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(54) METHOD OF CONTROLLING A TEXTILE MACHINE COMPRISING A ROW OF WORKSTATIONS ARRANGED NEXT TO EACH OTHER AND THE TEXTILE MACHINE

(57) A method of controlling a textile machine comprising a row of workstations arranged next to each other (1), in which at each workstation the presence of the sliver (2) is continuously monitored before entering an entry silver (2) device independently of the other workstations. At each workstation (1) the presence of the sliver (2) is monitored at least at a distance (Y) in front of a member for yarn formation, whereby the distance (Y) is determined by the velocity of the sliver (2) motion and the period necessary for the controlled stopping of the workstation with yarn (P) situated in the travel path at the workstation when the yarn (P) end is not wound on the bobbin (C) after stopping the workstation.

The invention also relates to a textile machine comprising a row of workstations arranged next to each other (1), each of which comprises a member for yarn formation, behind which are in the direction of the movement of the fibrous material arranged other subunits for yarn formation (P), for drawing-off yarn and for winding yarn on a bobbin (C), whereby at each workstation is arranged a detector (6) of the presence of sliver (2). The detector (6) of sliver (2) is located at each workstation at a distance (Y) in front of the member for yarn formation, whereby the distance (Y) is determined by the velocity of the movement of the sliver (2) and the period of time required for the controlled stopping of the workstation with yarn (P) in the travel path at the workstation when the yarn (P) end is not wound on the bobbin (C) after stopping the workstation.

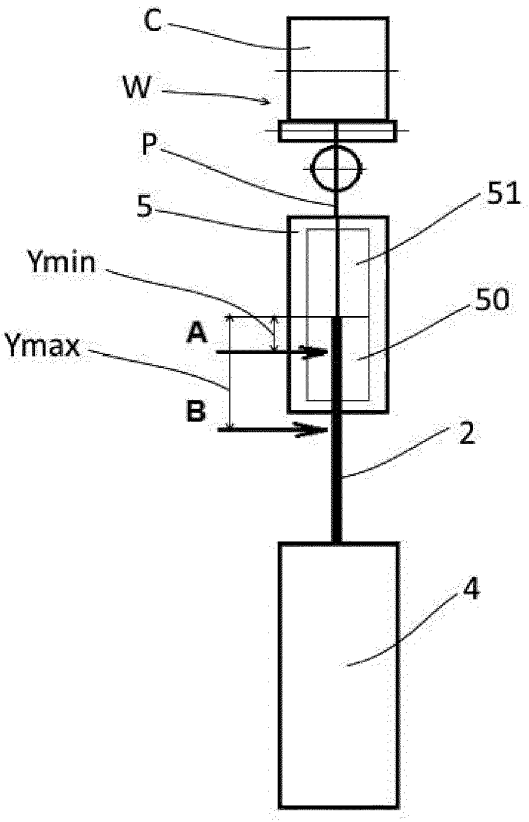

Fig. 4

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Description

Technical field

[0001] The invention relates to a method of controlling a textile machine comprising a row of workstations arranged next to each other, in which at each workstation the presence of sliver is monitored before entering an entry sliver mechanism independently of the other workstations.

[0002] The invention also relates to a textile machine comprising a row of workstations arranged next to each other, each of which comprises a member for yarn formation, behind which are arranged in the direction of the fibrous material motion other subunits for yarn formation - for drawing-off yarn and for winding yarn on a bobbin, whereby at each workstation a detector of sliver presence is arranged.

Background art

[0003] For present-day textile machines comprising a row of workstations arranged next to each other, monitoring of sliver is essential for achieving continuous, i.e. uninterrupted operation of the individual workstations of the machine and for feeding sliver to the workstations, the sliver being distributed in textile industry in containers, the so-called cans.

[0004] The monitoring of the sliver can be performed by the machine operator. However, this is inappropriate due to demands on human labor and due to unreliability of such monitoring.

[0005] It was with the introduction of automation of the replacement of sliver cans in the textile production that systems of automatic monitoring of sliver became increasingly important.

[0006] Mechanical systems for the monitoring of sliver at the entry to the spinning unit of the workstation of a textile machine, e.g. by means of various contact arms, etc., are difficult to use from the point of view of desired automation of operator functions.

[0007] Known are methods of the optical monitoring of the sliver at the workstation of a textile machine, where on the bodies of a row of adjacent workstations in the textile machine in the area behind the passing sliver is located a light reflective surface at each workstation. On the attending device, which is movable along the row of workstations, are arranged a light transmitter and a receiver of reflected light, which are directed to the area where light reflecting surfaces are positioned at the workstations. Alternatively, the detector of sliver on the attending device is formed by a sensor able to detect the presence of sliver without reflection, and so there is no reflecting surface at the workstation. If during the movement of the attending device along the row of workstations the receiver of the reflected light on the attending device catches the reflection of the light emitted by the light transmitter on the attending device, it means that the sliver is not present at the particular workstation and necessary measures are taken for the operator of that particular workstation. Otherwise, the attending device must stop by the workstation and only then it is able to perform the detection of the sliver.

