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(54) Winding unit comprising a detection system

Spulvorrichtung umfassend ein Detektionssystem

METIER DE FILATURE COMPRENANT UN SYSTEME DETECTEUR

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention falls within the technical field of spinning.

[0002] In particular, the present invention relates to spinning equipment or spinning machines.

[0003] In detail, the present invention relates to a detection system used in the controls of such spinning machines.

[0004] In more detail, the detection system comprises a detector element (microsensor).

DESCRIPTION OF THE STATE OF THE ART

[0005] In the sector of yarn and thread manufacturing the operation of spinning is known. It is a sequence of operations necessary for the processing of textile fibres into yarn or thread.

[0006] This requires a series of processes depending on the different fibres used.

[0007] A first set of operations includes, typically, the opening, blending and cleaning of fibres. The sequence continues with the carding process, in which the fibres are unravelled and properly ordered resulting in carded bundles or rolags.

[0008] Then the actual spinning phase begins, which involves the twisting of the fibres transforming the bundles into a more or less thin cord which forms the yarn, or thread.

[0009] This process use equipment called spinning machines. A very common spinning machine is the ring spinning machine. It is used typically in the production of combed yarns of cotton, wool or synthetic fibres.

[0010] The ring spinning machine performs the drawing, twisting and winding of the thread around a spool which rotates at high speed (even more than 20,000 RPM). Known ring spinning machines are in general made of two symmetrical sides comprising respective platforms where a plurality of rotary spindles are arranged and on which the spools are inserted. Above the winding spindles there is a creel loaded with bobbins on which the bundles of carded fibres are placed to feed the spinning machine. A sliver is generated from the carded fibres which is conveyed through a series of rollers to draw it and then towards the underlying platform of spindles for the twisting and winding of the thread on the spool. The different speed of rotation of the rollers automatically determines the drawing of the sliver which reaches the spindles with the required thickness. The twisting of the thread on the spindles is determined by a steel ring (traveller), which runs on a circular guide (ring) perpendicular to and coaxial with the spool inserted on the spindle: the rotary motion of the spindle causes the spool to advance which, in turn, pulls the ring within which the thread runs. This rotary motion produces the twist of the thread while it winds on the spool. At the same time, the guide rises and falls resulting in the uniform winding of the thread on the spool. With this system, the number of twists per minute the thread is subjected to corresponds to the number of revolutions the ring performs around the spindle; this type of spinning machine allows for high production speeds.

[0011] The ring rotates around the spindle on the track of the ring at a high speed, even more than 20,000 RPM. The thread may break during this process. To assess the efficiency and the optimum performance of the various parts of the spinning machine, the detection of the breaks and the number of revolutions on the individual spindles are of significant importance.

[0012] In known ring spinning machines, the control of breaks and revolutions on the spindles is generally carried out by means of a detection system based on magnetic sensors.

[0013] These sensors use the voltage induced in a copper coil as a result of the change of the magnetic field generated by the sensor itself. They are placed on the spindle platform in the vicinity of the guide ring and detect the passage of the traveller. Sensors of the known type comprise a permanent magnet and a copper coil wound on a spool with the entire assembly housed in a plastic container.

[0014] The use of these sensors involves some drawbacks, however.

[0015] One drawback of the known systems is the presence of the permanent magnet and the force of attraction that it generates with respect to the traveller. This can result in breakage of the thread placed in the traveller, in particular in the starting phase when the spool is accelerated and set in rotation by the rotation spindle. Another drawback is the significant size of the detection systems as a whole, and in particular the size of the sensor.

[0016] In fact, an elevated size hampers the insertion of the thread on the traveller during any repair operations as a result of breakage of the thread.

[0017] In addition, an elevated size favours the deposition of volatile residual materials, such as the fibres of the material being processed, and increases the need for periodic cleaning operations.

[0018] Furthermore, an elevated size increases the difficulty of maintenance of the guide ring, such as centring or cleaning operations.

[0019] US4023341 discloses a device for detecting yarn breaks in drawing frames and spinning frames comprising a permanent magnet attached to the ring support of the textile machine and an electromagnetic impulse detector also attached to the ring support, close to the path of the traveler which is made at least partially of a ferromagnetic material, said impulse detector being connected, through an amplifier, to a yarn cutting device positioned upstream of the feeding rollers and of the yarn stretching wheel. The electromagnetic impulse detector consists of a coil wound onto a ferromagnetic core.

