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# (54) METHOD AND DEVICE FOR SUPPLYING EMPTY TUBES TO ATTENDING DEVICES OF A TEXTILE MACHINE

(57) The invention relates to a method and a device for supplying empty tubes (5) to attending devices (2, 3, 4) of a textile machine, particularly of a spinning machine (100), in which tubes (5) are by means of a conveyor (6) supplied in one direction to the workstations (1101-1151-11 nn) of the textile machine (100), at which attending devices requesting a new tube (5) are positioned. During the presence of at least one tube (5) on the running conveyor (6) and at a simultaneous request of another attending device (2, 3, 4) for supplying a tube (5), another tube (5) is placed on the running conveyor (6), whereby evaluation is made of at least one mutual position of the workstations (1101-11 nn) of the machine, at which the attending devices (2, 3, 4) requesting a new tube (5) are positioned, and with respect to the optimal use of the working time of the machine a decision is made on the optimal order of assignment of the tubes (5) present on the running conveyor (6) to the individual attending devices (2, 3, 4) requesting a new tube (5).

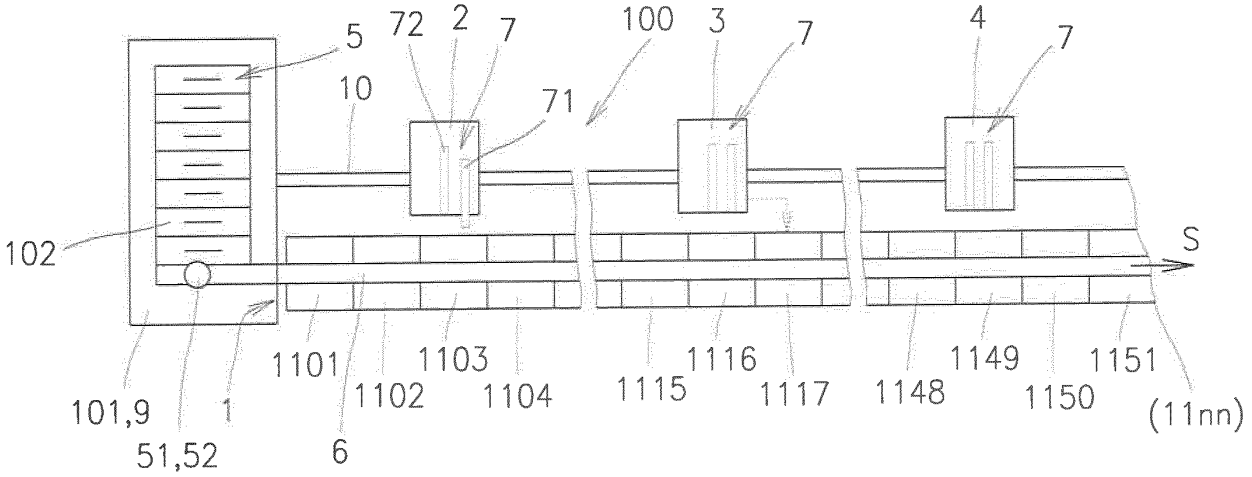


Fig. 2

EP 3 279 123 A1

## Description

### Technical field

**[0001]** The invention relates to a method for supplying empty tubes to attending devices of a textile machine, particularly of a spinning machine, in which empty tubes are supplied unidirectionally by means of a conveyor to the workstations of the textile machine, at which the attending devices requesting a new tube are positioned.

**[0002]** In addition, the invention relates to a device for supplying empty tubes to at least two attending devices arranged displaceably along at least one row of workstations of a textile machine, particularly of a spinning machine, in which each row of the workstations is provided with a container of empty tubes and a one-way conveyor of empty tubes, whereby the machine is equipped with a control unit which is coupled to the individual workstations of the machine, to the tube container, to the tube conveyor for the respective side of the machine and to the attending devices.

### Background art

**[0003]** Automatic spinning machines which wind the spun-out yarn in their winding device on a final bobbin are usually equipped with several attending devices moving along rows of workstations.

**[0004]** In some spinning machines there is always one empty tube stored at each workstation, which is replaced after being removed and placed into the winding device of the workstation. That requires monitoring the state of the tubes at the workstations, which is usually performed by the operator. Moreover, there is a need for a special complicated mechanism for removing the tube from the conveyor and placing it in a storage place.