[0008] The disadvantage of this arrangement is the fact that the information about the sliver is obtained only during the movement of the attending device passing by or when it is stopped. Therefore, a situation may occur, and, indeed, such situations do occur, when the sliver at a particular workstation is not detected for some time due to the workload of the attending device at the other workstations, which reduces the possibilities of the automatic operation of the machine, the operator functions, etc. Due to irregular sliver detection the sliver is completely consumed and yarn production is stopped at the workstation with the yarn end being wound on the bobbin, if it is not the case when the method of controlled stopping of the workstation without winding the yarn end on the bobbin is applied. Resuming the yarn production then requires not only feeding sliver and introducing it into the spinning unit, but also finding the yarn end on the bobbin and a longer preparation process of the workstation for the renewal of spinning. Given that the space of the detection of the sliver is arranged at the bottom of the workstation, it is necessary for the attending device to extend to the lower part of the workstation, which means that the attending device has increased in height. Another drawback of the background art is the sensitivity of the sliver detection to the color of the fibers and to the thickness of the sliver, which causes errors in the sliver detection.

[0009] There are also other well-known systems of monitoring sliver on open-end spinning machines when at each workstation a detector of quality and presence of yarn is located, e.g., see solutions according to WO9920819A1 and others. The thus located detectors monitor sliver and enable, among other things, to detect consumption of the sliver and the resulting interruption of spinning. In well-known cases, however, the sliver consumption leads only to the interruption of spinning, which results in the yarn end being wound on the bobbin, which means that for the resumption of spinning it is necessary to find the yarn end on the bobbin again, guide it into the travel path at the workstation, introduce it into the draw-off tube of the spinning unit and only after that start the process of resuming spinning. Nevertheless, this method is time-consuming and requires using sophisticated technical means.

[0010] The aim of the invention is to eliminate or at least minimize the disadvantages of the background art.

Principle of the invention

[0011] The aim of the invention is achieved by a method of controlling a textile machine comprising a row of workstations arranged next to each other, whose principle consists in that the presence of sliver is monitored at each workstation at least at a certain distance in front of

the member for yarn formation, whereby the distance is determined by the velocity of the sliver motion and the period of time which is necessary for the controlled stopping of the workstation with yarn situated in the travel path at the workstation, the yarn not being wound on the bobbin after stopping the workstation.

[0012] The principle of the textile machine comprising a row of workstations arranged next to each other consists in that at each workstation a detector of sliver is disposed at a certain distance in front of a member for yarn formation, whereby the distance is determined by the velocity of the sliver motion and the period of time necessary for the controlled stopping of the workstation with yarn situated in the travel path at the workstation, when the yarn end is not wound on the bobbin after stopping the workstation.

[0013] The advantage of this arrangement is providing information continuously about the state of the sliver at each workstation regardless the operation of the attending device. That enables to introduce a number of automation procedures even on machines with a lower number of attending devices or even on machines without any attending devices. Another positive aspect of this invention is the fact that it allows further optimization of the movement of the attending device along the row of workstations and use the work time of the attending device really only for providing attendance to the workstations, which enables to reduce the number of attending devices required for the servicing of all the workstations of the machine. Another advantage of the solution according to the invention is that due to the fact that the sliver is not monitored in the lower part of the workstation any longer, the attending device can be reduced in height. If the sliver is consumed at the workstation without providing supply of new sliver in time, this state is immediately registered, which allows to respond immediately and stop the production at the respective workstation so that resuming production after the feeding of new sliver will take a minimum of time with very few means involved, e.g., it enables to stop the yarn production in such a manner that the yarn end is situated in the travel path at the workstation in the vicinity of the member for yarn formation and the individual subunits of the workstation are prepared to renew yarn production. Also, if the sliver end is detected in time, it enables to stop the workstation in a controlled manner, in which the yarn end stops in the travel path of the yarn at the respective workstation without this yarn being wound on the bobbin. After such controlled stopping the operator only guides the new sliver properly and can initiate the spinning-in process, because the preceding preparatory process can take place before introducing the new sliver without having to find the free end of yarn on the bobbin manually or automatically, thereby significantly reducing the standstill time of the workstation and extending production time of the workstation. Another advantage is avoiding a risk of false detection of sliver, which may occur due to the influence of the color of the fibers or the thickness of the sliver or due to incorrect mutual position of the devices of the system consisting of the light emitter on the attending device, the reflecting surface at each workstation, the receiver of the reflected light on the attending device, etc.

Description of the drawings

[0014] The invention is schematically represented in the drawing, where Fig. 1 shows several workstations of the textile machine arranged next to each other, Fig. 2 shows an example of using the present invention on an open-end spinning machine, Fig. 2a is a detail of a holder with a detector of sliver in the direction X of Fig. 2, Fig. 3 represents the first example of using the invention on an air-jet spinning machine, Fig. 3a shows another example of using the invention on an air-jet spinning machine, Fig. 3b is a top view of an arrangement of an entry condenser and a transverse arm with the detector of sliver, Fig. 4 shows another example of using the present invention on an air-jet spinning machine - the state during spinning, and Fig. 4a shows an arrangement according to Fig. 4 - the state after the controlled stopping of the workstation.