[0020] Thus the main object of the present invention

is to resolve or at least in part obviate the drawbacks mentioned above that characterize the detection devices of the known type.

[0021] In particular, one object of the present invention is to provide a detection system for a thread winding unit of a spinning machine which increases the reliability of the spinning machine itself.

[0022] Another object of the invention is to provide a detection system for a thread winding unit of a spinning machine which reduces the overall dimensions compared to devices of the known type.

[0023] A further object of the invention is to provide a detection system for a thread winding unit of a spinning machine which facilitates maintenance operations compared to devices of the known type.

[0024] Yet another object of the invention is to provide a detection system for a thread winding unit of a spinning machine which facilitates repair operations compared to devices of the known type.

[0025] A further object of the invention is to provide a detection system for a thread winding unit of a spinning machine which facilitates cleaning operations compared to devices of the known type.

[0026] Another object of the invention is to provide a detection system for a thread winding unit of a spinning machine which reduces the attractive force as regards the traveller so as not to cause breakage of the thread inside the traveller, especially during start-up.

SUMMARY OF THE PRESENT INVENTION

[0027] The present invention is based on the general consideration that the problems encountered in the prior art can be at least partially overcome by the realization of a detection system for a thread winding unit around a spool in which the detection system is based on the variation of intensity of a magnetic field and wherein this variation of intensity is caused by means suited to generate a magnetic field, these means pertaining to the winding unit.

[0028] Thus firstly, the present invention relates to a thread winding unit for winding a thread around a spool and comprising a detection system, this winding unit comprising a traveller element suited to receive the thread to be wound and suited to slide on a guide element set up along a closed path around the spool, this detection system being suited to detect the passage of the traveller element on the basis of a variation of intensity of a magnetic field, wherein the system comprises means suited to generate a magnetic field, these means pertaining to the winding unit.

[0029] The means suited to generate a magnetic field comprise at least one magnetized portion of the guide element and the traveller element comprises a material suited to vary the intensity of the magnetic field generated by the magnetized portion of the guide element during the sliding of the traveller element on the guide element. In a preferred embodiment, the means suited to generate a magnetic field comprise at least one magnetized portion of the traveller element. Advantageously, the magnetized portion comprises a permanent magnet.

[0030] Advantageously, the traveller element comprises a ferromagnetic material.

[0031] Even more advantageously, the traveller element is made of steel.

[0032] In a further preferred embodiment, the system comprises a support element for the guide element.

[0033] Preferably, the means suited to generate a magnetic field comprise at least one magnetized portion of the support element and the traveller element comprises a material suited to vary the intensity of the magnetic field generated by the magnetized portion of the support during the sliding of the traveller element on the guide element.

[0034] Advantageously, the traveller element comprises a ferromagnetic material.

[0035] Even more advantageously, the traveller element is made of steel.

[0036] Preferably, the support element and the guide element are translatable along a longitudinal direction substantially parallel to the axis of the spool.

[0037] In yet another preferred embodiment, the guide element is annular in shape. Advantageously, the traveller element is annular in shape.

[0038] Preferably, the traveller element slides in a track of the guide element.

[0039] In another preferred embodiment, the system comprises a detector element for the variation of intensity of the magnetic field.

[0040] Preferably, the detector element is capable of detecting magnetic induction down to one single Gauss.

[0041] In a further preferred embodiment, the detector element comprises a winding of conductive material wrapped around a core of ferromagnetic material.

[0042] More preferably, the detector element comprises a copper coil with a central core made of ferromagnetic material.

[0043] Preferably, the detector element has an inductance greater than or equal to 100 mH (milliHenries).

[0044] In yet another preferred embodiment, the detector element comprises a Hall effect sensor.

[0045] Advantageously, the Hall effect sensor has a sensitivity greater than or equal to 2.5 mV/Gauss.

[0046] Advantageously, the system comprises an acquisition and processing unit related to the detector element.

[0047] In a further preferred embodiment, the winding unit comprises means for rotation of the spool about its axis.

[0048] Secondly, the present invention relates to a spinning apparatus of the type comprising a thread winding unit in which the winding unit is realized as described above.

[0049] Preferably, the apparatus comprises a fibre feeding unit and a drawing unit of those fibres which are suited to cooperate to generate a thread for the winding

unit.

