(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 301 209 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.04.2018 Bulletin 2018/14

(51) Int Cl.:
D01H 13/14 *(2006.01)* ***D01H 13/26*** *(2006.01)*
D01H 13/32 *(2006.01)*

(21) Application number: **17193448.2**

(22) Date of filing: **27.09.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **29.09.2016 CZ 20160607**

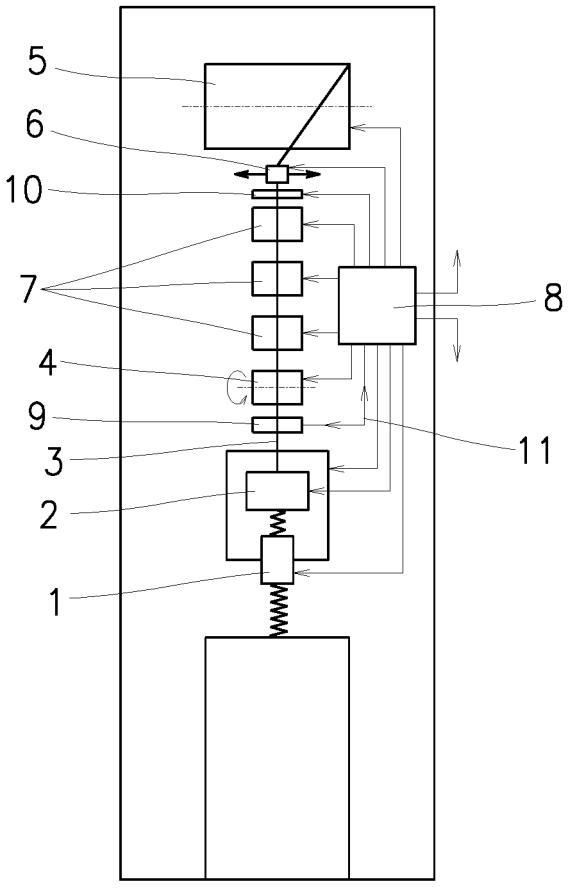
(71) Applicant: **Rieter CZ s.r.o.**
562 01 Ústí nad Orlicí (CZ)

(72) Inventors:
- **Kousalik, Pavel**
  562 03 Usti nad Orlici (CZ)
- **Beran, Zdenek**
  563 01 Lanskroun (CZ)

(74) Representative: **Musil, Dobroslav**
Zabrdovicka 801/11
615 00 Brno (CZ)

(54) METHOD FOR MONITORING YARN AT A WORKSTATION OF A TEXTILE MACHINE AND A TEXTILE MACHINE FOR PERFORMING THE METHOD

(57) The invention relates to a method for monitoring yarn (3) at a workstation of a textile machine having a row of workstations arranged next to each other and also to a textile machine, in which the yarn (3) being produced is during its production monitored by a yarn quality sensor (9), yarn defects are detected (3), the quality of yarn is evaluated (3) and the data is transmitted to a control device (8), which makes decisions about the subsequent processes at the workstation. The control device (8) transmits to the yarn quality sensor (9) online and real-time information about the current operating conditions of the workstation and the yarn quality sensor (9) accordingly adjusts the processes of monitoring the yarn (3) and evaluating the yarn parameters (3), whereupon the results of the thus adjusted process of monitoring the quality of the yarn (3) are sent to the control device (8) so that decisions can be made about further processes at the workstation.



EP 3 301 209 A1

Description

Technical field

[0001] The invention relates to a method for monitoring yarn at a workstation of a textile machine, in which the yarn being produced is during its production monitored by a yarn quality sensor, yarn defects are detected, the quality of yarn is evaluated and the data is transmitted to the control device, which makes decisions about the subsequent processes at the workstation.

[0002] The invention also relates to a textile machine with a device for monitoring yarn at a workstation, which comprises a row of workstations arranged next to each other, where each workstation comprises a yarn quality sensor, which is aligned with the yarn working path and connected to a control device which is provided with means for decision making and controlling the workstation.