**[0005]** Other known devices typically have one reserve empty tube seated on an attending device, whereby after the attending device is brought to the workstation requesting the replacement of a fully wound bobbin with an empty tube, the reserve empty tube is removed by the means of the attending device from its container and placed into the winding device of the workstation. For the efficiency of the system, it is important, among other things, that the tube which has been removed is replaced on the attending device as soon as possible.

**[0006]** In the case of spinning machines which are provided with two or more attending devices on one side of the machine due to avoidance of unnecessary stoppage times, it is necessary to solve the order of the attending operations of the attending devices so that the conveyor (usually a belt conveyor) will deliver the tube from the container at the end of the machine to the specified attending device, or to the respective workstation without a risk of this tube being removed by another attending device which is situated between the specified attending device and the container. This is the drawback of the current spinning machines in which the transport of the empty tubes to the attending devices is realized by one one-way belt conveyor.

**[0007]** For example, EP 1675797 B1 solves this situation in such a manner that the fulfillment of the second request for replacing a fully wound bobbin with an empty tube by the second attending device is suppressed until the operation of the first attending device blocking the rail is terminated and until this attending device leaves the travel rail. Fig. 1 schematically represents a part of the spinning machine comprising a row of workstations **A1** to **A13**, whereby a one-way container **C** of the tubes **D** is provided at the end **B** of the machine. Next to the container **C** is located a belt conveyor **E** of the tubes which extends along a row of the workstations **A**. Three attending devices **G** are located on the travel rail **F.**

**[0008]** At the workstation **A9** it is necessary to exchange a fully wound bobbin for an empty tube **D**. The attending device **G2** moves to the workstation **A9** and via the control unit of the machine requests supplying the tube **D**. The tube **D1** is placed by the container **C** on the conveyor **E**, which transports it in the direction **S** of its movement to the workstation **A9**. After the request of the attending device **G2**, but still during placing the tube **D1** on the conveyor **E**, the attending device **G1** stops at the workstation **A4** and requests the tube **D** as well. In this situation, the control unit evaluates the mutual position of the workstations **A4** and **A9** with the attending devices **G1**, **G2**, **G3** positioned at the workstations **A4** and **A9** and suppresses the request of the attending device **G1** and the tube **D1** removal from the conveyor **E** is not allowed until the attending device **G2** receives the tube **D1**, or, optionally, until the tube **D1** has passed by the attending device **G1**.

**[0009]** Nevertheless, in many cases the mutual position of the workstations **A4** and **A9** with the attending devices **G1** and **G2** positioned at the workstations is very disadvantageous due to the time needed for automatic suppression of the request of the attending device **G1** situated closer to the container **C**. Therefore, this system is efficient only in some cases at a certain specific favourable mutual position of the attending devices and/or the workstations which request insertion of a new empty tube.

**[0010]** Therefore, the goal of the present invention is to improve the time utilization of the attending devices when replacing fully wound bobbins with empty tubes at the workstations of spinning machines.

### Principle of the invention

**[0011]** The goal of the invention is achieved by a method for supplying empty tubes to attending devices of a textile machine according to the invention, whose principle consists in that during the presence of at least one tube on the running conveyor and the simultaneous request of another attending device for supplying a tube, another tube is placed on the running conveyor and at least the mutual position of the machine workstations re-

questing a new tube, at which the attending devices are positioned, is evaluated and the control unit makes the decision on optimal assignment of the tubes present on the running conveyor to the attending devices requesting for a new tube with respect to the optimal use of the working time of the machine. This optimization shortens the time when the workstations do not work, thus increasing machine productivity, which is particularly important especially in modern high-performance spinning machines with a plurality of attending devices, whereby the greater the number of the attending devices, the more important the solution according to the invention is.

**[0012]** Another improvement is achieved in an advantageous embodiment, when prior to making the decision on the optimal order of assigning the tubes present on the running conveyor to the attending devices requesting a new tube the actual time point of the need for an empty tube and the current position of the tubes on the conveyor are evaluated.

**[0013]** Also, it is advantageous if the actual time point of the need for an empty tube is evaluated on the basis of the current and/or future servicing activity of the respective attending device and the expected duration of this operation/these operations.

**[0014]** In the case of spinning out different batches of yarn on one machine at the same time, different colours of the tubes are used for differentiation. In these cases, before making the decision on the optimal order of assignment of the tubes present on the running conveyor to the attending devices requesting a new tube, the color of the tube is evaluated.

**[0015]** The principle of the device for supplying empty tubes consists in that the control unit is provided with a decision algorithm for the optimal order of assignment of the tubes present on the conveyor to the individual attending devices requesting a new tube on the basis of at least the mutual comparison of the positions of the workstations of the machine, at which the attending devices requesting a new tube are positioned.