Examples of embodiment

[0015] The invention will be described with reference to examples of embodiment of a textile machine comprising a row of workstations arranged next to each other.

[0016] The textile machine comprises a row of identical workstations **1** arranged next to each other, which perform identical operations for the formation of yarn from sliver **2.**

[0017] Each workstation **1** is aligned with a space **3** for mounting a container **4** of sliver **2.** From the container **4** the sliver **2** is guided to a spinning unit **5,** behind which in the direction of the fibrous material movement are arranged other subunits, especially a drawing-off mechanism **O** of yarn **P** and a winding device **W** for winding yarn on a bobbin **C**. These subunits as such are well-known, both from the philosophical point of view and from the point of view of their design, therefore they will not be described in detail. For this reason, the fibrous material being processed in Fig. 1 ends in the inlet hole of the spinning unit **5,** and the process of converting sliver **2** into yarn and its winding on the bobbin is not illustrated.

[0018] The spinning unit **5** of each workstation is aligned with a detector **6** of sliver, which is connected to a control system of a respective workstation **1**, or it is connected to a control system of a group (section) of workstations **1** of the machine or it is connected to a control system of the entire machine.

[0019] The detector **6** of sliver according to a preferred embodiment comprises a source **60** of light and a sensor **61** of light, which is situated opposite, whereby between the source **60** of light and the sensor **61** of light there is a gap **62** for the passage of the monitored sliver **2.** The gap **62** thus forms a detection space of sliver **2.** In an

unillustrated example of embodiment, the detector **6** of sliver is produced by using a different suitable technology, able to detect the presence of the fibrous material in the detection space, e.g. the detector **6** of sliver is created as a capacity detector.

[0020] The detector **6** of sliver is at each workstation arranged at a distance **Y** in front of the member for yarn formation, i.e. in front of the spinning rotor or in front of the spinning nozzle, etc., whereby the minimum distance **Y** of the detector **6** is determined by the velocity of the sliver **2** motion and the period of time required for performing the controlled stopping of the workstation after detecting the absence of the sliver **2** in such a manner that the yarn **P** end still remains in the travel path of the yarn at the workstation and is not wound on the bobbin **C,** and therefore it is not necessary to find the yarn **P** end on the bobbin **C**. For simplicity purposes, it is also possible to measure the distance **Y** from a different defined place of the spinning unit **5** or of the workstation, e.g. in a situation when it is desirable for the sliver **2** after the controlled stopping of the workstation with yarn **P** situated in the travel path of yarn at the workstation not to be drawn into the spinning unit **5** and remain accessible to the operator or attending device, etc. Therefore, among other things, the invention makes it possible for the end of sliver **2** to be situated after the controlled stopping of the workstation with yarn **P** in the travel path at the workstation in a defined place or in a defined area (at a distance) at the workstation and the entire sliver is not consumed. Otherwise, further processes would be necessary for the attendance of the workstation.

[0021] In the embodiment shown in Fig. 2, the spinning unit **5** of the workstation **1** is provided with an inlet hole **8** of sliver **2** leading into the spinning unit **8** of the workstation **1** of an open-end spinning machine. A holder **7** is mounted on the spinning unit **5** in front of the inlet hole **8,** the holder being provided with a guide device **70** of sliver **2.** The guide device **70** is here provided in the form of a pair of parallel walls **700,** between which there is a gap **62** for the passage of the sliver **2,** where the gap **62** constitutes a detection space of sliver **2.** One wall **700** of the guide device **70** is on the inner side of the guide device **70** provided with a source **60** of light and the other wall **700** of the guide device **70** is on the inner side of the guide device **70** provided with a sensor **61** of light, the source **60** and the sensor **61** of light constitute forming an optical sensor **6** of sliver. The length of the holder **7** which determines the overall distance **Y** of the detector **6** of sliver **2** from the member for yarn formation corresponds to the expected velocity of sliver **2** and the period of time required for the response of the workstation **1**, or, more specifically, the response of its respective subunits, to the signal of the detector **6** of sliver **2** about the absence of the sliver **2** and to the subsequent controlled stopping of the workstation, so that the yarn **P** end can remain in the travel path of the yarn at the workstation and so that it is not wound on the bobbin **C.** In an unillustrated example of embodiment, instead of optical elements constituting the detector **6** of sliver, elements which make up a capacity detector are used.