Background art

[0003] In yarn production, the yarn being produced is monitored at a workstation of a textile machine by a yarn quality sensor, which is connected to a control device of a workstation and/or of a group (section) of the workstations and/or of the machine. The yarn quality sensor is largely an autonomous device, preset to monitor specific desired yarn characteristics, so it monitors the yarn, evaluates its characteristics and sends the data about the results to the control device. The control device is then provided with means for making decisions about the steps which follow in the event of finding a yarn defect at the workstation. Generally, yarn defects are detected by the yarn quality sensor which has set so-called cleaning limits or the so-called cleaning curve. The cleaning limits or the cleaning curve characterize for the yarn quality sensor the difference between which detected yarn parameter change is considered a defect and which is not considered a defect. Different types of defects are distinguished according to their characteristics, particularly defects of different lengths and diameters, or cross-section defects, an increase in the unevenness or hairiness of yarn, etc. If the change in the yarn parameter exceeds the limits defined by the cleaning limits or the cleaning curve, it is assessed as a real yarn defect and the yarn defect removal process is initiated by the control device.

[0004] However, in yarn production, there are specific activities and situations when it is rather difficult to find out whether the yarn parameter currently detected is defective or not because a certain yarn parameter may be considered a fault in one situation, while in a different situation it may not be considered a fault.

[0005] A typical case like this is the production of fancy yarns during which the parameters of the yarn being spun out are intentionally changed at the workstation in time, i.e., along the length of the yarn, so that these changes will cause the desired change in the yarn parameters. The so-called "fancy quality" of the yarn manifests itself in the intentional unevenness of the yarn appearance, such as local thick spots, local thin spots, local changes in the number of yarn twists, etc., which influences the yarn appearance, etc. The occurrence of these "events" in the yarn is detected by the yarn quality sensor. However, even in the case of these fancy yarns it is necessary to detect the occurrence of undesired phenomena, which are afterwards evaluated as faults or lowered quality of the yarn, hereinafter denoted by the general term yarn faults. As a rule, these yarn faults after being detected need to be removed from the yarn. In the case of fancy yarns, even intentional irregularities of yarn may, by their nature, exceed the above-mentioned boundary of the cleaning limits or the cleaning curve, in the same manner as the undesirable irregularities, which means that in the standard approach even these desired, i.e., intentionally created irregularities of the yarn, would be classified as real yarn faults or yarn of lowered quality and would be automatically removed from the yarn (according to their severity), which is undesirable in this case. A solution is known for improving the detection of yarn faults of fancy yarns according to WO 2010 009 565, in which, in addition to the cleaning curve, additional areas of the so-called permitted events (permitted irregularities) are introduced into the evaluation process of yarn faults, which do exceed the boundary set by the cleaning limits or the cleaning curve, but the sensor or the control system does not consider them as defects to be removed from the yarn. These areas of permitted events describe the character of the permitted cases of unevenness (permitted faults) of the yarn which upon being detected are not signalled as faults and the process of fault removal is not initiated.

[0006] Furthermore, US 7,424,800 discloses a solution which introduces in the evaluation process of yarn faults additional criteria describing the "good" yarn and describing also intentional irregularities of yarn. When the occurrence of these criteria is detected by the yarn quality sensor, it is then decided whether a "good" yarn or yarn with intentional unevenness has passed through it, or whether undesirable (not permitted) irregularity has passed through the sensor, and a decision is made accordingly whether to start the fault removal process.

[0007] The disadvantage of these solutions is the need to change the setting and parameters of the areas of the permitted events, or the setting of the additional criteria each time when there is a change in the type of yarn produced or a change in the intentional irregularities of the yarn parameters, which is a demanding and complicated process.

[0008] Another problem in the production of yarns is the occurrence of numerous states which affect the detected yarn parameters and which, moreover, in spite of exceeding the cleaning limits or the cleaning curve, cannot be considered as defects, since in terms of the whole workstation the state in question is classified as a delib-

erately selected state or change in the state. An example of this is typically the addition of liquid additives to the yarn in an air-jet spinning machine during spinning of some types of artificial fibers. The supplied liquid is a technological necessity and during the yarn production and detection of its quality it manifests itself in the yarn, for example, by reducing the "hairiness" of yarn, by changing the detected yarn diameter, etc. However, if a liquid supply failure occurs in the process, whether a reduction or increase in the amount of the liquid supplied, or in case of a complete failure, this may not always be properly detected by the yarn quality sensor, which may lead to subsequent decision errors, etc. Also, situations may occur when the amount of liquid being injected is deliberately changed and a change in yarn parameters caused by this change may not be classified as a fault.