**[0016]** In a preferred embodiment, the decision algorithm is also provided with data sets for evaluating the actual time point of the need for empty tubes and the position of the tubes on the conveyor, whereby these data sets preferably contain information about types of the attending operations of the attending devices and their duration.

**[0017]** If necessary, the decision algorithm is provided with data sets for evaluating the colour of the tube and its assignment to certain workstations.

## Description of drawings

**[0018]** Fig. 1 schematically represents a plan view of a part of one row of workstations of a spinning machine provided with three attending devices according to the background art. The device according to the present invention is schematically represented in a plan view of Fig. 2, Fig. 3 is a block diagram of the mutual relation of the attending devices, a device for placing empty tubes on one-way conveyor and the control unit of the machine and Fig. 4 shows a table schematically illustrating examples of assignment of the tubes to the three attending devices according to their requirements, only considering the mutual position of the workstations and the current position of the tubes on the conveyor.

## Examples of embodiment

**[0019]** Fig. 2 schematically represents a part of a spinning machine equipped with a device according to the invention for improving the supply of empty tubes to attending devices which are able to move to the individual workstations of the machine. The transport of fully wound bobbins from the workstation of the machine is not the subject of the device according to the present invention.

**[0020]** Figs. 2 and 3 show one row **1** of the workstations **11nn** of the spinning machine **100**, which are in the illustrated embodiment attended to by three attending devices **2**, **3**, **4**.

**[0021]** The attending devices move along the row **1** of the workstations **11** along a guide rail **10**. Each attending device **2**, **3**, **4** has its location and a range of motion, these parameters being adjustable. A container **102** of empty tubes **5** is arranged at the end **101** of the machine **100**. Next to the tube container **102** is located an endless one-way conveyor **6** of the tubes **5**, arranged along the row **1** of the workstations **11**, whose storage surface is within reach from an unillustrated handling means of the attending devices **2**, **3**, **4**. If all the preceding requests for an empty tube have been fulfilled, the conveyor is standing, whereby only one tube is ready on it outside the working area of the attending devices. With the number of three attending devices on one side of the machine, up to three tubes **5** can be transported on the conveyor **6** at the same time.

**[0022]** The attending device **2**, **3**, **4** comprises handling means **7** for stopping the empty tube **5** transported by the conveyor **6** and for its transfer to a standby position on the attending device **2**, **3**, **4**. These known unillustrated means include a stop means **71**, which stops the tube **5** on the conveyor **6** relative the standing attending device, and a gripping means **72**, which transfers it to the above-mentioned standby position on the attending device **2**, **3**, **4** and, if necessary, inserts it into the winding device of the workstation **11nn**.

**[0023]** According to Fig. **3**, the attending devices **2**, **3**, **4** and all the workstations **11nn** of the spinning machine **100** are connected via bidirectional lines **21**, **31**, **41** to the control unit **8** of the spinning machine **100,** to which is also connected an unillustrated device **9** for transferring the empty tubes **5** on the one-way conveyor **6** via the line **81**, as well as other unillustrated means of the spinning machine **100**.

**[0024]** In Fig. 2 the first attending device **2** is situated near the container **102** next to the workstation **1103** in the direction away from the container **102** of the empty

tubes **5**. The second attending device **3** is situated downstream of the first attending device **2**, as shown in Fig. **2**, next to the workstation **1116**. The third attending device **4 is** situated at the workstation **1149,** downstream of the second attending device **3**, operating to look after the end portion of the row **1** of the workstations **11nn**.

**[0025]** At the time when replacement of a fully wound bobbin with an empty tube is not required, the attending devices **2**, **3**, **4** positioned at the workstations **11nn** carry out various other attending operations (the cleaning of the workstations by blowing, detecting the yarn end and sucking it in, etc.). From the point of view of idle time, that is with respect to the efficiency of the machine, it is necessary to bring every non-spinning workstation, including a workstation with a fully wound bobbin, to production mode as soon as possible. Optimized transport of the empty tubes to the workstations **11nn** contributes significantly to achieving this goal.

**[0026]** The operation of the device for supplying the empty tubes **5**, or **51**, **52**, **53** to the attending devices **2**, **3**, **4** is described with reference to an example of arrangement of the attending devices as shown in Fig. 2.