[0050] Advantageously, the winding unit also performs a twisting operation of the thread.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] Further advantages, objectives and characteristics as well as embodiments of the present invention are defined in the claims and will be further clarified in the following by means of the following description in which reference is made to the attached drawings. In the drawings, corresponding or equivalent characteristics and/or component parts of the present invention are identified by the same reference numbers. In particular, in the figures:

- Fig. 1 shows a schematic view of a spinning machine comprising a detection system according to a preferred embodiment of the present invention;
- Fig. 2 shows a top view of a detail of Fig. 1 wherein the detection system according to the preferred embodiment of the present invention is visible;
- Fig. 3 shows a first alternative embodiment of the detection system of Fig. 2;
- Fig. 4 shows another alternative embodiment of the detection system of Fig. 2.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0052] Although the present invention is described below with reference to embodiments represented in the drawings, the present invention is not limited to the embodiments described below and shown in the drawings. On the contrary, the embodiments described below and represented in the drawings clarify some aspects of the present invention, the purpose of which is in any case defined by the claims.

[0053] The present invention finds particular application in the technical field of production of spinning machines for the textile industry. In particular, the present invention finds an advantageous application in the production of ring spinning machines. It should be noted, however, that the present invention is not limited to the production of ring spinning machines. On the contrary, the present invention may find application in all cases involving the control of the winding of a thread around a spool.

[0054] An embodiment of a ring spinning system 1, hereinafter simply referred to as the machine, is shown in Fig. 1. The machine 1 comprises a detection system which is the object of the present invention, indicated as a whole by number 20 and shown in detail in Fig. 2.

[0055] The machine 1 shown schematically in the figure represents a ring spinning machine, able to simultaneously perform the drawing, twisting and winding of the thread around a spool 2 which rotates at high speed. The speed of rotation of the spool 2 may exceed 20,000 revolutions per minute.

[0056] In the schematic view of Fig. 1 for the sake of simplicity two winding units 8 are shown with the respective spools 2 arranged on two symmetrical fronts of the machine 1. It is clear, however, that the machine 1 will be suitably configured to receive a plurality of winding units 8 arranged advantageously, but not necessarily symmetrically aligned, on the two fronts. For the purposes of the present invention, the description will be made for only one winding unit 8 of the machine 1. The inventive concept can, in any case, obviously be extended to all winding units 8 on the machine 1.

[0057] The machine 1 comprises an upper bobbin 3 on which the original fibres 4 are arranged which feed the machine 1 and which will constitute the final thread 5.

[0058] Below the bobbin 3 there are a series of rollers 6 toward which the sliver drawn from the bobbin 3 of fibre 4 is conveyed. The particular conformation of the outer surface of these rollers 6 and the different speed of rotation of the three pairs of rollers 6 automatically determines the drawing of the sliver 7 that reaches the underlying winding unit 8 in the form of thread 15 with the required thickness.

[0059] The winding unit 8, or spindle platform comprises a rod 9, or spindle, rotating at high speed around a central axis. On the spindle 9, the spool 2 of the thread 5 is inserted so as to integrally rotate with the spindle 9.

[0060] Externally to the spindle 9, and the spool 2, a guide element 11 is positioned for a traveller element 12, better seen in Fig. 2.

[0061] The guide element 11 preferably has an annular shape suited to define a closed path around the spool 2. Advantageously, the guide element 11 is circular in shape and arranged coaxially with the spool 2.

[0062] The guide element 11 is preferably connected to a support element 13. The support element 13, and with it the guide element 11, is advantageously movable along a substantially vertical direction Y along the length of the spindle 9, preferably between the end zones of the spool 2. In other words, the support element 13, and with it the guide element 11, is advantageously movable along a substantially vertical direction Y and substantially parallel to the axis of the spool 2 in its inserted position on the spindle 9.

[0063] The traveller element 12 preferably has an annular shape to allow the through passage of the thread 15 coming from the drawing rollers 6. The thread is then conveyed towards the spool 2 on which it will be wound, as also shown in Fig. 2. In addition, the traveller element 12, is associated with the guide element 11 in such a way that it can slide around it and around the spool 2 along the closed path defined by the guide 11 itself.

[0064] Preferably the traveller element 12 slides on a special track, not shown, built-in on the guide element 11.