[0009] Another problem situation to which current yarn quality sensors are unable to respond adequately is, for example, a change in the speed of the yarn being produced, which does not necessarily be reflected on the change in the yarn thickness or other parameters, but it has a significant influence on the evaluation of yarn faults, especially of those in which also the length of the fault must be assessed. Assuming that the standard speed of the yarn movement during production is 300 m.min-1, the yarn quality sensor has cleaning limits or a cleaning curve set to correspond to this speed, which means that at this speed of the yarn movement, a determined length of the yarn passes through the monitoring zone of the yarn sensor per unit of time, which is expected in advance because the current yarn quality sensors do not monitor the yarn continuously but sequentially, which means that a given number of yarn images are taken per unit of time, and this is expected in determining the defective length and the overall statistical evaluation of the yarn quality. Nevertheless, if for some reason the yarn speed at the workstation changes, the yarn length which will pass through the yarn quality sensor per unit of time will change as well, although the frequency of the yarn images taken by the yarn sensor within this unit of time will be the same. However, not knowing that the speed of yarn has changed, the yarn quality sensor evaluates the length parameters of the yarn faults wrongly. The evaluation of the length faults is therefore completely wrong and the overall statistics of the evaluation of the yarn quality is wrong.

[0010] There are also a number of other situations when the yarn quality sensor is not able to react properly to the situation at the workstation of the textile machine and a faulty detection of a defective state occurs, or, on the contrary, a defective condition is not detected.

[0011] A common disadvantage of the background art is therefore the limited ability of the yarn quality sensor to react flexibly to different changes in the conditions during the production of yarns at the workstation.

[0012] Therefore, the aim of the invention is to eliminate or at least minimize the drawbacks of the background art, especially improve the detection of yarn in terms of changes of the working states at the workstation of the machine.

Principle of the invention

[0013] The aim of the invention is achieved by a method for monitoring yarn at a workstation of a textile machine whose principle consists in that a control device transmits online and in real-time information about the current operating conditions of the workstation to a yarn quality sensor, which accordingly adjusts the process of monitoring the yarn and evaluating the yarn parameters and sends the results of the thus adjusted process of monitoring the yarn quality to the control device so that decisions can be made about the subsequent processes at the workstation.

[0014] The invention also relates to a textile machine with a device for monitoring yarn at a workstation, whose principle consists in that the yarn quality sensor and the control device are interconnected by a means for online and real-time bidirectional transmission of information about the paramaters of the yarn being produced and/or about changing conditions at the workstation.

[0015] The advantage of this solution is that it enables to change the setting of the yarn quality sensor operatively in real-time mode according to the currently performed operation at the workstation, so that the yarn quality sensor is always properly set to monitor the yarn being produced according to the current settings of the working organs of the workstation.

Description of drawings

[0016] The invention is schematically illustrated in the drawing, which shows online and real-time bidirectional interconnection of the yarn quality sensor and the control device (of the workstation, of the section, of the machine).

Examples of embodiment

[0017] The invention will be described with reference to an exemplary embodiment of a yarn making textile machine. The machine comprises at least one row of identical workstations arranged next to each other. Each workstation comprises a system of working nodes, working means, working organs to transform fibers into yarn. In the direction of the fibers movement, the workstation first comprises a fiber feeding device **1**, whose outlet leads to a spinning unit **2** of fibers, in which continuous yarn **3** is formed from the fibers, e.g., by means of a spinning rotor or a spinning nozzle. From the spinning unit **2** the yarn **3** is drawn off by a drawing-off mechanism **4** of yarn and is wound on a bobbin **5**, whereby the yarn is traversed across the bobbin **5** width by a traversing device **6** of yarn. If necessary, depending on the specific embodiment, other nodes **7** are arranged between the drawing-off mechanism **4** of yarn from the spinning unit **2** and the traversing device **6** of yarn on the bobbin **5**,

such as a compensator of fluctuations of the difference between the winding speed and the drawing-off speed during winding the yarn on a conical bobbin, an intermediate storage device of yarn and other working nodes and devices, etc. The arrangement of a workstation of a yarn making textile machine, including possible variants, are well-known and therefore it is not necessary to describe it in detail. The individual nodes **1** to **7** of the workstation are connected to a control device **8**, i.e., either to the control device of the workstation and/or to the control device of a group of the workstations, the so-called section, and/or are connected to the control device of the textile machine.