**[0027]** For example, at the workstation **1117** it is necessary to replace a fully wound bobbin with an empty tube **5**, or just insert the empty tube **5** into the winding device of the workstation, or transfer the empty tube **5** into a standby position of the attending device. The second attending device **3** moves to this workstation **1117** and requests an empty tube **5**. The conveyor **6** with the first tube **51** intended for the second attending device **3** starts moving. The waiting second attending device **3** initially inserts its reserve tube **5** into the winding device of the workstation **1117** and performs further operations. At the same time, its unillustrated stop means **71** is extended to the area of the conveyor **6**.

**[0028]** Already at the time of transporting the first tube **51** by the conveyor **6** there is often a need for replacing a fully wound bobbin with an empty tube **5**, also at another workstation, in the example shown it is at the workstation **1103**, which is situated relative to the workstation **1117** closer to the container **102** of the empty tubes **5**. The first attending device **2** stops at the workstation **1103** and before the preceding request of the attending device **3** has been fulfilled, requests an empty tube **5**. The second tube **52** from the container **102** is placed on the running conveyor **6**. The control unit **8** evaluates the optimal assignment of the tubes **51**, **52** to the attending devices **2**, **3** with respect to their mutual position and other criteria being judged.

**[0029]** In the current situation, the control unit **8,** for example, leaves the first tube **51** for the second attending device **3**, and the tube **52** is assigned to the first attending device **2**. The stop means **71** of the second attending device **3** may remain extended, whereas the stop means **71** of the first attending device **2** will be retracted until the first tube **51** has passed by it, whereupon it is extended. Thus, both the attending devices **2** and **3**, that is to say, the attending devices positioned at the specified workstations **1117**, **1103** wait for the delivery of the empty tubes intended for them - the second attending device **3** waiting for the tube **51** and the first attending device **2** waiting for the tube **52**.

**[0030]** In another case, it is necessary to replace a fully wound bobbin with an empty tube at the workstation **1103**. The first attending device **2** stops at the workstation **1103** and requests an empty tube. The conveyor with the first tube **51** intended for the first attending device **2** starts moving. The first attending device **2** is waiting for the tube **51**, its unillustrated stop means being extended to the area of the conveyor **6**. Simultaneously, it inserts its reserve tube **5** into the winding device of the workstation **1103** and performs further operations.

**[0031]** Subsequently, also at the workstation **1117** it is necessary to exchange a fully wound bobbin for an empty tube **5**. The second attending device **3** stops at this workstation **1117** and before the preceding request has been fulfilled, requests an empty tube **5**. The second tube **52** is placed on the running conveyor **6**. The control unit **8** evaluates the optimal assignment of the tubes to the attending devices **2**, **3**, whereby two alternatives of fulfilling these requests may occur.

**[0032]** In the first alternative, the first tube **51** will be intended for the second attending device **3** and the second tube **52** will be intended for the first attending device **2**. Thus, there will an exchange of the target attending devices, since originally the first tube **51** was intended for the first attending device **2**, but after receiving the request from the second attending device **3** and after the decision according the decision algorithm, the first tube **51** will be intended for the second attending device **3** and the second tube **52** for the first attending device **2**. The stop means **71** of the first attending device **2** must be retracted and after the passage of the first tube **51** intended for the second attending device **3** it must be extended. The attending devices **2** and **3** will wait for the delivery of the empty tubes **51**, **52** intended for them.

**[0033]** In the second alternative, the first tube **51** will still be intended for the first attending device **2** and the second tube **52** will be intended for the second attending device **3**. The stop means **71** of the first attending device **2** stops the first tube **51** on the conveyor **6**, whereupon after it is removed by the gripping means **72,** the stop means **71** of the attending device **2** is retracted, the stop means **71** of the second attending device **3** may be extended immediately. The attending devices **2** and **3** wait for the delivery of the empty tubes **51**, **52** intended for them.

**[0034]** In the following example, a combination for the three attending devices **2**, **3**, **4**, is described in a situation when the third request for an empty tube is made before the two preceding requests have been fulfilled.

**[0035]** At the workstation **1149** it is necessary to replace a fully wound bobbin with an empty tube. The third attending device **4** stops at this workstation **1149** and requests an empty tube. The conveyor with the first tube **51** intended for the third attending device **4** starts moving.

The third attending device **4** is waiting for the tube **51**, its unillustrated stop means **71** being extended to the area of the conveyor **6**. At the same time, it inserts its reserve tube **5** into the winding device of the workstation **1149** and carries out further operations.