[0065] In operation, the rotation of the spindle 9 and the spool 2, drag the traveller element 12 within which the thread 15 runs; this rotation produces the winding of the thread 5 and simultaneously the twisting of the thread

5 while it winds on the spool 2. The support element 13 together with the guide element 11, simultaneously rises and falls along the vertical direction Y, resulting in the uniform winding of the thread 5 on the spool 2.

[0066] The winding unit 8 therefore performs the uniform winding of the thread 5 on the spool 2 and simultaneously applies the required twisting for the production of the thread.

[0067] With this system, the number of twists per minute applied to the thread 5 corresponds to the number of revolutions that the traveller element 12 executes around the spindle 9.

[0068] In accordance with the present invention, the machine 1 is associated with a detection system 20, better seen in Fig. 2.

[0069] The detection system 20 is used to detect the passage of the traveller element 12 during its rotations around the spool 2. The detection of these passages advantageously allows the correct operation of the spinning process to be checked.

[0070] First it enables the verification of any rupture of the thread 5. In that case, in fact, the traveller element 12 is no longer driven in rotation by the thread 5 and this event is therefore directly detectable by the detection system 20 which in fact no longer detects the passage of the traveller element 12.

[0071] Secondly, the detection of these passages enables the determination of the current speed of rotation of the traveller element 12 which, as mentioned above, directly affects the twisting applied to the thread 5. Therefore, from the measured values, it will be possible to control the exact speed of rotation to be imparted to the spindle 2 to obtain the desired degree of twisting of the thread 5.

[0072] The detection system 20 comprises a detector element 21 preferably associated with the support element 13 of the guide element 11.

[0073] Preferably, the detector element 21 is capable of detecting magnetic induction down to one single Gauss.

[0074] More preferably, the detector element 21 comprises a winding of conductive material wrapped around a core of ferromagnetic material 22, more particularly a special copper coil the central core of which is made of ferromagnetic material (ferrite), and in any case a detector element without permanent magnets.

[0075] The detector element 21 can therefore detect changes in magnetic fields even of low intensity. The detector element 21 is therefore capable of detecting magnetic induction down to one single Gauss and the special coil preferably has an inductance greater than or equal to 100 mH (milliHenries).

[0076] The detector element 21 may be advantageously positioned in front of the winding unit 8, as shown in the right portion of Fig. 1, or advantageously positioned behind the winding unit 8, as shown in the left portion of Fig. 1.

[0077] The detector element 21 is suitably housed in a casing 21a, preferably made of plastic material. The detector element 21 will also be advantageously positioned in proximity to and facing the traveller element 12 when the latter will pass in its vicinity during the rotation on the guide element 11, as indicated by the element in dashed lines in Fig. 2.

[0078] In alternative embodiments, the detector element 21 may be constructed differently, for example, comprising a Hall effect sensor, also without permanent magnets, and in any case it is capable of detecting magnetic induction down to one single Gauss.

[0079] The Hall effect sensor will be suitably powered and will allow the detection of low intensity magnetic fields, as well as the variations of those magnetic fields. Advantageously, the Hall effect sensor is capable of detecting magnetic induction down to one single Gauss and it is preferably capable of detecting magnetic induction down to a value greater than or equal to 2.5 mV/Gauss.

[0080] According to the present invention, the traveller element 12 preferably comprises a magnetized portion suited to advantageously create a magnetic field M with a pre-established magnitude.

[0081] The variations of the magnetic field M due to the movement of the traveller element 12 around the guide element 11 are suitably detected by the detector element 21. In this way the detector element 21 enables the detection of the actual rotation of the traveller element 12 around the guide element 11, as well as determines the number of revolutions per minute of the same.

[0082] In the case of the use of a Hall effect sensor, then, the actual intensity of the magnetic field M generated by the traveller element 12, and not only the variations, is detected by the detector element itself. The intensity of the magnetic field M detected by the Hall effect sensor will be at its maximum when the traveller element 12 is facing the detector element 21 itself, that is, in the position indicated with the element in dashed lines in Fig. 2.

[0083] In a preferred embodiment, the detection system 20 comprises a unit, not shown in the figures, for the acquisition and processing of the signals generated by the detector element 21.

[0084] Advantageously and in accordance with the present invention, the magnitude of the magnetic field M of the traveller element 12 can be maintained at low values. The use of the detector element 21, that is, the special coil without permanent magnets 22 or the Hall effect sensor, in fact enables the accurate detection of even weak magnetic fields.