[0018] A yarn quality sensor **9** is arranged between the outlet of the yarn **3** from the spinning unit **2** and the traversing device **6** of yarn on the bobbin **5.** Generally, the yarn quality sensor **9** is usually arranged between the outlet of the yarn **3** from the spinning unit **2** and the drawing-off mechanism **4** of yarn from the spinning unit **2**, whereas between the drawing-off mechanism **4** of yarn from the spinning unit **2** and the winding device of yarn on a bobbin **5** is usually arranged a sensor **10** of the yarn **3** presence, which enables to detect a yarn **3** break in this area.

[0019] The yarn quality sensor **9** and, optionally, the sensor **10** of the yarn presence, is connected to the control device **8** (of the workstation, of the section, of the machine), which is equipped with software for making decisions about the operations at the workstation in case that undesirable state of the yarn **3** at the workstation is detected by the respective sensor **9, 10.** In the event of undesirable state or undesirable yarn **3** parameter being detected at the workstation, the control device **8** issues instructions to start necessary activities at the workstation to eliminate the undesirable state.

[0020] To implement the present invention, the yarn quality sensor **9** and the control device **8** assigned to it, whether it is the control device of the workstation and/or the control device of the section of the workstations and/or the control device of the textile machine, are interconnected with the aid of a means **11** for bidirectional online communication in real-time. According to one embodiment, this means for bidirectional online communication in real-time is provided as a means for transmitting two-state information. In another embodiment, the real-time bidirectional online communication means **11** is implemented as a means for transmitting analog information. In another embodiment, the real-time bidirectional online communication means **11** is realized as a data communication means. In another unillustrated example of embodiment, the real-time bidirectional online communication means **11** is implemented using simultaneously several methods, either by multiplying the communication means or by transmitting one type of information by one communication means and by transmitting a different type of information by another communication means. As can be seen from the above, the yarn quality sensor **9** at the workstation for the implementation of the present invention is connected by the real-time bidirectional online communication means **11** with the control device **8** of the workstation and/or the control device of the section of the workstations and/or the control device of the textile machine.

[0021] In the following, an embodiment of the invention will be described in the production of fancy yarns, i.e. yarns **3** with deliberately generated changes in the yarn **3** parameters. The production of fancy yarns takes place at a workstation of a textile machine in such a manner that during yarn **3** production at least some working nodes **1** to **7** of the workstation receive instructions from the control device **8** (of the workstation, of the section of workstations, of the textile machine) to change the operating parameters of these working nodes **1** to **7**, and these changes manifest themselves in the produced yarn **3** by the occurrence of intentional irregularities that are required (deliberate) to produce the so-called fancy yarns **3**. The intentional irregularities of yarn **3** thus created are generated artificially by a targeted change of the operating parameters of at least some working nodes **1** to **7** of the workstation. The result of the thus generated intentional irregularities of yarn **3** on the yarn **3** passing during production through the monitoring zone of the yarn quality sensor is the required (deliberate) change in the yarn **3** parameters in the specific length section of the continuous yarn **3**.

[0022] The evaluation of the quality of the yarn **3** with intentional irregularities and detecting faults in this yarn **3** is then performed in such a manner that the yarn **3** is monitored by the yarn quality sensor **9** and the detected values of the yarn **3** parameters are evaluated and on the basis of the decision-making process it is determined whether the respective section of the yarn **3** is considered faulty or not. It is important to note that intentional irregularities of the yarn **3** during this decision-making process are not considered a fault, whereas unintentional unevenness of the yarn **3** or unintentional changes in a yarn **3** parameter are classified as defective.

