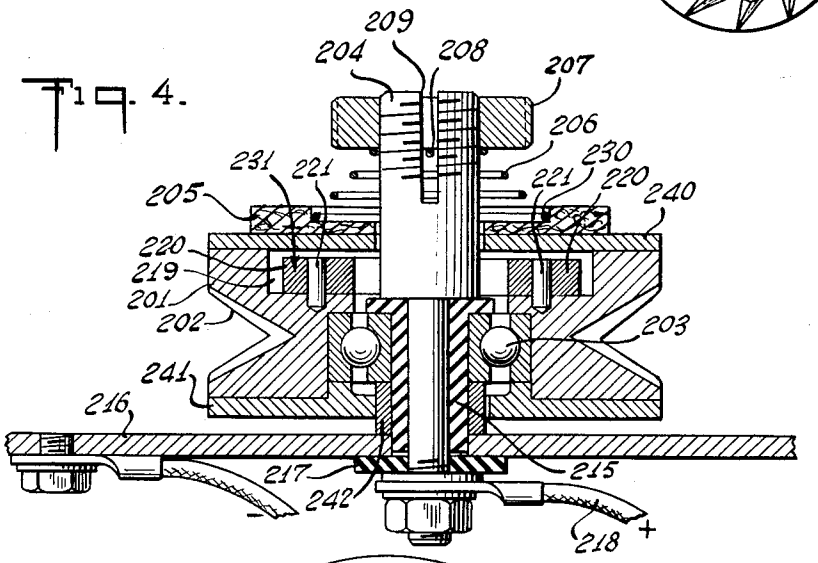
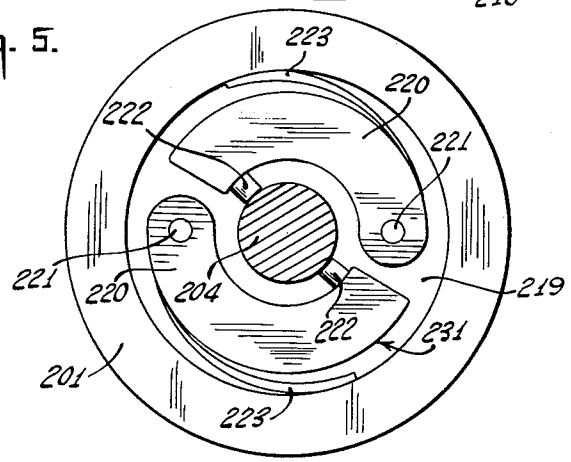


Fig. 5.



INVENTORS
Jean Rabeux
Raymond Jacob
BY
NOLTE AND NOLTE
ATTORNEYS

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Fig. 6.

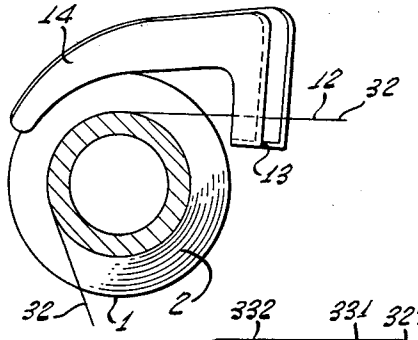


Fig. 7.

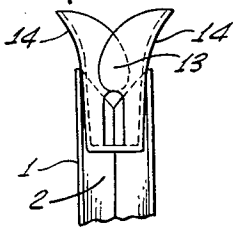


Fig. 9.