[0085] Advantageously, also the attractive force as regards the traveller element 12 is maintained at low values, reducing this way the number of ruptures compared to known systems in which there are significant attractive forces arising from the use of permanent magnets.

[0086] Consequently, the reliability of the machine 1 of the invention is greater than ring spinning machines of the known art.

[0087] Still advantageously, the detection of the trav-

eller element 12 by the detector element 21, that is, the special coil without permanent magnets 22 or the Hall effect sensor, can be very precise even at greater distances than those found in systems of the known art.

[0088] This allows the detector 21 to be placed in a more distant and/or less cumbersome position.

[0089] In a preferred embodiment, the magnetic field M of the traveller element 12 corresponds to a weak residual magnetization of a magnetization process to which the traveller element 12 is subjected. Preferably, in this case, the traveller element comprises any material suitable to be magnetized and able to present a residual magnetization following that magnetization. Preferably, for example, the traveller element comprises any ferromagnetic material, more preferably steel, or alloys, metal alloys, materials composed of elements suited to be magnetized, etc.

[0090] However, in different embodiments the magnetic field M of the traveller element 12 can be obtained in any other way. For example, the design may foresee that the entire traveller element 12 is constituted by a permanent magnet, or that only a part of the same comprises a permanent magnet.

[0091] Another advantageous aspect is that if a magnetic field M is associated with the traveller element 12, it allows the use of a detector element 21 without permanent magnets.

[0092] This enables the overall dimensions of the detector element 21 to be minimized, particularly when for that purpose, a special coil without permanent magnets 22 or a Hall effect sensor is used.

[0093] The reduction of the overall dimensions of the detector element 21, advantageously mounted on the support element 13 in the vicinity of the guide element 11, leaves more free space to perform maintenance and/or cleaning operations and in particular, the periodic calibration operations of the guide element 11 or the cleaning of the different components.

[0094] Furthermore, the small size of the detector element 21 facilitates the insertion of the thread 15 on the traveller element 12 or the repair of the thread after a rupture.

[0095] Still advantageously, the use of a detector element 21 without permanent magnets and/or copper coils allows the use of a casing 21a featuring rounded shapes and with reduced overall dimensions. This characteristic enables the reduction of the amount of material deposited on the casing 21a of the detector element 21, such as volatile residual materials resulting from the fibres of the thread.

[0096] This results in a reduction of problems connected with ruptures between neighbouring winding units, as well as a reduction of the cleaning time of the detector element 21 itself.

[0097] With reference to Fig. 3, an alternative embodiment of the detection system 60 of the invention is shown.

[0098] This detection system 60 differs from the detection system 20 described with reference to Fig. 2 by the fact that the guide element 71 advantageously comprises a magnetized portion 72 suited to advantageously create a magnetic field M with a pre-established magnitude. Simultaneously, the traveller element 62 comprises at least one portion suited to modify the intensity of this magnetic field M during its sliding on the guide element 71. Preferably, the traveller element 62 is made of ferromagnetic material, more preferably steel.

[0099] The variations of the magnetic field M due to the movement of the traveller element 62 along the guide element 71 are duly detected by the detector element 21. In this way the detector element 21 detects the actual rotation of the traveller element 62 around the guide element 71 and determines the number of revolutions per minute of the same, in the same manner previously described for the first embodiment.

[0100] In the case of use of the Hall effect sensor, the actual intensity of the magnetic field M generated by the magnetized portion 72, and not only the variations, is detected by the detector element itself.

[0101] Advantageously and in accordance with the present invention, the magnitude of the magnetic field M generated by the magnetized portion 72 can be maintained at low values.

[0102] The use of the detector element 21, that is, the special coil without permanent magnets 22 or the Hall effect sensor, in fact enables the accurate detection of even weak magnetic fields.

[0103] Advantageously, also the attractive force as regards the traveller element 62 is maintained at low values, reducing this way the number of ruptures compared to known systems in which there are significant attractive forces arising from the use of permanent magnets.

[0104] Consequently, the reliability of the machine 1 of the invention is greater than ring spinning machines of the known art.

[0105] Still advantageously, the detection of the traveller element 62 by the detector element 21, that is, the special coil without permanent magnets 22 or the Hall effect sensor, can be very precise even at greater distances with respect to systems of known art.

[0106] This allows the detector clement 21 to be placed in a more distant and/or less cumbersome position.