**[0036]** Afterwards, at the workstation **1103,** too, it is necessary to replace a fully wound bobbin with an empty tube **5**. The first attending device **2** stops at this workstation **1103**, and before the preceding request has been fulfilled, requests an empty tube **5**. The second tube **52** is placed on the running conveyor **6**. The control unit **8** evaluates the optimal assignment of the tubes to the attending devices **2**, **4**. After the evaluation of the current position of the workstations being attended to and the current position of the tubes on the tube conveyor, the tube **51** will be intended for the third attending device **4** and the tube **52** for the first attending device **2.** The first attending device **2** is waiting for the tube **52**, extending the stop means to the area of the conveyor **6** only after the passage of the first tube **51** intended for the third attending device **4**. Simultaneously, it inserts its reserve tube **5** into the winding device of the workstation **1103** and performs other operations.

**[0037]** In addition, also at the workstation **1117** it is necessary to exchange a fully wound bobbin for an empty tube **5**. The second attending device **3** stops at this workstation **1117**, which, before the preceding requests have been fulfilled, requests an empty tube **5**. The third tube **53** is supplied on the running conveyor **6**. The control unit **8** evaluates the optimal assignment of the tubes to the attending devices **2**, **3**, **4**. If we use for the evaluation only the current position of the workstations being attended to and the current position of the tubes on the tube conveyor, there may be two alternatives of meeting these requirements.

**[0038]** In the first alternative, the first tube **51** will be still intended for the third attending device **4**, the second tube **52** will be in this case intended for the second attending device **3** and the third tube **53** will be intended for the first attending device **2**. The stop means **71** of the third attending device **4** will remain extended, while the stop means **71** of the second attending device **3** will not be extended until the first tube **51** has passed by it, and finally the stop means **71** of the first attending device **2** will not be extended until the passage of the first tube **51** and the second tube **52**. The attending devices **2**, **3** and **4** will wait for the delivery of the empty tubes **51**, **52** and **53** intended for them.

**[0039]** In the second alternative, the first tube **51** will be intended for the third attending device **4**, the second tube **52** will be intended for the first attending device **2** and the third tube **53** will be intended for the second attending device **3**. The stop means **71** of the third attending device **4** will remain extended, the stop means **71** of the first attending device **2** will be extended only after the first tube **51** has passed by it and the stop means **71** of the second attending device **3** will be extended only after the passage of the first tube **51**. The second tube **52** is initially removed by the first attending device **2** and only then the third tube **53** for the attending device **3** moves past the first attending device **2**. The attending devices **2**, **3**, and **4** wait for the delivery of the empty tubes **51**, **52** and **53** intended for them.

**[0040]** The algorithm for the optimal order of assignment of the tubes **5** present on the conveyor **6** to the individual attending devices **2**, **3**, **4** requesting a new tube **5**, which contributes to the optimal use of the time of the spinning machine **100**, in this manner decides about the order of supplying the attending devices **2**, **3**, **4** with the empty tubes **5**. In doing so, it uses the criteria, such as, first of all, the current mutual comparison of the positions of the attending devices **2**, **3** and **4**, their current attending operation and expected duration of this operation, the following attending operation expected, the actual time point of the request for an empty tube, the current position of the tubes **5** on the conveyor **6**, or, as the case may be, other criteria, such as different colours of the tubes **5** from the point of their assignment to certain workstations, etc.

**[0041]** The operation of the device according to the invention is schematically represented in a table in Fig. 4, wherein only the mutual position of the workstations being attended to and the current position of the tubes **5** on the conveyor **6** are evaluated. In the first three columns of the table there are the attending devices **2**, **3**, **4**, which are in the direction away from the container **102** of the empty tubes **5** arranged in ascending order according to their reference numerals. In each row of these three columns, the attending devices **2**, **3**, **4** are arranged according to the order in which the requests for an empty tube **5** were made. Indicated in the other tree columns are the variants of assignment of the tubes **51**, **52**, **53** to the respective attending device **2**, **3**, **4** according to the criteria which are evaluated by the control unit **8** of the spinning machine **100**.

**[0042]** If an error occurs on the attending device **2**, **3**, **4**, e.g., such an error that it is no longer possible to remove the respective tube **5**, this does not interfere with the removal of the respective other tubes **5** by the other attending devices. According to one embodiment, the respective tube **5** intended for the attending device **2**, **3**, **4** with a failure to remove the tubes, the respective tube is transported to the end of the textile machine, where is located a collecting vessel (not shown) into which the unremoved tube is then placed. According to another advantageous embodiment, the respective tube **5**, which is intended for the defective attending device **2**, **3**, **4** failing to remove the tubes **5**, is transported to the initial position on the conveyor **6**, for example, by reverse movement of the conveyor **6**, where it waits until it is requested by another attending device **2**, **3**, **4**. In this case, after the request for such a tube **5,** which is already at the beginning of the conveyor **6**, the new tube **5** is not placed on the conveyor **6** and the operation of the device is started, i.e., the transport of the tubes according to the present invention begins.