[0023] To be able to distinguish at all the intentional irregularities of yarn **3** from the undesirable unevenness of yarn **3** and other faults of yarn **3**, or, in other words, to be able to distinguish desirable and undesirable yarn **3** parameters, the control device **8** (of the workstation, of the section, of the machine) according to the invention transmits to the yarn quality sensor **9** online in real-time information about the yarn **3** parameters being currently deliberately changed in the specific sections of the yarn **3** length (the information about operating parameters of the respective working nodes **1** to **7** of the workstation being currently deliberately changed), and so the sensor **9** "knows" when the intentional unevenness of the yarn **3** (the beginning of the unevennes) will enter the measuring zone, and, if necessary, it even "knows" what parameters this intentional unevenness of the yarn **3** should have, or it even "knows" when this intentional unevenness of the yarn **3** will end.

[0024] Thus, the yarn quality sensor **9** behaves essen-

tially in three ways on the basis of this received information at the time when the yarn **3** with deliberately generated irregularities passes through the measuring zone of the sensor **9**.

[0025] In the first case, the yarn quality sensor **9** does not monitor the yarn **3** at all (it switches off) in the length sections corresponding to the intentional irregularities of the yarn **3** and these sections of the yarn **3** are not included in the complex evaluation of the quality of the spun-out yarn **3** at all.

[0026] In the second case, the yarn quality sensor **9** monitors the yarn **3** in the length sections corresponding to the intentional irregularities of the yarn **3** and evaluates the quality of the yarn **3** also in these sections, but according to criteria or according to the cleaning curve which are different from the criteria used for the assessment of the yarn **3** quality in the sections without intentional irregularities. If in this case the yarn quality sensor **9** receives from the control device **8** also the information about at least one qualitative parameter of the intentional irregularity of the yarn **3** in the respective section of the yarn **3** length, then the yarn quality sensor **9** monitors the yarn **3** in the length sections corresponding to the intentional irregularities of the yarn **3** and in these sections also the degree of the match between the specific intentional irregularity of the yarn **3** with the information about the required intentional unevenness of the yarn **3**, which is the third way of the sensor behaviour.

[0027] According to a preferred embodiment, the control device **8** transmits to the yarn quality sensor **9** the information about the start and the end, or about the start and the length of the intentional unevenness of the yarn **3**, so that the sensor **9** can evaluate each intentional unevenness of the yarn **3** in terms of its occurrence as well as in terms of the length of the intentional unevenness of the yarn **3**.

[0028] According to another advantageous embodiment, the control device **8** transmits to the yarn quality sensor **9** the information about at least one qualitative parameter of the deliberate unevenness of the yarn **3** in the respective section of the yarn **3** length. As a result, the yarn quality sensor **9** can evaluate each intentional unevenness of the yarn **3** form the point of view of its parameters in the given section of the yarn **3**.

[0029] In another embodiment of the invention, when monitoring the quality of uniform yarn **3** on an air jet textile machine, in which auxiliary liquid is fed in the process of yarn **3** formation, typically water or a mixture of water base or another liquid, during the standard yarn **3** production, the yarn **3** exhibits certain parameters, including the fact that it contains said liquid. In terms of the detected yarn **3** parameters, this influnces, for example, the hairiness of the yarn **3**. However, if the detected yarn **3** hairiness changes, this may not necessarily mean a liquid supply error, since it may be also caused by other errors. The determination of whether or not there is a liquid supply error can be done due to this invention completely automatically. For example, the control system **8** gives a signal to the liquid supply system, which is also one of other working nodes **7** at the workstation, namely the signal to increase the liquid supply. At the same time, the control system **8** sends to the yarn quality sensor **9** online and in real-time the information about the change of the liquid supply and the yarn quality sensor **9** gets ready for monitoring yarn **3** with a larger amount of the liquid and sends to the control device **8** the detected yarn **3** parameters without a liquid or with less liquid. According to the detected yarn **3** parameters the control device **8** then decides about the further steps at the workstation, e.g., about stopping the workstation and removing the fault, or about resumption of the original supply of the liquid and spinning resumption, or decides about another test, in which, for example, the supply of the fed liquid is stopped or reduced, information is sent online and in real-time to the yarn quality sensor, which gets ready for monitoring such yarn **3** and sends the detected parameters of the yarn **3** back to the control device **8**. Subsequently, the control device **8** decides about the further procedure of the operations at the workstation.