[0107] In a preferred embodiment, the magnetic field M of the magnetized portion 72 corresponds to a weak residual magnetization of a magnetization process the guide element 71 of which is subjected to. Preferably, in this case, the guide element 71 includes any material suited to be magnetized and able to present a residual magnetization as a result of that magnetization. Preferably, for example, the guide element 71 includes any ferromagnetic material, more preferably steel, or alloys, metal alloys, materials composed of elements suited to be magnetized, etc.

[0108] In different embodiments, however, the magnetic field M generated by the guide element 71 can be obtained in any other way. For example, the design may

foresee that the whole guide element 71 is constituted by a permanent magnet, or that only a part of the same includes a permanent magnet.

[0109] The embodiment of the detection system 60 described herein achieves the same benefits indicated for the first embodiment.

[0110] Fig. 4 shows another alternative embodiment of the detection system 80 of the invention.

[0111] This detection system 80 differs from the detection system 20 described with reference to Fig. 2 by the fact that the support element 83 of the guide element 11 advantageously comprises a magnetized portion 92 suited to advantageously create a create a magnetic field M with a pre-established magnitude. Simultaneously, the traveller element 62 comprises at least a portion suited to modify the intensity of this magnetic field M during its sliding along the guide element 11. Preferably, the traveller element 12 is made of ferromagnetic material, more preferably steel.

[0112] The variations of the magnetic field M due to the movement of the traveller element 62 around the guide element 11 are suitably detected by the detector element 21. In this way the detector element 21 detects the actual rotation of the traveller element 62 around the guide element 11 and determines the number of revolutions per minute of the same, in the same manner previously described for the first embodiment.

[0113] In the case of use of the Hall effect sensor, the actual intensity of the magnetic field M generated by the magnetized portion 92, and not only the variations, is detected by the detector element itself.

[0114] Advantageously and in accordance with the present invention, the magnetic field M generated by the magnetized portion 92 can be maintained at low values.

[0115] The use of the detector element 21, that is, the special coil without permanent magnets 22 or the Hall effect sensor, in fact allows the accurate detection of even weak magnetic fields.

[0116] Advantageously, the attractive force as regards the traveller element 62 is also maintained at low values, reducing this way the number of ruptures compared to known systems in which there are significant attractive forces arising from the use of permanent magnets.

[0117] Consequently, the reliability of the machine 1 of the invention is greater than ring spinning machines of the known art.

[0118] Still advantageously, the detection of the traveller element 62 by the detector element 21, that is, the special coil without permanent magnets 22 or the Hall effect sensor, can be very precise even at greater distances with respect to systems of known art.

[0119] This allows the detector 21 to be placed in a more distant and/or less cumbersome position.

[0120] In a preferred embodiment, the magnetized portion 92 comprises an element applied to the support element 83 and the magnetic field M of the magnetized portion 92 corresponds to a weak residual magnetization of a magnetization process to which that portion 92 is subjected. Preferably, in this case, the magnetized portion 92 comprises any material suited to be magnetized and able to present a residual magnetization as a result of that magnetization. Preferably, for example, the magnetized portion 92 comprises any ferromagnetic material, more preferably steel, or alloys, metal alloys, materials composed of elements suited to be magnetized, etc.

[0121] In different embodiments, however, the magnetic field M generated by the magnetized portion 92 can be obtained in any way. For example, the design can foresee that the entire magnetized portion 92 is constituted by a permanent magnet, or that only a part of the same comprises a permanent magnet.

[0122] The embodiment of the detection system 80 described herein achieves the same advantages indicated above for the first embodiment.

[0123] Note that in further embodiments the design could foresee one or more combinations of the embodiments described above, that is, a magnetized portion pertaining to one or more of the constitutive elements of the traveller element, the guide element or the support element.

[0124] From the above description it is clear that the detection system of the invention achieves the intended purposes and in particular enables the construction of a detection system for the thread winding unit of a ring spinning machine which increases the reliability of the ring spinning machine itself.

[0125] While the present invention was described with reference to particular embodiments represented in the figures, it should be noted that the present invention is not limited to the particular embodiments shown and described herein.

[0126] It should be noted that the described examples where only the traveller is magnetized and where only the support element is magnetized does not fall within the scope of the claims. Embodiments shown in figures 2 and 4 and respective description are examples useful for understanding the invention.

[0127] The scope of the present invention is defined by the appended claims.

