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## (54) DEVICE AND METHOD FOR CONTROLLING A BALLOON WHEN UNRAVELING A YARN FROM A BOBBIN

(57) A device (12) for controlling a balloon during the unraveling of a yarn (14) from a bobbin (16), comprising: a containment element (15) adapted to contain at least partially said balloon of said yarn (14) with a through opening thereof (18); a support (20) adapted for supporting said containment element (15), and adapted to be fixed to a structure of a winding unit; movement means (22) arranged between said containment element (15) and said support (20), said movement means (22) being adapted to move said containment element (15), during the unraveling of the yarn (14) from the bobbin (16), between a rest position, and an extracted position; and a programmable control unit of said movement means (22). The movement means (22) are adapted for moving said containment element (15) from said rest position to said extracted position, based on at least one operating parameter set on said programmable control unit.

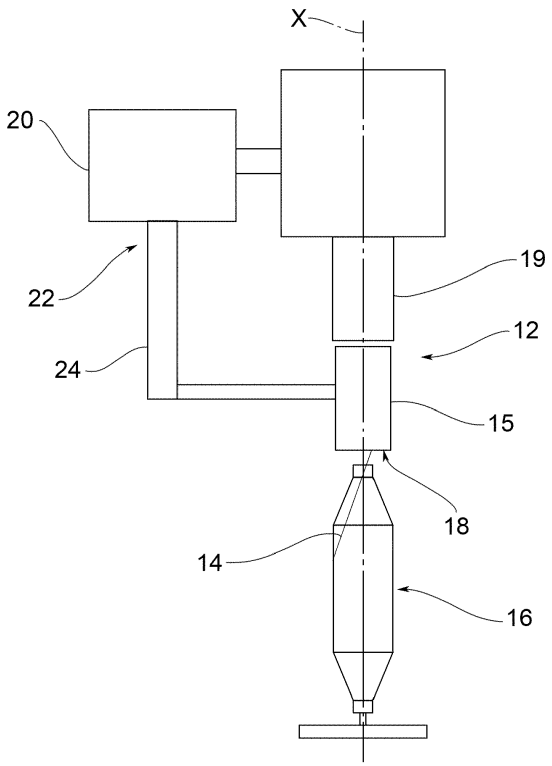


FIG.1

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## Description

FIELD OF APPLICATION

**[0001]** The present invention relates to a device for controlling a balloon during the unraveling of a bobbin, and to a method for controlling a balloon during the unraveling of a bobbin.

BACKGROUND ART

**[0002]** It is known that industrial-type winders comprise a plurality of mutually independent winding units, operated by a programmable control unit.

**[0003]** The winding unit winds a yarn onto a generally cone-shaped support to make a reel that will be used in weaving, knitting, or other next processes.

**[0004]** The yarn is wound on the support with a predetermined type of winding to optimize the successive unraveling of the yarn from the reel during the step of weaving.

**[0005]** In this description, the term thread or monofilament or continuous filament means a single filament or continuous bave (e.g. in the case of silk, artificial or synthetic fibers), while the term yarn means the set of fibrils of variable length which are parallelized and joined by twisting. Hereinafter, we shall use either term indiscriminately, meaning that the applications of the present invention are not limited to one type or the other.

**[0006]** The winding is preferably carried out with a cylinder in contact with the reel and rotating around an axis which is substantially parallel to that of the reel, arranged with a particular geometry of seats made on its surface.

**[0007]** It is known that the high unwinding speeds on the reel impose high unraveling speeds of the bobbins which feed the yarn that will be wound on the reel.

**[0008]** One of the main consequences of the increased bobbin unraveling speed is the increase in unwinding tensions, which in some cases can cause the yarn to break. Additionally, as the bobbin gradually empties, there is a further increase in tension due to the unwinding.

**[0009]** The yarn near the bobbin forms a so-called balloon; the yarn in its unwinding movement from the bobbin widens with respect to the shape of the yarn wound on the bobbin, and such widening extends for a given height above the bobbin. The more the unraveling speed increases, the more the diameter of the balloon increases.