**[0043]** The invention is not limited to three attending

devices. Using three attending devices serves only as a basic example of embodiment used here to explain the principle of the invention, and the actual number of the attending devices used in the machine depends on the specific requirements of the machine and automation of its operation.

**List of references**

(device according to the invention)

**[0044]**

| | |
|---|---|
| 1 | row of workstations |
| 10 | guide rail (of the attending devices) |
| 100 | spinning machine |
| 101 | end of the spinning machine |
| 102 | container of the empty tubes |
| 11 | workstation (1101, 1102...1151) |
| 2 | first attending device |
| 21 | bidirectional line (between the control unit and the attending device) |
| 3 | second attending device |
| 31 | bidirectional line (between the control unit and the attending device) |
| 4 | third attending device |
| 41 | bidirectional line (between the control unit and the attending device) |
| 5 | tube |
| 51 | first (tube being sent) |
| 52 | second (tube being sent) |
| 53 | third (tube being sent) |
| 6 | conveyor (of the empty tubes) |
| 7 | means for stopping the empty tube being transported by the conveyor 6 and means for transferring it |
| 71 | stop means |
| 72 | gripping means |
| 8 | control unit of the spinning machine |
| 81 | bidirectional line (between the control unit and the device for transferring tubes) |
| 9 | device for transferring the empty tubes (from the container to the conveyor) |

(device according to the background art)

**[0045]**

| | |
|---|---|
| A1-A13 | workstation of the spinning machine |
| B | end of the machine |
| C | tube container |
| D, D1 | tube |
| E | tube conveyor |
| F | travel rail (of the attending devices) |
| G1-G3 | attending device |
| S | direction of the movement of the tube conveyor |

**Claims**

1. A method for supplying empty tubes (5) to attending devices (2, 3, 4) of a textile machine, particularly of a spinning machine (100), in which tubes (5) are supplied in one direction by means of a conveyor (6) to the workstations (1101-1151-11 nn) of the textile machine (100), at which the attending devices (2, 3, 4) requesting a new tube (5) are positioned, **characterized in that** during the presence of at least one tube (5) on the running conveyor (6) and at a simultaneous request of another attending device (2, 3, 4) for supplying a tube (5), another tube (5) is placed on the running conveyor (6), whereby at least the mutual position of the machine workstations (1101-11 nn), at which the attending devices (2, 3, 4) requesting a new tube (5) are positioned, is evaluated, and with respect to the optimal use of the working time of the machine a decision is made on the optimal order of assignment of the tubes (5) present on the running conveyor (6) to the individual attending devices (2, 3, 4) requesting a new tube (5).

2. The method according to claim 1, **characterized in that** before making the decision on the optimal order of assignment of the tubes (5) present on the running conveyor (6) to the attending devices (2, 3, 4) requesting a new tube (5), the actual time point of the need for an empty tube **5** and the current position of the tubes **5** on the conveyor **6** are evaluated.

3. The method according to claim 2, **characterized in that** the actual time point of the need for an empty tube (5) is evaluated on the basis of the current and/or future attending operation of the respective attending device (2, 3, 4) and the expected duration of this operation/these operations.

4. The method according to claim 1, **characterized in that** before making the decision on the optimal order of assignment of the tubes (5) present on the running conveyor (6) to the individual attending devices (2, 3, 4) requesting a new tube (5), the colour of the tube (5) is evaluated for assignment to the respective workstations (11 nn).

5. The method according to any of the preceding claims 1 to 4, **characterized in that** if the attending devices (2, 3, 4) requesting a new tube (5) fail to remove the tube (5) after the tube (5) has been placed on the conveyor (6), the other attending devices remove the tubes intended for them respectively without interruption, whereby the tube (5) intended for said attending device (2, 3, 4) with a failure to remove the tubes (5) is conveyed to the end of the textile machine to a collecting vessel.

6. The method according to any of the preceding claims

1 to 4, **characterized in that** if the attending devices (2, 3, 4) requesting a new tube (5) fail to remove the tube (5) after the tube (5) has been placed on the conveyor (6), the other attending devices remove the tubes intended for them respectively without interruption, whereby the tube (5) intended for said attending device (2, 3, 4) with a failure to remove the tubes (5) is conveyed to the initial position on the conveyor (6), where it waits for being requested by another attending device (2, 3, 4).