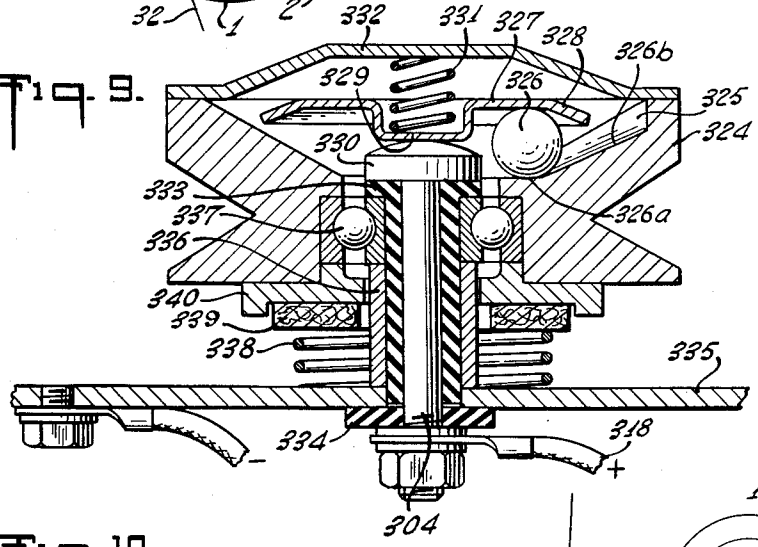
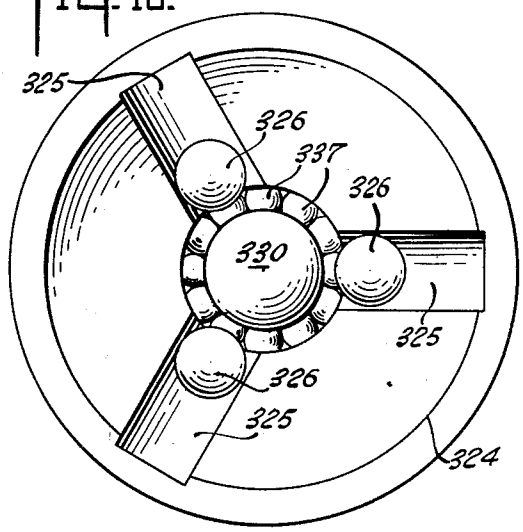


Fig. 10.



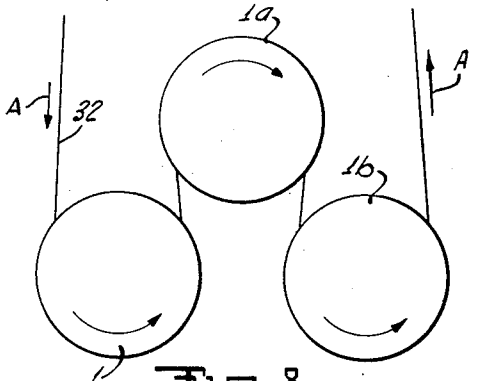


Fig. 8.

INVENTORS
Jean Rabeux
Raymond Jacob
BY
NOLTE AND NOLTE
ATTORNEYS

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CENTRIFUGAL ELECTRIC SWITCHING DEVICE FOR CONTROLLING THE UNWINDING OF YARN IN TEXTILE MACHINES AND THE LIKE

Jean Rabeux, Paris, and Raymond Jacob, Eaubonne, France, assignors to Societe d'Applications Generales d'Electricite & de Mecanique, Paris, France

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4 Claims. (Cl. 200—61.18)

This invention relates to textile machinery and more particularly to a device for controlling the unwinding of a yarn, thread, filament or the like from a bobbin or similar device.

This application is a continuation-in-part of our co-pending application Serial No. 560,426, filed January 20, 1956, now abandoned, entitled Yarn Brake.

Hitherto customary controlling devices or yarn brakes of this kind act directly on the yarn to be controlled by friction or tightening, which, in turn results in a great number of inconveniences. For example, the hitherto customary controlling devices do not subject the yarn to the correct tension as the intensity of the braking effect varies with numerous factors, namely: Humidity, irregularities of the yarn (such as fineness, beads, straws, knots), fouling of the brake by floss or flock torn away, resistances being caused by the unwinding of the yarn, or resistances creating excess tensions multiplied by the friction on the transmissions according to a well known law. Thus, a great number of breakages is caused by defects of the hitherto known controlling devices caused by the irregularity of the braking effect and equally by the weakening of the yarn, said weakening being caused by the friction and the tightening of the yarn, which features untwist the yarn and tear and break the fibers. In the case of continuous fibres the hitherto customary devices wear and tear and even break the outer fibres affected by the braking effect.

Furthermore, the threading of the yarn in the hitherto customary controlling devices is rather complicated.

Moreover, the wear and tear of the hitherto customary controlling devices is very high, so that a considerable amount of maintenance is required.

An object of the invention is to overcome the disadvantages of the hitherto customary yarn controlling devices or yarn brakes.