**[0010]** A correlation between balloon diameter and unwinding tension is known; in particular, it is known that as the unwinding speed of the bobbin increases, the diameter of the balloon increases, and consequently so does the unwinding tension.

**[0011]** Attempts have been made in the prior art to solve this problem by trying to confine the diameter of the balloon by passing the yarn inside a containment element, having a substantially cylindrical shape, placed near the upper end of the bobbin from which the yarn unravels.

**[0012]** The containment element is part of a device known in technical jargon as a"balloon breaker", which comprises other components according to the functions associated with the device itself.

**[0013]** In particular, there are devices provided with a drive that allows the movement of the containment element towards the bobbin, i.e. downwards as the yarn is gradually emptied from the bobbin.

**[0014]** This solution is particularly appreciated because it makes it possible to maintain an optimal distance between the yarn still wrapped on the bobbin and the containment element so as to allow optimal confinement of the balloon inside the containment element.

**[0015]** Generally, the movement is performed through a drive connected to a screw element parallel to the direction of movement of the containment element, exploiting the movement of a so-called spiral screw coupling.

**[0016]** The device further comprises sensors, e.g. optical sensors, adapted to detect the height of the portion of bobbin covered with yarn and transmit such information to a programmable control unit, which consequently controls the drive to lower the containment element.

**[0017]** Such solution, although widely appreciated, is not free from drawbacks.

**[0018]** First of all, the system is highly complex because it requires continuous monitoring of the winding state of the yarn on the bobbin to be able to move the containment element continuously.

**[0019]** Furthermore, it is an expensive system because it requires the use of a drive, sensors, guides, etc. Given that a winder normally consists of a very high number of winding units, it can be easily understood that the cost of incorporating these devices into all winding units has a significant impact on the final cost of the winder.

**[0020]** Moreover, the high number of required components also affects the number of parts that could potentially have problems, or which in any case need to be subjected to routine and supplementary maintenance.

PRESENTATION OF THE INVENTION

**[0021]** The need is therefore felt to solve the drawbacks and limitations mentioned above with reference to the prior art.

**[0022]** Therefore, the need is felt to provide a balloon control device which has a simpler structure than the devices of the prior art.

**[0023]** Furthermore, the need is felt for a device which is less expensive than the devices installed on winders of the prior art.

**[0024]** Moreover, the need is felt for a system that does not provide the use of sensors to establish the winding state of the yarn on the bobbin.

**[0025]** Furthermore, the need is felt for a device that drastically reduces the time needed for its routine and supplementary maintenance.

**[0026]** Moreover, the need is felt for a method for controlling a balloon when unraveling a bobbin in a winding

unit which uses fewer sensors and is thus easier to implement with respect to the systems of the prior art.

**[0027]** These requirements are met at least partially by a balloon control device according to claim 1, and by a method for controlling a balloon during the unraveling of a bobbin according to claim 10.

DESCRIPTION OF THE DRAWINGS

**[0028]** Further features and advantages of the present invention will be more comprehensible from the following description of preferred embodiments given by way of nonlimiting examples, in which:

- figure 1 schematically shows a balloon control device according to the present invention in a first configuration of use; and
- figure 2 schematically shows a balloon control device according to the present invention in a second configuration of use.

**[0029]** Elements or parts in common to the embodiments described below will be indicated using the same reference numerals.

DETAILED DESCRIPTION

**[0030]** Figures 1 and 2 schematically show a device for controlling a balloon when unraveling a yarn 14 from a bobbin 16, which is indicated by reference numeral 12 as a whole. Such device 12 is adapted to be installed in at least one winding unit of a winder.

**[0031]** The device 12 for controlling the balloon comprises a containment element 15 adapted to contain at least partially in a through opening 18 thereof the balloon of the yarn 14.