[0030] Another example of the use of the present invention is the possibility of detecting correctly defects and overall quality of the yarn **3** even during the repeated (short-term) changes in the speed of yarn **3** during stable yarn **3** production when the control device **8** sends the yarn quality sensor **9** online and in real-time information about this repeated (short-term) change in the speed of yarn **3**, the yarn quality sensor **9** adjusts the setting of its parameters in real-time to adapt them to the current speed of the yarn **3** and subsequently performs proper and reliable monitoring of the yarn **3** quality (sending the data to the control device **8**) adaptively according to the current speed of the yarn **3** movement.

[0031] A fundamental feature of the invention is therefore the adaptation of the yarn quality sensor to the current conditions at the workstation or to immediate changes in these conditions, which is made possible by the fact that the control device **8** informs online and in real-time the yarn quality sensor **9** about the current conditions at the workstation or about changes in these conditions. Thus, the yarn quality sensor **9** always adapts to these current conditions and is able to either correctly evaluate the yarn **3** quality and the occurrence of faults in a variety of situations, or serve to detect the states of the working means of the workstation, etc.

[0032] In principle, this invention allows adaptive sensing of the yarn **3** parameters, always based on the current conditions at the workstation or on the current setting of the working nodes **1** to **7** at the workstation.

[0033] It is clear that there is a number of possible scenarios of how to use the adaptive yarn quality sensor, while the basic principle is always maintained, namely that the control device **8** transmits online and in real-time the information about the current operating conditions of the workstation to the yarn quality sensor **9**, which accordingly adjusts the process of yarn **3** monitoring and the yarn **3** parameters evaluation and sends the results

of the thus adjusted monitoring of the yarn **3** quality to the control device **8**, which decides about the subsequent processes at the workstation. The control device **8** either transmits to the yarn quality sensor **9** the information about the start and the end, or the start and duration of the changes in the operation of the nodes **1** to **7** of the workstation, or the control device **8** transmits to the yarn quality sensor **9** the information about at least one qualitative parameter of the change in the operation of the nodes **1** to **7** of the workstation in the respective section of the yarn **3**. On the basis of the information about the current operating conditions of the nodes **1** to **7** of the workstation, the yarn quality sensor **9** then adjusts the processes of monitoring and evaluatiing the yarn **3** according to these current operating conditions of the nodes **1** to **7** of the workstation. At the same time, the information about the current operating conditions of the nodes **1** to **7** of the workstation is transmitted as two-state information and/or as analog information and/or as a data communication.

[0034] It is obvious that the invention is not limited only to the embodiments specifically described herein, since the principle of the invention, which consists in implementing real-time bidirectional online communication between the yarn quality sensor **9** and the control device **8** and transmitting information about ongoing processes or their changes in order to improve and simplify the detection of different yarn **3** states under different conditions at the workstation, can be implemented in a wide range of textile machines and methods of yarn **3** production or yarn **3** modification.

Claims

1. A method for monitoring yarn (3) at a workstation of a textile machine having a row of workstations arranged next to each other, in which the yarn (3) being produced is during the production process monitored by a yarn quality sensor (9), yarn (3) faults are detected, the quality of yarn (3) is evaluated and the data is transmitted to a control device (8), which controls processes at the workstation, **characterized in that** during stable yarn (3) production the control device (8) transmits to the yarn quality sensor (9) online and in real-time information about the current operating conditions of the workstation, including the information about short-term repeated changes, the yarn quality sensor (9) accordingly adjusts in real-time the processes of monitoring the yarn (3) and of evaluating the yarn (3) parameters and sends the results of the thus adjusted yarn (3) monitoring process to the control device (8) for controlling the workstation.

2. The method according to claim 1, **characterized in that** the control device (8) transmits to the yarn quality sensor (9) information about the start and the end or about the start and the duration of the changes in the operation of the nodes (1 to 7) of the workstation.

3. The method according to claim 1, **characterized in that** the control device (8) transmits to the yarn quality sensor (9) information about at least one qualitative parameter of a change in the operation of the nodes (1 to 7) of the workstation in the respective section of the yarn (3) length.