Another object of the invention is to provide a yarn brake wherein the braking action is not directly exerted on the yarn.

A further object of the invention is to provide a yarn brake, by means of which a perfect and lasting control of the tension in the yarn and its travelling speed may be obtained without causing fatigues in any form.

Another object of the invention is to provide a yarn brake wherein the yarn being in adhering engagement with a braking element does not rub with or slide on a part of the yarn brake.

Another object of the invention is to provide, on a yarn brake, a centrifugal circuit interrupter which will be relatively simple to manufacture, control and regulate, and which will not be susceptible to rapid wear of contacts or to malfunctioning caused by grease and dirt.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings forming part of this specification, wherein:

FIG. 1 is a vertical sectional view of a yarn brake according to the invention,

FIG. 2 is a vertical sectional view of a ring of suitable material applicable to the yarn contacting member of the yarn brake shown in FIG. 1 for assuring a perfect adhesion of the yarn to the yarn brake according to the invention,

FIG. 3 is a horizontal sectional view of a different embodiment of a yarn contacting member of the yarn brake shown in FIG. 1,

FIG. 4 is a vertical sectional view of a different embodiment of a yarn brake according to the invention which includes controlling means responsive to a minimum degree of feed of the yarn,

FIG. 5 is a top plan view of the detecting means of the device shown in FIG. 4, the means for braking the yarn being omitted,

FIG. 6 is a top plan view, partly in section, of a yarn guide for use in connection with a yarn brake according to the invention,

FIG. 7 is a side elevational view of the yarn guide shown in FIG. 6,

FIG. 8 is a diagrammatic illustration of an arrangement of three yarn brakes according to the invention, arranged in series,

FIG. 9 is a vertical sectional view of a yarn brake incorporating another embodiment of a controlling means responsive to feed of the yarn, and

FIG. 10 is a top plan view of the upper portion of the pulley shown in FIG. 9, the movable armature and the cover having been removed for clarity of illustration.

Referring now to FIG. 1, the yarn brake according to the invention comprises a roller **1** rotatably mounted on a bolt **4** by means of a ball bearing **3**. The roller **1** is provided with an annular V-shaped groove **2** for engagement with the yarn or the like during the unwinding of the latter from a bobbin or the like.

A braking disc **5** subjected to the action of a spring **6** exerts a braking action on the roller **1**. Said braking disc **5** may be made of leather, of rubber or of a friction material known in the trade as "Ferrodo"-material or of any other material having appreciable frictional properties. The braking action of the disc **5** may be controlled by an adjustment of a nut **7** screwed on the threaded end of the bolt **4** and engaged with the spring **6**. A special arrangement is provided to prevent the disc **5** from being rotated by the rotating roller **1** whereby the braking action of the disc **5** would be decreased. For this purpose, one end **30** of the spring **6** is fixed to the disc **5**, while the other end **8** of said spring **6** is engaged with a longitudinal slot **9** of the bolt **4**.

In accordance with the invention the groove **2** of the roller **1** is made in such a way that the taking along of the roller **1** by the yarn through adhesion is assured and the risk of sliding is eliminated.

Therefore, the groove **2** of the roller **1** shall be provided with a surface suitable for this purpose or the surface of said groove shall be coated with a very adhesive material. Said features can be obtained in many different ways and, preferably, the selection is made in consideration of the particular type of yarn to be engaged with the yarn brake and of the fibre making up the yarn.

For example, the roller **1** comprising the groove **2** may be made of a suitable material, for example a friction material known in the trade as "Ferrodo" or rubber or other friction materials.

Furthermore, if the type and/or quality of the yarn to be controlled by the yarn brake is changed quite often, a ring **10** of friction material as shown in FIG. 2 may be placed on the roller **1** for engagement with the groove **2** of the latter. Such a ring **10** molded of an elastic material can be readily mounted on the roller **1** and remains in its position by its own contraction. Furthermore, such a ring **10** may be readily replaced by another one when its portions coming into adhering engagement with the yarn are worn out or when a different type of yarn is to be controlled by the yarn brake.