**[0032]** Furthermore, the device 12 comprises a support 20 adapted for supporting the containment element 15 and adapted to be fixed to a structure of a winding unit.

**[0033]** The device 12 further comprises movement means 22 arranged between the containment element 15 and the support 20, adapted to move the containment element 15, during the unraveling of the yarn 14 from the bobbin 16, between a rest position, and an extracted position.

**[0034]** Furthermore, the device comprises a programmable control unit connected to the movement means 22.

**[0035]** The movement means 22 are adapted to move the containment element 15 from the rest position to the extracted position, based on at least one operating parameter set on the programmable control unit.

**[0036]** Figure 1 schematically shows the device 12 in a first configuration with containment element 15 in the rest position. Figure 2 schematically shows the device 12 in a second configuration with containment element 15 in the extracted position.

**[0037]** According to a possible embodiment of the present invention, the device 12 according to the present invention may comprise a second containment element 19 fixed with respect to the supporting structure 20. Conveniently, the second containment element 19 may be aligned with the containment element 15.

**[0038]** The at least one predetermined operating parameter may comprise the yarn thread count and/or the winding speed and/or processing time.

**[0039]** According to a possible alternative embodiment, the at least one predefined operating parameter may comprise yarn tension.

**[0040]** According to a possible embodiment of the present invention, the movement means 22 may comprise a linear actuator 24, which is schematically shown in figures 1 and 2. In particular, the linear actuator may be a pneumatic or hydraulic actuator.

**[0041]** The direction of movement can be substantially parallel to the direction of an axis X of a bobbin during unraveling. In particular, the direction of movement can be substantially vertical with respect to the supporting surface of the machine.

**[0042]** According to a possible embodiment of the present invention, the movement means 22 may only allow two operating positions, in particular the rest position, in which the containment element 15 is close to the support 15, and an extracted position, in which the containment element is spaced from the support 20 with respect to the previous position.

**[0043]** In this description, the expression operating position means a position that can be maintained while processing for a given processing time, e.g. longer than 5 seconds.

**[0044]** In other words, the movement means according to the present invention may allow a discrete positioning of the containment element 15 with respect to the support 20.

**[0045]** The distance between the rest position and the extracted position of the containment element 15 may be greater than 50 mm. In particular, the distance between the rest position and the extracted position of the containment element 15 may be between 60 mm and 100 mm.

**[0046]** According to a possible embodiment of the present invention, the predetermined operational parameter through which the programmable control unit controls the movement equipment is a processing time.

**[0047]** In particular, the programmable control unit may be adapted to require the movement of the containment element 15 when a given processing time is reached.

**[0048]** According to a possible embodiment, the preset operating parameter is the yarn count, and a percentage of yarn unwound from the bobbin. In this case, the operator can enter the two parameters in the programmable control unit which, together with the winding speed, will allow the programmable control unit to establish the percentage of yarn unwound from the bobbin and thus the consequent activation of the movement means.

**[0049]** Advantageously, the percentage of yarn unwound from the bobbin can be set to be between 40 and

50%.

**[0050]** According to a possible alternative embodiment, the at least one predetermined operating parameter may be the yarn tension. For example, the programmable control unit can be adapted to enter the yarn tension value at which activate the movement means 22.

**[0051]** In this regard, the balloon control device 12 may comprise at least one sensor adapted to detect the tension value reached by the yarn and to transmit such value to the programmable control unit to compare it with the value set by the operator.

**[0052]** The device 12 for controlling the balloon during the unraveling of yarn from a bobbin may allow a discrete positioning of the containment element 15 with respect to the support and, in particular, with respect to the bobbin. As mentioned above, the devices of the prior art allow a continuous movement of the containment device as the unwinding progress state changes. Such continuous movement, on the one hand, optimizes the containment of the balloon, but on the other hand, has a heavy impact on the cost of the machine and its complexity.