Claims

1. Winding unit (8) for winding a thread (15) around a spool (2), and comprising a detection system (20; 60; 80), said winding unit (8) comprising a traveller element (12; 62) suited to receive said thread (15) to be wound and suited to slide on a guide element (11; 71) arranged along a closed path around said spool (2), said detection system (20; 60; 80) being suited to detect the passage of said traveller element (12; 62) on the basis of a variation of intensity of a magnetic field, wherein the winding unit comprises means (12; 72; 92) suited to generate a magnetic field, wherein said means (12; 72; 92) pertain to said winding unit (8) and said means (72) comprise at

least one magnetized portion (72) of said guide element (71) wherein said traveller element (62) comprises a material suitable to vary the intensity of the magnetic field generated by said magnetized portion (72) of said guide element (71) during the sliding of said traveller element (62) on said guide element (71).

2. Winding unit (8) according to claim 1, **characterized in that** said means (12) comprise at least one magnetized portion of said traveller element (12).

3. Winding unit (8) according to claim 2, **characterized in that** said at least one magnetized portion comprises a permanent magnet.

4. Winding unit (8) according to claim 1, **characterized in that** said traveller element (62) comprises a ferromagnetic material.

5. Winding unit (8) according to any of the preceding claims, **characterized in that** it comprises a support element (13; 83) for said guide element (11).

6. Winding unit (8) according to claim 5, **characterized in that** said means (92) comprise at least one magnetized portion (92) of said support element (83) and said traveller element (62) comprises a material suitable to vary the intensity of the magnetic field generated by said magnetized portion (92) of said support element (83) during the sliding of said traveller element (62) on said guide element (11).

7. Winding unit (8) according to claim 6, **characterized in that** said traveller element (62) comprises a ferromagnetic material.

8. Winding unit (8) according to any of the preceding claims, **characterized in that** said traveller element (12; 62) slides in a track of said guide element (11; 71).

9. Winding unit (8) according to any of the preceding claims, **characterized in that** it comprises a detector element (21) of said variation of intensity of the magnetic field.

10. Winding unit (8) according to claim 9, **characterized in that** said detector element (21) is capable of detecting magnetic induction down to one single Gauss.

11. Winding unit (8) according to claim 10, **characterized in that** said detector element (21) comprises a Hall effect sensor (21a) or a winding of conductive material wound around a core of ferromagnetic material.

12. Winding unit (8) according to claim 10 or 11, **characterized in that** it comprises an acquisition and processing unit connected to said detector (21).

13. Apparatus for spinning (1) of the type comprising a winding unit (8) for winding a thread around a spool (2) and a detection system (20; 60; 80), **characterized in that** said winding unit (8) is realized according to any of the preceding claims.

14. Apparatus according to claim 13, **characterized in that** it comprises a fibre (4) feeder unit (3) and a drawing unit (6) of said fibres (4) suited to cooperate to generate a thread (15) for said winding unit (8).

Patentansprüche

1. Spuleinheit (8) zum Aufwickeln eines Fadens (15) um eine Spule (2), und ein Detektionssystem (20; 60; 80) umfassend, wobei die besagte Spuleinheit (8) ein Läuferelement (12; 62) umfasst, das geeignet ist, den besagten, aufzuwickelnden Faden (15) aufzunehmen und geeignet, auf einem Führungselement (11; 71) zu gleiten, das entlang eines geschlossenen Wegs um die besagte Spule (2) herum angeordnet ist, wobei das besagte Detektionssystem (20; 60; 80) geeignet ist, den Durchgang des besagten Läuferelements (12; 62) auf Basis einer Veränderung der Stärke eines Magnetfelds zu erfassen, wobei die Spuleinheit Mittel (12; 72; 92) umfasst, die geeignet sind, ein Magnetfeld zu erzeugen, wobei die besagten Mittel (12; 72; 92) zu der besagten Spuleinheit (8) gehören und die besagten Mittel (72) wenigstens einen magnetisierten Abschnitt (72) des besagten Führungselements (71) umfassen, und wobei das besagte Läuferelement (62) ein Material umfasst, das geeignet ist, die Stärke des während des Gleitens des besagten Läuferelements (62) auf dem besagten Führungselement (71) durch den besagten magnetisierten Abschnitt (72) des besagten Führungselements (71) erzeugten Magnetfelds zu verändern.