Moreover, the desired effect may also be obtained by a special shape of the groove 2 of the roller 1. For example, as shown in FIG. 3, a roller 101 may have a groove 102 provided with outwardly extending ribs 111 or the like. Of course, the invention is not restricted to the particular form of a fluted groove as shown in FIG. 3.

Furthermore, the desired effect may be obtained by coating the surface of the groove 2 (FIG. 1) of the roller 1 with a material presenting a rough surface, such as a plastic material or emery which may be glued to or sprayed onto the surface of the groove.

According to the embodiment shown in FIGS. 4 and 5, the rotation of a roller 201 is utilized for controlling the delivery of the yarn.

As shown in FIG. 4, a roller bearing 203 carrying the roller 201 is mounted on a sleeve 215 electrically insulating a bolt 204 from said roller bearing 203 and roller 201. The roller 201 is electrically connected with one pole of an electric circuit by means of the bearing 203 and a support 216. The bolt 204 electrically insulated from its support 216 by means of the sleeve 215 and a washer 217 is made to contact a conductor 218.

Cover plates 240 and 241 are secured to the top and bottom faces of roller 201. A sleeve 242 supports the bearing 203 and makes electrical contact between the bearing and the support 216. Sufficient clearance exists between the cover plates and the bolt 204 to prevent short circuit.

The roller 201 has a recess 219 receiving a centrifugal detecting or controlling device generally indicated by 231. Said controlling device 231 comprises two weights 220 swingably mounted on pins 221 secured to the roller 201. Said weights 220 carry contacts 222 which are normally held in engagement with the bolt 204 by means of springs 223 connected to the weights 220 and engaged with the inner wall of the recess 219.

Elements 205–209 and 230 are similar to parts 5–9 and 30, respectively, of the embodiment shown in FIG. 1.

When, during the operation of the device, the roller 201 rotates, the weights 220 and their contacts 222 are moved away from the bolt 204 by the action of centrifugal forces. Now, if the delivery of the yarn engaged with the groove 202 of the roller 201 falls below a predetermined value depending on the control by the springs 223, the weights 220 are returned towards the bolt 204 for again closing the circuit.

All materials but the braking disc, washer 217 and sleeve 215 should be conductive. Where it appears that deformation of parts would cause short circuit of the current path suitable insulating strips may be used to prevent such failure.

Any desired effect may be caused by the closing of said circuit: for example the circuit may cause an acceleration of the machine or a stopping of the machine (if upon a breakage of yarn the delivery becomes zero) or the release of a signal.

Furthermore a two-step controlling system may be readily obtained by the control of two electric circuits by means of a bolt having two nested parts insulated from each other. Such an arrangement renders possible the control of a maximum and minimum delivery or travelling speed of the yarn.

In order to obtain a maximum adherence of the yarn in the groove, preferably the engagement of the yarn with the groove is carried out along an arc as large as possible as indicated by FIG. 6. As the yarn 32 has a very low tension at 12, said low tension being caused by the unwinding of the yarn from a bobbin or cop, preferably a yarn guide 13 is used so as to avoid an escape of the yarn from the groove 2 of the roller 1. Owing to the sufficiently extended and open wings 14 (FIG. 7) the yarn guide assures an instant threading of the yarn.

Under certain conditions requiring the application of an appreciable tension to the yarn a plurality of yarn brakes arranged in series may be used. For example FIG. 8 illustrates the use of three yarn brakes, the yarn 32 being trained around rollers 1, 1*a* and 1*b* of said brakes and travelling in the direction of the arrow A. One or more of such a series of yarn brakes may be equipped with a controlling device responsive to the degree of delivery or speed of the yarn.

FIGS. 9 and 10 illustrate another embodiment of a centrifugal circuit interrupter and controlling device. In FIG. 10 the movable armature and the cover have been removed for clarity of illustration. The apparatus of this embodiment is characterized by the fact that it comprises members which permit movement of the yarn during its unwinding by merely adherence, and simultaneously serves as means for controlling the tension as well as the unwinding of the yarn. In this embodiment the movable activating elements of the circuit interrupter which are subject to the action of centrifugal force have no effect on increasing or decreasing the transmission of the current and do not constitute one of the contact poles of the interrupter in contrast to the previous device of the embodiment of FIGS. 4 and 5. On the contrary, these movable elements serve solely as a mechanical intermediary rather than carrying the current themselves, and they function substantially without either pivots or articulation. The member or members of contact that are actuated by these movable elements are mechanically connected to engage other means for the closure of the electrical circuit and thus reduce the friction to the minimum when the circuit is opened or closed.