**[0053]** With the device of the present invention, although only a discrete number of positions are possible, it has been noted that the control of the balloon during unraveling is efficient enough to allow processing at very high winding speeds, e.g. ranging from 800 meters per minute to 1500 meters per minute.

**[0054]** In a possible alternative embodiment, the movement means may comprise an electric actuator. The electric actuator may allow a continuous movement between the rest position and the extracted position.

**[0055]** Therefore, in any case, the balloon is controlled without the presence of sensors which must be managed by a programmable control unit which can be very complex.

**[0056]** In the device of the present invention, the programmable control unit may, for example, be a simple timer, adapted to control the movement means when a given processing time is reached.

**[0057]** In particular, the use of only two positions of the containment device was found to be particularly advantageous, with significant advantages in terms of simplicity of construction.

**[0058]** A possible method for controlling a balloon while unraveling a bobbin in a winding unit of a winder will be described.

**[0059]** The method substantially comprises the steps of:

- preparing a balloon control device 12 as described above;
- moving the containment element 15 from the rest position to the extracted position based on at least one operating parameter set on the programmable control unit.

**[0060]** Furthermore, the predetermined operating parameter, for example, may be the yarn thread count and/or the winding speed and/or a processing time.

**[0061]** According to a possible embodiment, the predetermined operating parameter can be the yarn tension.

**[0062]** Therefore, the advantages of the method according to the present invention are now apparent.

**[0063]** In particular, the method makes it possible to obtain efficient balloon control during the unraveling of a bobbin in a winding unit of a winder without using information received from sensors.

**[0064]** Furthermore, the method makes it possible to use simple linear actuators that allow discrete positioning of the containment element.

**[0065]** Reference was made to a discrete number of positions of the containment element, referring to the preferred embodiment with only two positions in the preceding description. However, embodiments are possible in which the number of discrete positioning of the containment element may be greater than two, e.g. three.

**[0066]** In the embodiments described above, a person skilled in the art will be able to make changes and/or substitutions of elements described with equivalent elements without departing from the scope of the appended claims to satisfy specific requirements.

## Claims

1. Device (12) for controlling a balloon during the unravelling of a yarn (14) from a bobbin (16), comprising:

   - a containment element (15) adapted for containing at least partially with a through opening thereof (18) said balloon of said yarn (14);
   - a support (20) adapted for supporting said containment element (15), and adapted for being fixed to a structure of a winding unit;
   - movement means (22) arranged between said containment element (15) and said support (20), said movement means (22) being adapted to move said containment element (15), during the unravelling of the yarn (14) from the bobbin (16), between a rest position, and an extracted position; and
   - a programmable control unit of said movement means (22) ;

   **characterised in that**
   said movement means (22) are adapted for moving said containment element (15) from said rest position to said extracted position, based on at least one operating parameter set on said programmable control unit.

2. Device (12) according to the preceding claim, **characterized in that** said at least one predetermined operating parameter comprises the yarn thread count and/or the winding speed and/or a processing

time.

3. Device (12) according to claim 1, **characterized in that** the predetermined operating parameter is the tension of the yarn.

4. Device (12) according to any one of the preceding claims, **characterized in that** said movement means (22) comprise a linear actuator.

5. Device (12) according to the preceding claim, **characterized in that** said linear actuator is a pneumatic or hydraulic actuator.

6. Device (12) according to any one of the claims 1-4, **characterized in that** said movement means (22) comprise an electric actuator.

7. Device (12) according to the preceding claim, **characterized in that** said movement means (22) are suitable for moving said containment element (15) continuously between said rest position and said extracted position.

8. Device (12) according to any one of the claims 1-6, **characterized in that** said movement means (22) allow only two processing positions for said containment element (15), the rest position and the extracted position.

9. Device (12) according to any one of the preceding claims, **characterized in that** the distance between said rest position and said extracted position of the containment element (15) is greater than 50 mm.

10. Device (12) according to the preceding claim, **characterized in that** the distance between said rest position and said extracted position of the containment element (15) is between 60 mm and 100 mm.