[0022] Fig. 3 shows an exemplary embodiment with an entry condenser **90** of sliver **2** arranged in front of an entry drafting device **92** of the workstation **1** of an air-jet spinning machine. In the entry condenser **90** is arranged a detector **6** of sliver, whereby in the opposite sides of the condenser **90** is mounted a source **60** of light and a sensor **61** of light and the inner space of the condenser **90** constitutes a gap **62** for the passage of the sliver **2** forming a detection space of the sliver **2.** The detector **6** of sliver **2** is located at a distance **Y** in front of the member for yarn formation and the size of this distance **Y** corresponds to the expected velocity of sliver **2** and the required reaction time for the response of the workstation **1**, or the response of its respective working subunits, to the signal of the detector **6** of sliver **2** about the absence of the sliver **2** and to the subsequent controlled stopping of the workstation so that the yarn **P** end can remain in the travel path of the yarn at the workstation and so that it is not wound on the bobbin **C.**

[0023] In the exemplary embodiment shown in Figs. 3a and 3b, the detector **6** of sliver is mounted in the direction of the sliver **2** motion in front of the entry condenser **90,** when on the holder **93** of the entry condenser **90** is provided a transverse arm **94,** which passes from the area **A1** adjacent to one lateral side of sliver **2** through the space behind the sliver **2** as far as to the area **A2** adjacent to the other lateral side of the sliver **2.** In each of the areas **A1, A2** on the transverse arm **94** is provided one V-shaped wall **940,** whereby between the areas **A1, A2** there is a gap **62** for the passage of sliver **2** forming a detection space of sliver **2.** In one V-shaped wall **940** is mounted a source **60** of light and in the other V-shaped wall **940** is mounted a sensor **61** of light, which together constitute the detector **6** of sliver. For safety reasons, an auxiliary guide device of sliver **2** is arranged in the direction of the sliver **2** motion in front of the detector **6** of sliver, the auxiliary guide device of sliver **2** being mounted in the illustrated embodiment on a common holder **93** with a transverse arm **94.** The distance **Y** between the entry to the drafting device **92** of sliver **2** and the detector **6** of sliver corresponds to the expected velocity of sliver **2** and the required reaction time for the response of the workstation **1** for controlled stopping, or the response of the respective subunits, to the signal of the sensor **6** of sliver **2** about the absence of fibers. In an unillustrated example of embodiment, instead of optical elements constituting the detector **6** of sliver, elements which make up a capacity detector are used.

[0024] In the examples of embodiment in Figs. 3, 3a and 3b, also a sliver **2** break in front of the detector **6** can be detected by means of the detector **6** of sliver.

[0025] Fig. 4 schematically represents an embodiment with an arrangement of a workstation of an air-jet spinning machine, which in the direction from the bottom higher comprises a container **4** of sliver **2.** From the container **4** the sliver **2** is guided to a drafting zone **50** of the sliver

2, which represents here an entry subunit 5 of the spinning unit 8. Behind the drafting zone 50 is in the direction of the movement of the fibrous material arranged a zone 51 for twisting fibers into yarn. In this exemplary embodiment it is a zone with an unillustrated spinning nozzle. From the spinning nozzle, and therefore from the spinning unit 5, the yarn P is drawn off and is wound on the bobbin C in the winding unit W. In the path of the sliver 2 between the point B in front of the entry of the sliver 2 into the drafting zone 50 of the sliver 2 and the point A in front of the entry of the sliver 2 into the zone 51 of twisting fibers into yarn is located a detector 6 of sliver, which is connected to a control system of a respective workstation 1, or it is connected to a control system of a group (section) of the workstations 1 of the machine or it is connected to a control system of the entire machine. The distance Y between the entry of the sliver 2 into the zone 51 of twisting fibers into yarn and the location of the detector 6 of sliver 2 corresponds to the expected velocity of sliver 2 and the reaction time required for the response of the workstation 1, or, more specifically, the response of its respective subunits, to the signal of the detector 6 of sliver 2. The reaction time of the workstation is, e.g., the time needed for the controlled stopping of the workstation in such a manner that the end of the sliver 2 remains in front of the entry into the zone 51 of twisting fibers into yarn (see Fig. 4a), or in front of the entry into the drafting zone 50 of sliver 2, according to the requirements, and, at the same time, in such a manner that the yarn P end remains in the travel path at the workstation in front of the winding unit W, e.g., as is shown in Fig. 4a, so that the yarn P end remains in the zone 51 of twisting fibers into yarn, preferably in its outlet section, i.e., in this case, behind the spinning nozzle. The above-mentioned reaction time of the workstation is in another example of embodiment also a different time, depending on how the workstation is to respond to the signal of the detector 6 of sliver and in what positions in relation to the subunits of the workstation the end of the sliver 2 and the yarn P end should end after the response of the workstation.

Industrial applicability

[0026] The invention can be used for the production as well as for the operation of textile machines producing yarn from sliver.

Claims

1. A method of controlling a textile machine comprising a row of workstations arranged next to each other (1), in which at each workstation the presence of sliver (2) is monitored continuously before entering an entry sliver device independently of the other workstations, **characterized in that** the presence of the sliver (2) is at each workstation (1) monitored at least at a certain distance (Y) in front of the member for yarn formation, whereby the distance (Y) is determined by the velocity of the sliver (2) motion and the period of time required for the controlled stopping of the workstation with yarn (P) situated in the travel path at the workstation when the yarn (P) end is not wound on a bobbin (C) after stopping the workstation.