As in the device of FIGS. 4 and 5, all materials are conductive except as stated. The circuit interrupter in the embodiment of FIGS. 9 and 10 comprises a body portion 324 forming a roller or pulley for entraining the yarn during rotation. This body portion carries three identical radial grooves 325, in each of which may be located a ball 326. The cross-sectional shape of each groove conforms substantially to the outer surface or curvature of the balls and their profile includes a horizontal portion 326*a* in the vicinity of the central pivot and an inclined portion 326*b* toward the outer part of grooves 325.

The three balls are covered by a cap 327 which forms the movable armature of the electric interrupter. The cap 327 includes on its peripheral portion a conical surface 328 which is inclined inversely to slope 326*b* of the radial grooves 325 of the pulley, and which rest on the balls 326. A central portion 329 of cap 327 protrudes outwardly to form a base which engages a central pivot 330. Central portion 329 also forms a recess containing a returning means, for example a spring 331 which serves as a support against a cover 332 to urge cap 327 against pivot 330. The dimensions of the respective elements are such that whenever the pulley 324 is standing still or revolves at slow speeds, the balls 326 are on the horizontal portions 326*a* of the radial grooves 325, the engaging surfaces of the cap portion 329 and pivot 330 rest upon one another to close the electrical circuit. Inversely, in rapid motion, i.e. when the pulley 324 is entrained and set in motion by movement of the yarn, the cap 327 is raised in opposition to the force of its return spring 331 by movement of the balls 326 which mount the inclined profile 326*b* of the grooves 325 due to the action of the centrifugal forces. Thus, when cap 327 becomes disengaged with contact pivot 330 by raising of the portion 329 therefrom, the circuit from conductor 318 to support plate 335 is broken or interrupted.

Thus the current from conductor 318 in its path through central bolt 304 to central pivot 330 and destined toward portion 329 of the cap 327 passes solely through fixed members. However, in its return flow the current passes from cap 327 through pulley 324, through roller bearings 337 and sleeve 336. Bearings 337 embody the only movable, rather than fixed, current carrier of this embodiment since, as is required, the outer and inner races and balls of the bearing through which the current passes

move relative to each other. The support **335**, the sleeve **336** and the inner race of the ball bearing **337** form a fixed or stationary assembly. The external race of the ball bearing **337**, the pulley **324**, the cover **332**, the spring **331**, and the cap **327** all form a rotatable assembly, thus reducing to a minimum the possible causes of undesirable contact and of wear. The pole or contact **330**, which comprises the pivot, is fed directly with current through bolt **304** in a manner similar to that described in the embodiment of FIGS. 4 and 5. Bolt **304** is electrically insulated from supporting plate **335** by means of an insulating washer **334** and by means of an insulating sleeve **333**.

The retarding or braking effect of the device occurs in this embodiment on the lower portion of pulley **324**. A calibrated spring **338** is activated by means of an insulating friction disc **339** which frictionally engages a bottom cover **340** of the pulley. It is possible, by changing the calibration of spring **338** to regulate the tension of the yarn so as to vary the effect of the friction of the pulley.

Without departing from the scope of the present invention, it is also possible to vary the mode of operation of each of the elements of the apparatus other than as specifically described. For example, it is possible to modify the number of balls **326** or to replace them by rollers or by any other element capable of performing the same function. It is also possible to use only one instead of two of the slopes described to achieve the lifting of the cap, i.e. either the conical surface **328** of the cap **327** or the inclined slope **326***b* of the radial groove **325**. Furthermore, instead of a spring **331**, as means for returning the cap, either the force of gravity or, for example, magnetic attraction means may be employed. It is also possible to combine with the inventive current interrupter a means for regulating the braking effect of the bottom portion of the pulley so as to apply to the yarn a variable tension according to the particular requirement. For example, a system of screw threads may be mounted on sleeve **336**.