**7.** A device for supplying empty tubes (5) to at least two attending devices (2, 3, 4) arranged displaceably along at least one row of workstations (1101 - 11 nn) of a textile machine, particularly of a spinning machine (100), in which each row of the workstations (1101 - 11 nn) is provided with a container (102) of empty tubes (5) and a one-way conveyor (6) of empty tubes (5, 51, 52, 53), whereby the machine is equipped with a control unit (8), which is coupled to the individual workstations (11 nn), to the container (102) of the tubes (5) and the conveyor (6) of the tubes for the respective side of the machine (100) and to the attending devices (2, 3, 4), **characterized in that** the control unit (8) is provided with a decision algorithm for determining the optimal order of assignment of the tubes (5) present on the conveyor (6) to the individual attending devices (2, 3, 4) requesting a new tube (5) on the basis of at least the mutual comparison of the positions of the machine workstations (11 nn) at which the attending devices (2, 3, 4) requesting a new tube (5) are positioned.

**8.** The device according to claim 7, **characterized in that** the decision algorithm is also provided with data sets for evaluating the actual time point of the need for empty tubes (5) and the position of the tubes (5) on the conveyor (6).

**9.** The device according to claim 8, **characterized in that** the data sets for evaluating the actual time point of the need for empty tubes (5) contain information about types of attending operations and their duration.

**10.** The device according to claim 7, **characterized in that** the decision algorithm is further provided with data sets for evaluating the colour of the tube and its assignment to certain workstations (11 nn).