4. The method according to any of claims 1 to 3, **characterized in that** on the basis of the information about the currrent conditions of the workstation operation, the yarn quality sensor (9) adjusts the processes of monitoring and evaluating the yarn (3) according to these current conditions of the workstation operation.

5. The method according to any of claims 1 to 4, **characterized in that** the information about the current operating conditions of the workstation is transmitted as two-state information and/or as analog information and/or as data communication.

6. The method according to any of claims 1 to 5, **characterized in that** the control device (8) transmits to the yarn quality sensor (9) online and in real-time information about the current intentionally generated changes in the yarn (3) parameters in the given sections of the yarn (3) length, whereby the yarn quality sensor (9) on the basis of the information received at the time when the yarn (3) with thus intentionally altered parameters passes through the measuring zone of the sensor (9), the yarn (3) is either not monitored at all in the corresponding length sections, these sections of yarn (3) not being included in the overall evaluation of the quality of the spun-out yarn (3), or the yarn (3) quality sensor monitors the yarn (3) in the length sections with the intentionally altered parameters and in these sections it evaluates the yarn (3) quality according to the cleaning limits or according to the cleaning curve, which are different from the cleaning limits or the cleaning curve used for the yarn (3) sections without deliberately changed parameters and this data is sent online to the control device (8).

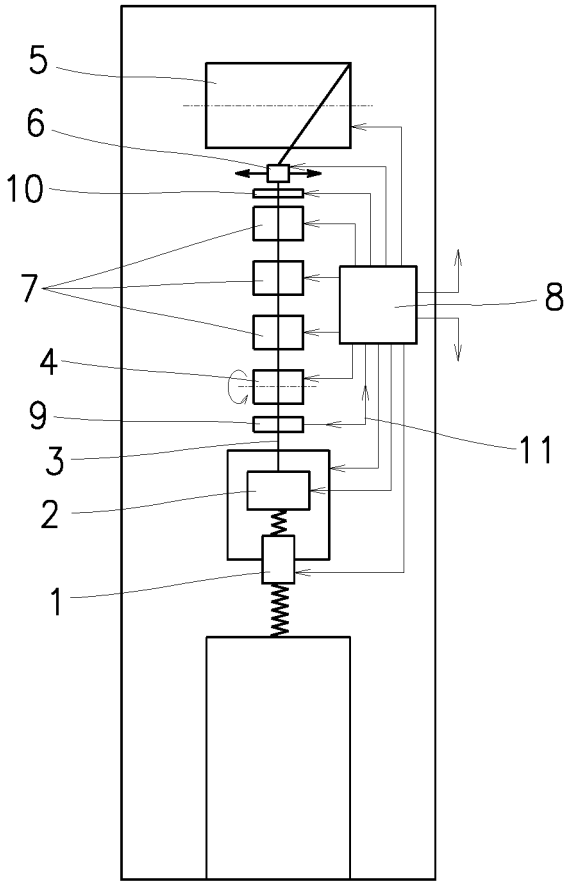
7. The method according to any of claims 1 to 5, **characterized in that** the control device (8) transmits to the yarn quality sensor (9) online and in real-time information about the deliberate changes in the operation of at least one working node (1 to 7) of the workstation, the yarn quality sensor (9) on the basis of the information received monitors the effect of the performed changes in the operation of the working nodes (1 to 7) at the workstation on the detected yarn (3) parameters, or, if necessary, to assess this effect, the yarn quality sensor (9) adjusts its inner

detection and evaluation processes.

8. The method according to any of claims 1 to 5, **characterized in that** the control device (8) transmits to the yarn quality sensor (9) online and in real-time information about short-term repeated changes in the speed of the yarn (3), the yarn quality sensor (9) adjusts the setting of its parameters in real-time so that they can correspond to the changed speed of the yarn (3) and subsequently carrries out proper and reliable monitoring of the yarn (3) quality and sends the data to the control device (8).

9. The method according to any of claims 1 to 5, **characterized in that** the control device (8) transmits to the yarn quality sensor (9) online and in real-time information about deliberate changes in the operation of at least one working node (1 to 7) of the workstation and the yarn quality sensor (9) monitors the impact of the performed changes in the operation of the working nodes (1 to 7) at the workstation on the detected yarn (3) parameters, sends the data to the control device (8), which in the event of a difference between the desired and real detected yarn (3) parameter subsequently further adjusts the operation of at least one working node (1 to 7) of the workstation to increase the degree of match between the detected yarn (3) parameter and the desired yarn (3) parameter.