2. The method according to claim 1, **characterized in that** after detecting the absence of sliver (2) at the distance (Y) in front of the member for yarn formation the operation of controlled stopping of the workstation with yarn (P) situated in the travel path at the workstation is initiated, during which the yarn (P) end is not wound on the bobbin (C).

3. The method according to claim 1 or 2, **characterized in that** the presence of sliver (2) is continuously monitored during its passage through a gap (62) between a source (60) of light and a sensor (61) of light.

4. A textile machine comprising a row of workstations arranged next to each other (1), each of which comprises a member for yarn formation, behind which are arranged in the direction of the fibrous material movement other subunits for yarn formation (P), for drawing-off yarn and for winding yarn on a bobbin (C), whereby at each workstation is arranged a sensor (6) of the sliver (2) presence, **characterized in that** at each workstation a detector (6) of sliver (2) is located at a distance (Y) in front of the member for yarn formation, the distance (Y) being determined by the velocity of the sliver (2) motion and the period of time needed for the controlled stopping of the workstation with yarn (P) situated in the travel path at the workstation, when the yarn (P) end is not wound on the bobbin (C) after stopping the workstation.

5. The textile machine according to claim 5, **characterized in that** the detector (6) is optical having a through zone for the passage of the sliver (2).

6. The textile machine according to claim 5 or 6, **characterized in that** the detector (6) of sliver (2) is arranged in an entry condenser (90) in front of an entry drafting device (92) of the workstation (1) of an air-jet spinning machine.

7. The textile machine according to claim 5 or 6, **characterized in that** the detector (6) of sliver (2) is arranged in the direction of the movement of sliver (2) in front of the entry condenser (90) in front of the entry drafting device (92) of the workstation (1) of an air-jet spinning machine.

8. The textile machine according to claim 7, **charac-**

terized in that a guiding device (91) of sliver (2) is arranged in front of the detector (6) of sliver (2).

9. The textile machine according to claim 7, **characterized in that** the detector (6) of sliver (2) is arranged in the direction of the movement of sliver (2) in the guide device (91) of sliver (2) or before the guide device (91) of sliver (2).

10. The textile machine according to claim 8 or 9, **characterized in that** the member for yarn formation is a spinning nozzle, in front of which is arranged a drafting device (50) of sliver (2), in which the detector (6) of sliver (2) is arranged.