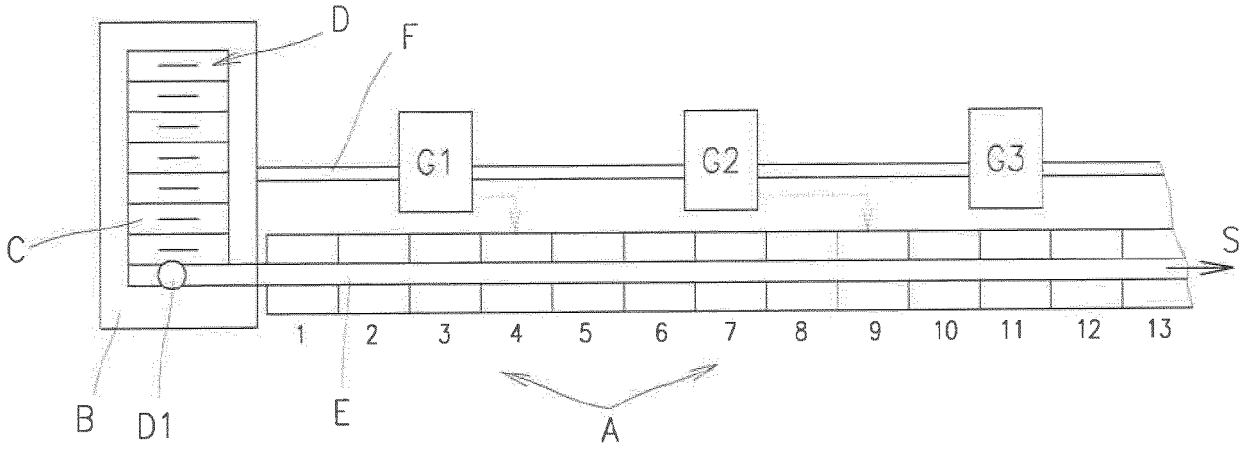


Fig. 1

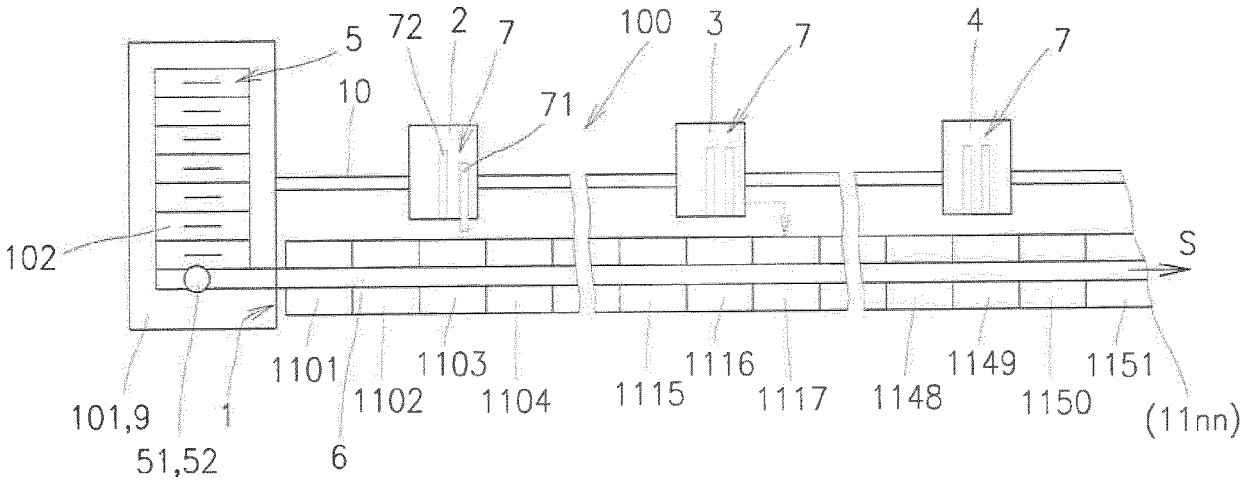
5
72
2
7
100
3
7
4
7
10
71
102
S
101,9
51,52
1
6
1101
1102
1103
1104
1115
1116
1117
1148
1149
1150
1151
(11nn)

Fig. 2

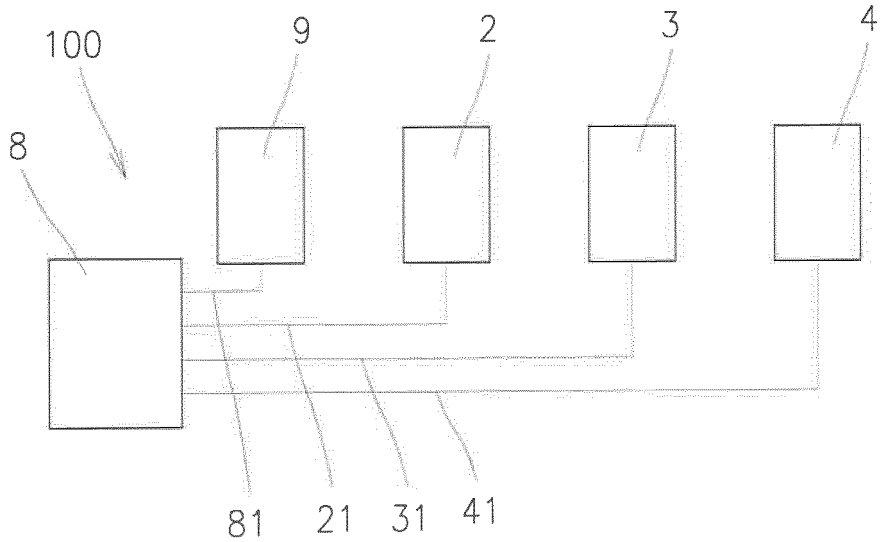


Fig. 3

| Order of requests | | | Assignment of tube 51, 52, 53 to individual attending devices 2 to 4 | | |
|---|---|---|---|---|---|
| 1. | 2. | 3. | | | |
| from individual attending devices 2 to 4 | | | after **1st** request | after **2nd** request | after **3rd** request |
| 3 | 2 | - | 51/3 | 51/3 52/2 | - |
| 2 | 3 | - | 51/2 | 51/3 52/2<br>51/2 52/3 | - |
| 4 | 3 | 2 | 51/4 | 51/4 52/3 | 51/4 52/3 53/2 |
| 4 | 2 | 3 | 51/4 | 51/4 52/2 | 51/4 52/3 53/2<br>51/4 52/2 53/3 |
| 3 | 4 | 2 | 51/3 | 51/4 52/3<br>51/3 52/4 | 51/4 52/3 53/2<br>51/3 52/4 53/2 |
| 3 | 2 | 4 | 51/3 | 51/3 52/2 | 51/4 52/3 53/2<br>51/3 52/2 53/4<br>51/3 52/4 53/2 |
| 2 | 4 | 3 | 51/2 | 51/4 52/2<br>51/2 52/4 | 51/4 52/3 53/2<br>51/4 52/2 53/3<br>51/2 52/4 53/3<br>51/4 52/2 53/3 |
| 2 | 3 | 4 | 51/2 | 51/3 52/2<br>51/2 52/3 | 51/4 52/3 53/2<br>51/3 52/2 53/4<br>51/3 52/4 53/2<br>51/2 52/3 53/4<br>51/2 52/4 53/3 |

Fig. 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4439

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B65H

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