10. A textile machine with a device for monitoring yarn (3) at a workstation, which comprises a row of workstations arranged next to each other, where each workstation comprises a yarn quality sensor (9), which is aligned with the yarn (3) working path and which is connected to a control device (8), provided with means for decision making and controlling the workstation, **characterized in that** the yarn quality sensor (9) and the control device (8) are interconnected by a means (11) for online and real-time bidirectional transmission of the information about the parameters of the yarn (3) being produced and/or changes of conditions at the workstation during stable yarn (3) production, including the information about short-term repeated changes, the yarn quality sensor (9) being provided with means for online adjustment of the processes of monitoring and evaluating the yarn (3) parameters in real-time.


5
6
10
7
8
4
9
11
3
2
1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 19 3448

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2016/145067 A1 (BURCHERT MATHIAS [DE] ET AL) 26 May 2016 (2016-05-26) * paragraph [0011] - paragraph [0015] * * paragraph [0028] * * paragraph [0041] - paragraph [0046]; figure 1 *	1,3-5,8, 10	INV. D01H13/14 D01H13/26 D01H13/32
X,D Y	US 7 424 800 B2 (OERLIKON TEXTILE GMBH & CO KG [DE]) 16 September 2008 (2008-09-16) * column 3, line 30 - column 4, line 46; figures 1, 3 *	1,2,6,7, 10 9	
Y	DE 10 2012 100553 A1 (RIETER AG MASCHF [CH]) 25 July 2013 (2013-07-25) * paragraph [0025] - paragraph [0026]; figure 1 *	9	
A	US 2015/361594 A1 (FISCHER ANDREAS [CH]) 17 December 2015 (2015-12-17) * paragraph [0032] - paragraph [0040]; figures 1-3 *	1,7,9,10	
A,P	EP 3 165 641 A1 (RIETER CZ S R O [CZ]) 10 May 2017 (2017-05-10) * paragraph [0013] - paragraph [0031]; figures 1, 2 *	1,10	TECHNICAL FIELDS SEARCHED (IPC) D01H B65H G01N
A	US 6 374 152 B1 (WEPFER HANSPETER [CH] ET AL) 16 April 2002 (2002-04-16) * column 3, line 23 - column 3, line 55; figure 2 *	1,6,10	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 February 2018	Todarello, Giovanni

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 19 3448

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-02-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2016145067 A1	26-05-2016	CN 105263837 A	20-01-2016
		EP 3008003 A1	20-04-2016
		US 2016145067 A1	26-05-2016
		WO 2014198733 A1	18-12-2014
US 7424800 B2	16-09-2008	CN 1867508 A	22-11-2006
		DE 10352429 A1	23-06-2005
		EP 1685054 A1	02-08-2006
		US 2007119144 A1	31-05-2007
		WO 2005047155 A1	26-05-2005
DE 102012100553 A1	25-07-2013	CN 104185698 A	03-12-2014
		DE 102012100553 A1	25-07-2013
		WO 2013110390 A1	01-08-2013
US 2015361594 A1	17-12-2015	CH 709748 A1	15-12-2015
		CN 105297196 A	03-02-2016
		EP 2955256 A1	16-12-2015
		JP 2016006246 A	14-01-2016
		US 2015361594 A1	17-12-2015
EP 3165641 A1	10-05-2017	CN 107059180 A	18-08-2017
		CZ 306820 B6	26-07-2017
		EP 3165641 A1	10-05-2017
		JP 2017089086 A	25-05-2017
		US 2017122926 A1	04-05-2017
US 6374152 B1	16-04-2002	CN 1198486 A	11-11-1998
		DE 59809009 D1	21-08-2003
		EP 0877108 A1	11-11-1998
		JP 4117583 B2	16-07-2008
		JP H10298836 A	10-11-1998
		US 6374152 B1	16-04-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2010009565 A **[0005]**
- US 7424800 B **[0006]**