It is within the scope of the current interrupter of the present invention to apply the apparatus thereof not only to textile type machines, but to any type of machines or mechanism which serves either to control the unwinding of yarn or like material, or to control the rotation of any mechanical element.

We have described preferred embodiments of our invention, but it is understood that this disclosure is for the purpose of illustration, and that various omissions and changes in shape, proportion and arrangement of parts, as well as the substitution of equivalent elements for the arrangements shown and described may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

For example the roller **1** could be replaced by a belt drive, and the braking effect could be obtained by discs by the action of their own weight or by the action of electromagnetic elements.

Furthermore the centrifugal controlling mechanism could operate by means of mercury switches or ball switches.

On the other hand, the devices according to the invention may be applied to any machine wherein a yarn, thread or filament or similar material such as silver, roving or the like is unwound from a body. The controlling device according to the invention may be used very well in circular looms, winding frames, cop winders, warping machines, beamers or the like.

It will be readily understood from above, that in the device according to the invention the braking or control of the yarn is not exerted directly on the yarn but on an element (grooved roller **1**) engaged with the yarn by adhesion. The braking action on said element may be precisely adjusted. The yarn does not slide relative to said element and is not tightened between any members of the device. It is sufficient to regulate the braking of said element in such a way that the tension obtained in the yarn is constantly less than the critical tension which would determine the sliding.

The yarn brake according to the invention controls the tension in the yarn and the degree of feed thereof. Furthermore, the device according to the invention may be used for controlling the associated textile machine in response to a minimum or maximum feed of the yarn or to a breakage of yarn. Moreover, the device according to the invention assures an easy threading of the yarn.

What we claim is:

1. An electrical circuit interrupter responsive to rotary speeds for controlling the unwinding of yarn in textile machines, comprising a rotatable roller capable of engagement with a yarn, stationary braking means in engagement with said roller for braking same, together with said yarn in engagement therewith and controlling means lodged substantially within said roller and responsive to the rotating speed of said roller, said controlling means including a fixed assembly having a continuous electrical conductive path therethrough, means at least partially insulating said rotatable assembly from said fixed assembly, conductive means movable axially along said rotatable assembly into and away from a contacting position to respectively make and break electrical contact between said fixed and said rotatable assemblies, said fixed and said rotatable assemblies being adapted for connection to an extraneous controlling circuit for regulating the unwinding of said yarn, means for urging said conductive means into said contacting position, and centrifugally actuable means positioned between said rotatable assembly and said conductive means for moving the latter away from said contacting position at rotating speeds of said rotatable assembly in excess of a predetermined speed value.

2. A centrifugal electrical circuit interrupter responsive to rotary speeds, comprising a fixed assembly having a continuous electrical conductive path therethrough, a rotatable assembly having a continuous electrical conductive path therethrough, means at least partially insulating said rotatable assembly from said fixed assembly, conductive means movable along the axis of said rotatable assembly into and away from a contacting position to respectively make and break electrical contact between said fixed assembly and said rotatable assembly, resilient means for urging said conductive means into said contacting position, and centrifugally actuatable means positioned between said rotatable assembly and said conductive means for moving the latter away from said contacting position at rotating speeds of said rotatable assembly in excess of a predetermined speed value.

3. A centrifugal electric switching device for yarn brakes and the like, comprising an axle, a roller rotatably mounted upon the end of said axle and insulated therefrom, a recess in the face of said roller beyond the end of said axle, stationary brake means resiliently biased against said roller for retarding the same, a cover plate enclosing said recess, an electrical contact plate between said cover plate and the end of said axle, resilient means biasing said contact plate against said axle, an electric circuit passing through said axle, said contact plate, said resilient means, said cover plate, said roller and said brake means, and centrifugally responsive means in said recess in engagement with said contact plate for breaking said electric circuit when said centrifugally responsive means urges said contact plate against said resilient means and away from said axle.

4. A centrifugal electric switching device as set forth in claim 3, wherein said recess includes a plurality of inwardly declining paths whereby the distances between said paths and said contact plate increase in the inward direction, and said centrifugal means includes at least two balls each located in one of said paths and in engagement with said contact plate, whereby rotation of said

roller results in outward movement of said balls and in interrupting said electric circuit, the latter being adapted to perform switching actions at predetermined speed values of said roller.

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