11. Method for controlling a balloon while unravelling a bobbin in a winding unit of a winder, comprising the steps of:

- providing a device (12) for controlling a balloon during the unravelling of a yarn (14) from a bobbin (16) according to any one of the claims 1-10;
- moving said containment element (15) from the rest position to the extracted position based on at least one operating parameter set on said programmable control unit.

12. Method for controlling a balloon according to the preceding claim, **characterized in that** said predetermined operating parameter is the thread count of the yarn and/or the winding speed and/or a processing time.

13. Method for controlling a balloon according to any of the claims 11-12, **characterized in that** said movement means (22) are adapted for moving said containment element (15) based on a percentage of yarn unravelled from said bobbin (16) set by an operator on said programmable control unit.

14. Method for controlling a balloon according to claim 11, **characterized in that** the predetermined operating parameter is the yarn tension.

15. Method for controlling a balloon according to any one of the claims 11-14, **characterized in that** following a breakage of the yarn during the unravelling operation, said movement means (22) are controlled by said programmable control unit to return the containment element (15) from the extracted position to the rest position.

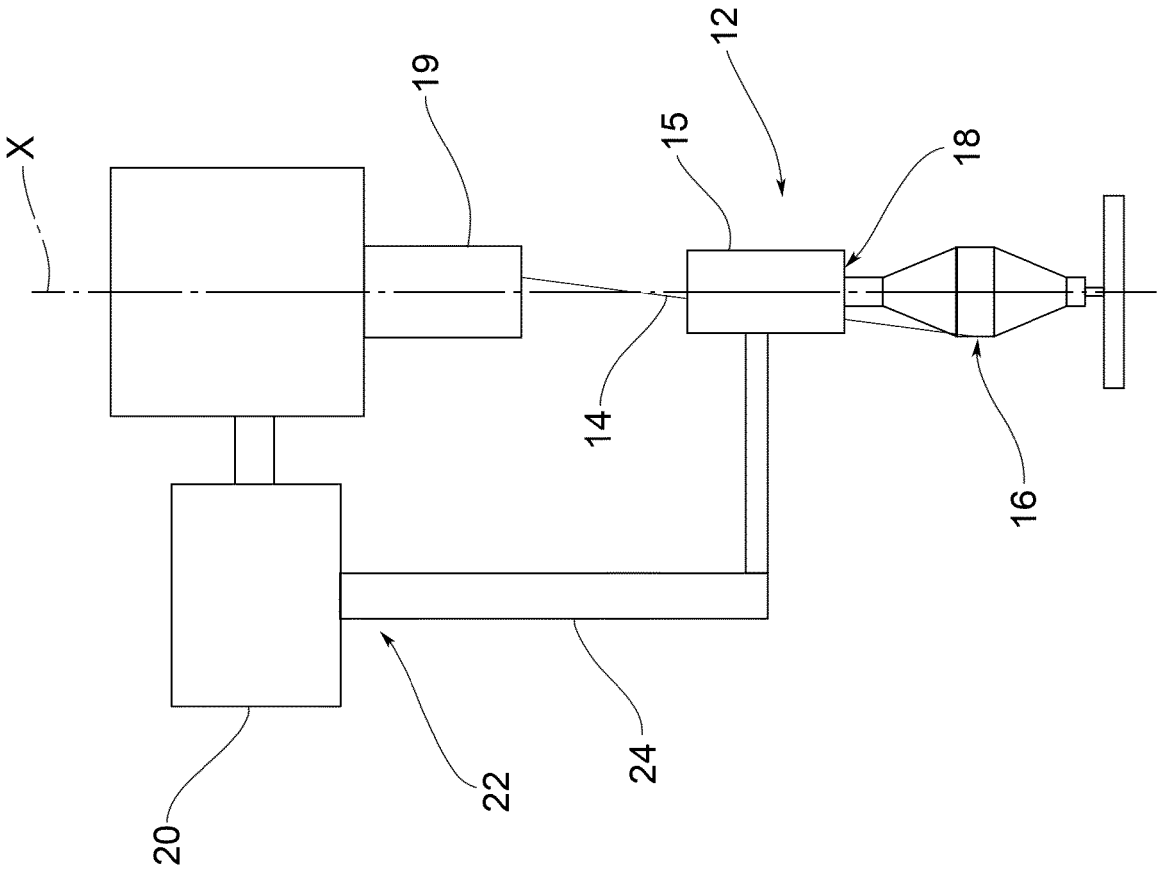


FIG.2

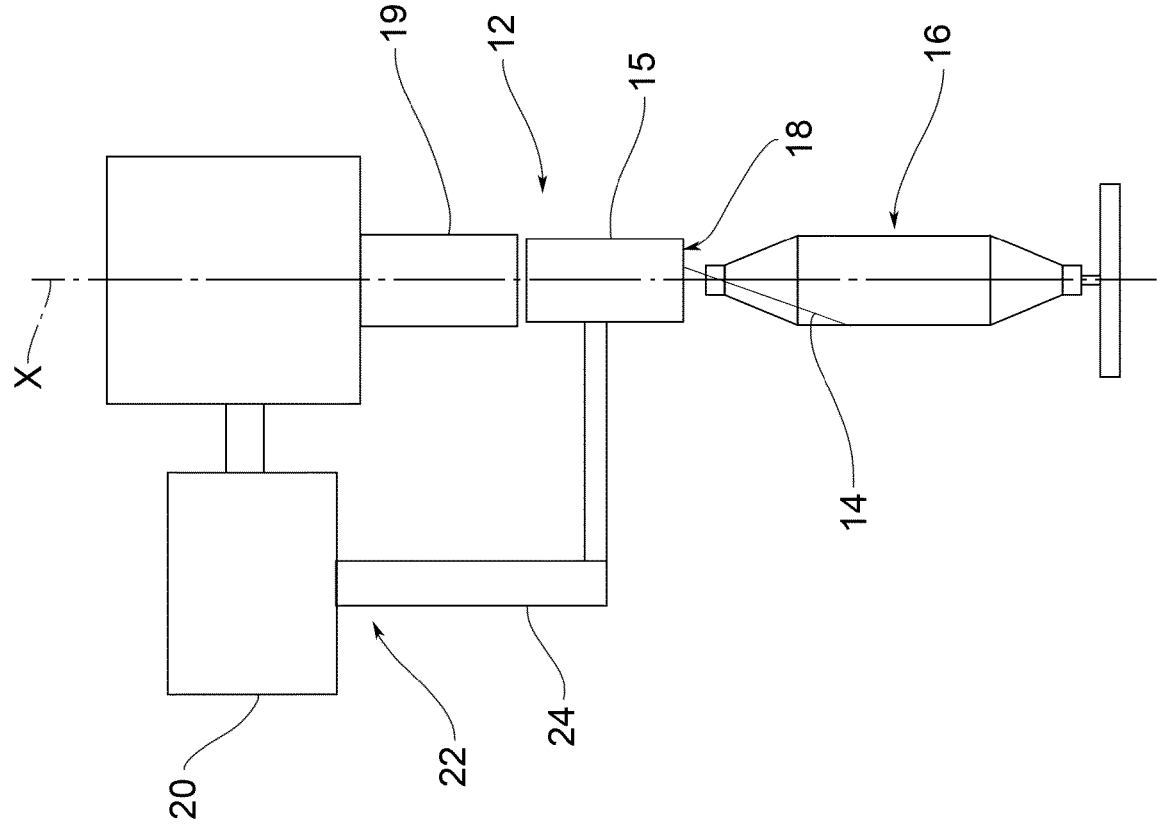


FIG.1

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# EUROPEAN SEARCH REPORT

Application Number
EP 20 17 9780

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The present search report has been drawn up for all claims

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|---|---|---|
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CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 17 9780

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