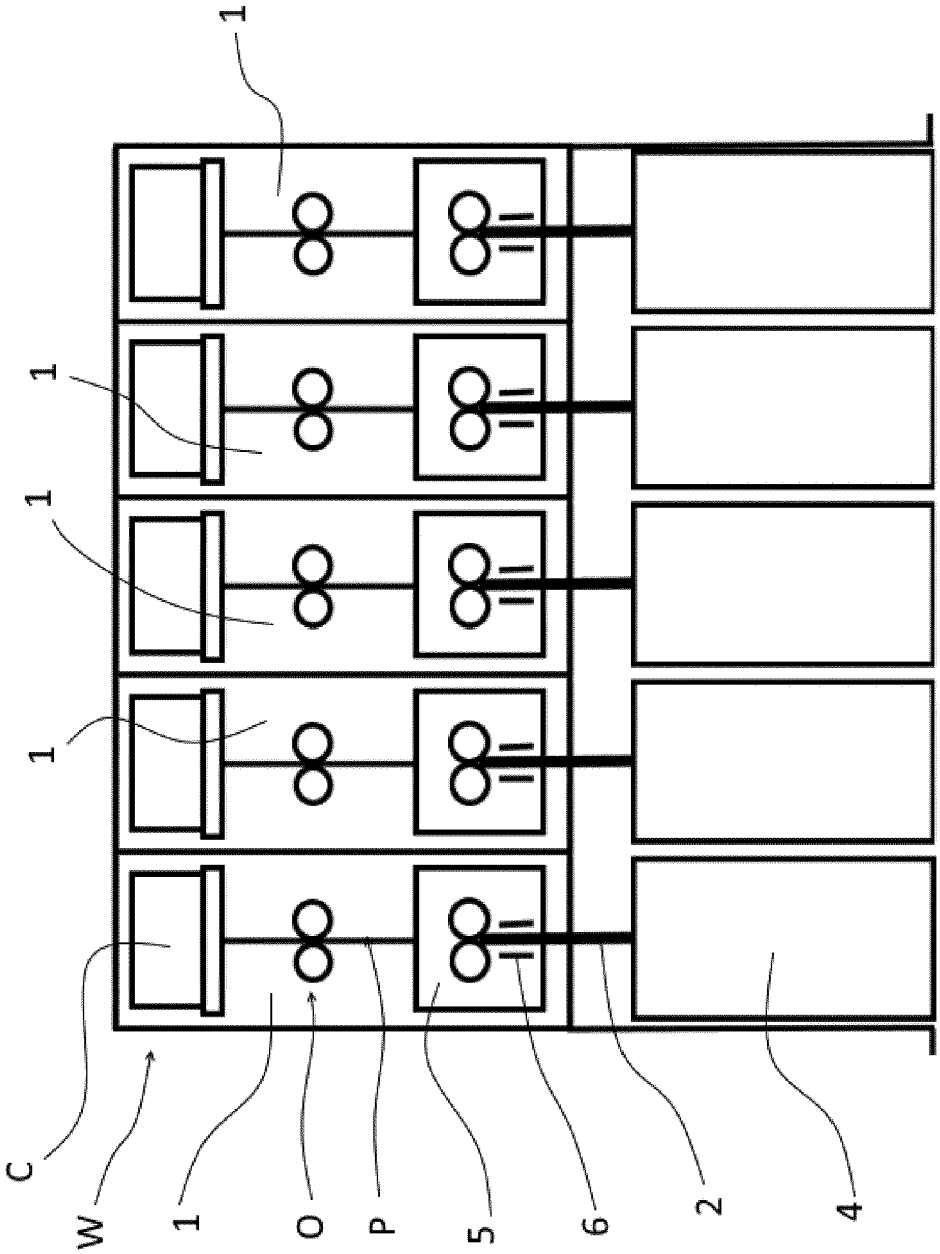

Fig. 1

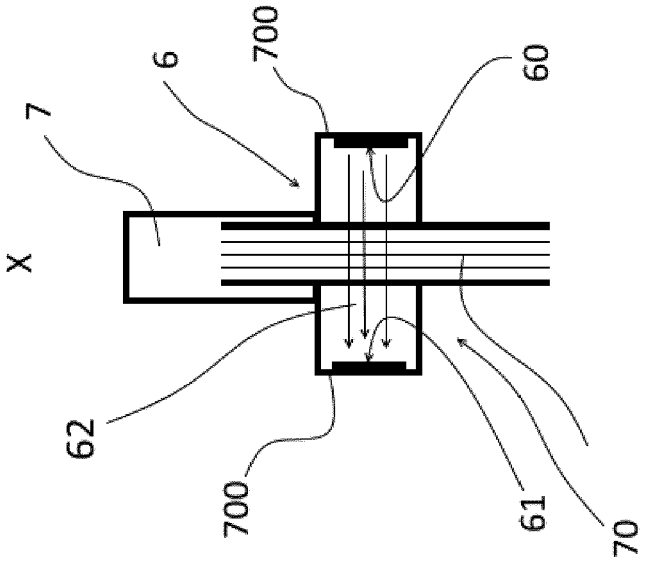

Fig. 2a

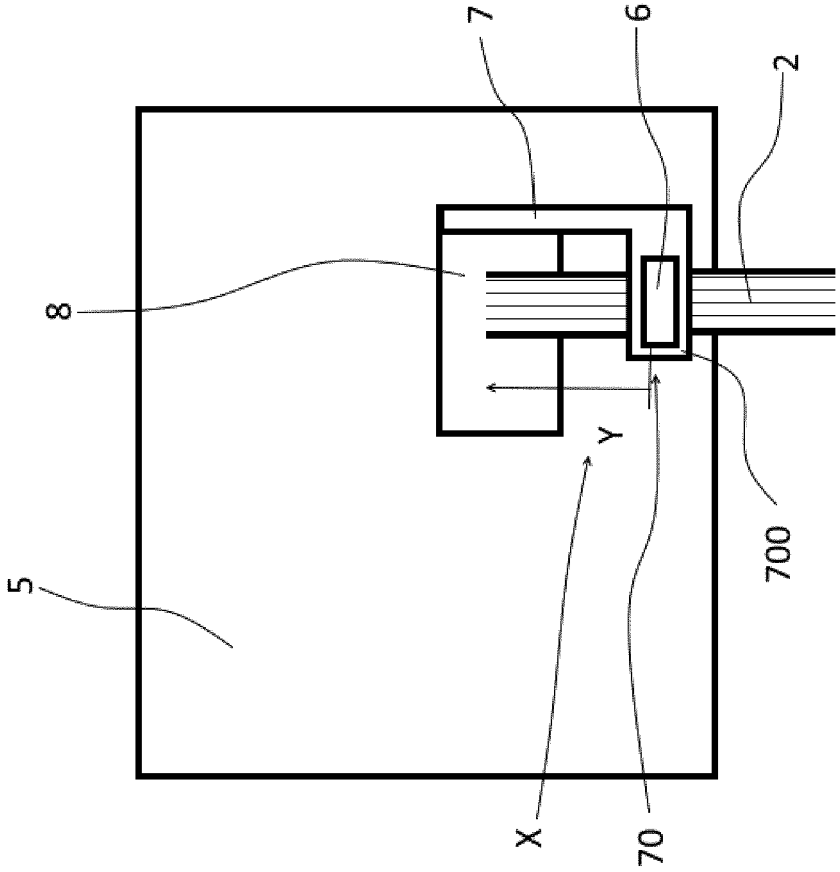

Fig. 2

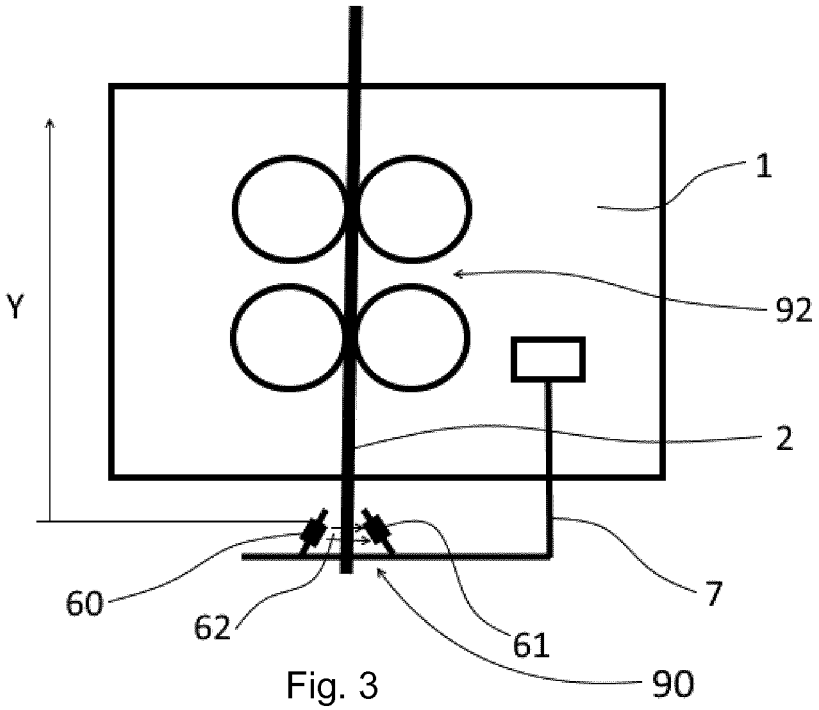

Fig. 3

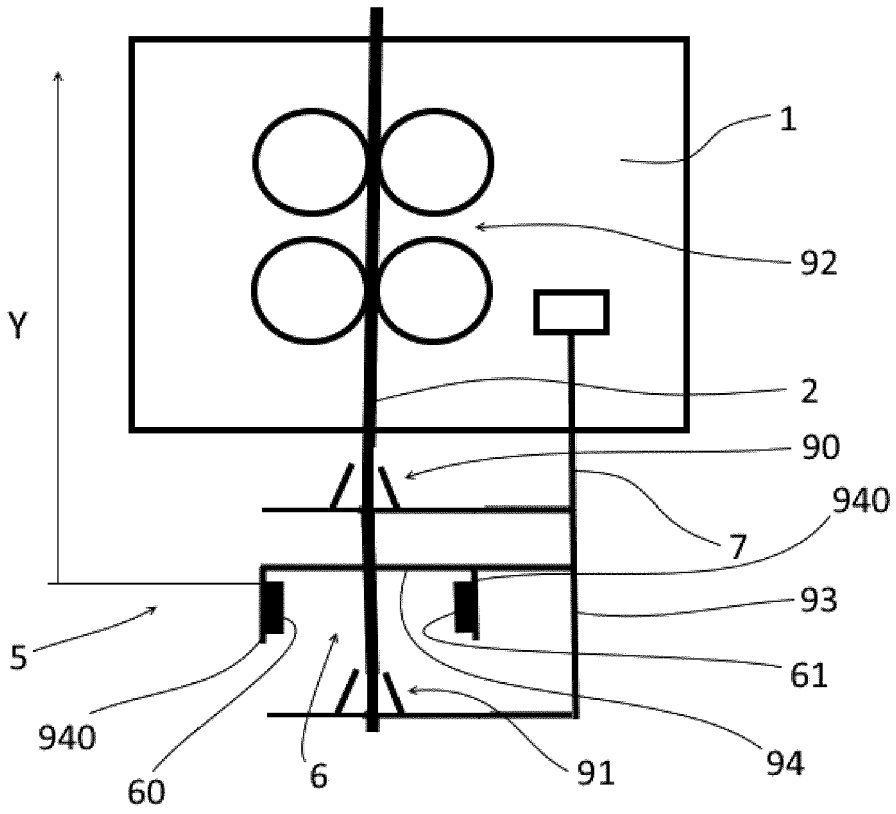

Fig. 3a

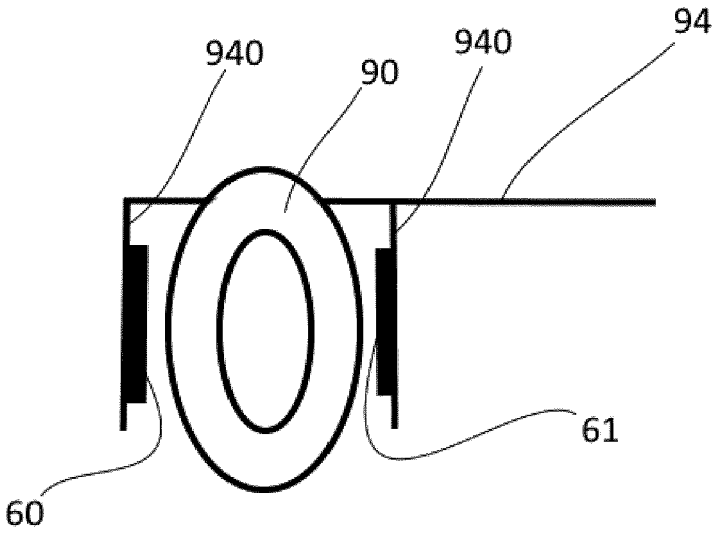

Fig. 3b

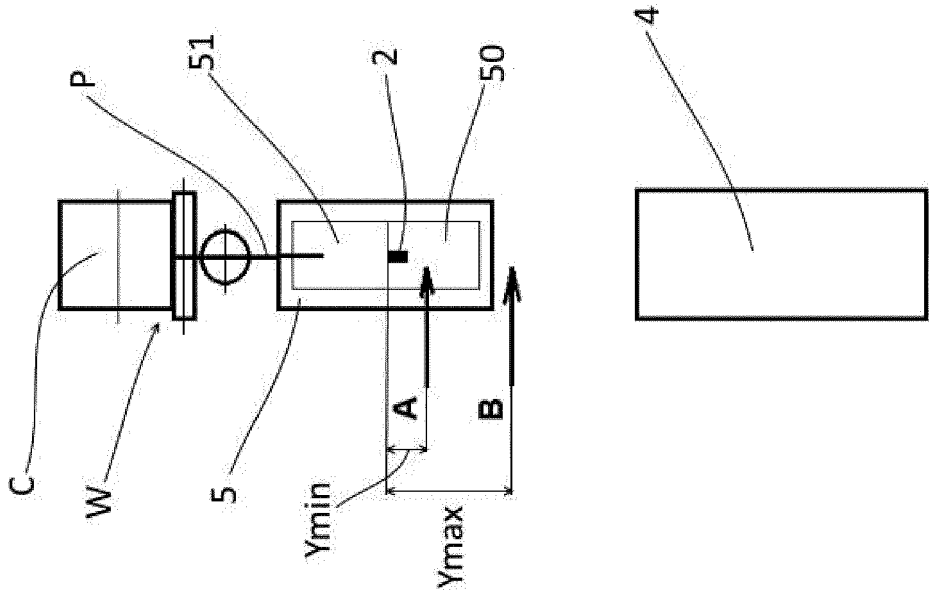

Fig. 4a

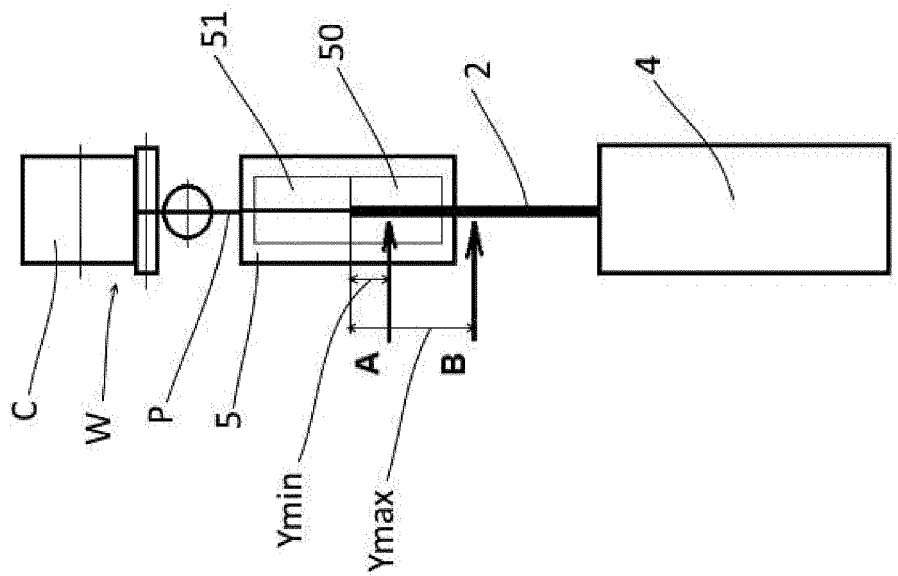

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 3523

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GB 2 154 619 A (SKF TEXTILMASCH KOMPONENTEN) 11 September 1985 (1985-09-11) * page 1, line 6 - line 15 * * page 1, line 88 - line 92 * * page 1, line 102 - line 106 * * page 2, line 111 - line 129 * * figures 1-2 * -----	1-10	INV. D01H1/20 D01H4/42 D01H13/14 D01H13/18
Y	EP 2 679 711 A1 (RIETER AG MASCHF [CH]) 1 January 2014 (2014-01-01) * paragraph [0007] - paragraph [0008] * * paragraph [0010] - paragraph [0012] * * paragraph [0057] * * figures 2-4 * * abstract * -----	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 August 2017	Humbert, Thomas

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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