2. Spuleinheit (8) gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** die besagten Mittel (12) wenigstens einen magnetisierten Abschnitt des besagten Läuferelements (12) umfassen.

3. Spuleinheit (8) gemäß Patentanspruch 2, **dadurch gekennzeichnet, dass** der besagte, wenigstens eine magnetisierte Abschnitt einen Dauermagneten umfasst.

4. Spuleinheit (8) gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** das besagte Läuferelement (62) ein ferromagnetisches Material umfasst.

5. Spuleinheit (8) gemäß eines jeden der vorstehenden Patentansprüche, **dadurch gekennzeichnet, dass** sie ein Halteelement (13; 83) für das besagte Führungselement (11) umfasst.

6. Spuleinheit (8) gemäß Patentanspruch 5, **dadurch gekennzeichnet, dass** die besagten Mittel (92) wenigstens einen magnetisierten Abschnitt (92) des besagten Halteelements (83) umfassen und das besagte Läuferelement (62) ein Material umfasst, das geeignet ist, die Stärke des während des Gleitens des besagten Läuferelements (62) auf dem besagten Führungselement (11) durch den besagten magnetisierten Abschnitt (92) des besagten Halteelements (83) erzeugten Magnetfelds zu verändern.

7. Spuleinheit (8) gemäß Patentanspruch 6, **dadurch gekennzeichnet, dass** das besagte Läuferelement (62) ein ferromagnetisches Material umfasst.

8. Spuleinheit (8) gemäß eines jeden der vorstehenden Patentansprüche, **dadurch gekennzeichnet, dass** das besagte Läuferelement (12; 62) in einer Spur des besagten Führungselements (11, 71) gleitet.

9. Spuleinheit (8) gemäß eines jeden der vorstehenden Patentansprüche, **dadurch gekennzeichnet, dass** sie ein Detektionselement (21) für die besagte Veränderung der Stärke des Magnetfelds umfasst.

10. Spuleinheit (8) gemäß Patentanspruch 9, **dadurch gekennzeichnet, dass** das besagte Detektionselement (21) in der Lage ist, magnetische Induktion bis zu einem einzelnen Gauß zu erfassen.

11. Spuleinheit (8) gemäß Patentanspruch 10, **dadurch gekennzeichnet, dass** das besagte Detektionselement (21) einen Halleffektsensor (21a) oder eine Wicklung aus um einen Kern aus ferromagnetischem Material gewundenem, leitfähigem Material umfasst.

12. Spuleinheit (8) gemäß Patentanspruch 10 oder 11, **dadurch gekennzeichnet, dass** sie eine Erfassungs- und Verarbeitungseinheit umfasst, die an den besagten Detektor (21) angeschlossen ist.

13. Spinnvorrichtung (1) des Typs, der eine Spuleinheit (8) zum Aufwickeln eines Fadens um eine Spule (2) und ein Detektionssystem (20; 60; 80) umfasst, **dadurch gekennzeichnet, dass** die besagte Spuleinheit (8) gemäß eines jeden der vorstehenden Patentansprüche. ausgeführt ist.

14. Spinnvorrichtung gemäß Patentanspruch 13, **dadurch gekennzeichnet, dass** sie eine Zufuhreinheit (3) für Fasern (4) und eine Streckeinheit (6) für die besagten Fasern (4) umfasst, die geeignet sind, zusammenzuwirken, um einen Faden (15) für die besagte Spuleinheit (8) zu erzeugen.

Revendications

1. Unité d'enroulement (8) apte à enrouler un fil (15) autour d'une bobine (2) et comprenant un système de détection (20; 60; 80), ladite unité d'enroulement (8) comprenant un élément curseur (12; 62) apte à recevoir ledit fil (15) à enrouler et apte à coulisser sur un élément de guidage (11 ; 71) disposé le long d'un parcours fermé autour de ladite bobine (2), ledit système de détection (20; 60; 80) étant apte à détecter le passage dudit élément curseur (12; 62) sur la base d'une variation d'intensité d'un champ magnétique, où l'unité d'enroulement comprend des moyens (12; 72; 92) aptes à générer un champ magnétique, où lesdits moyens (12; 72; 92) appartiennent à ladite unité d'enroulement (8) et lesdits moyens (72) comprennent au moins une portion magnétisée (72) dudit élément de guidage (71), où ledit élément curseur (62) comprend un matériau apte à varier l'intensité du champ magnétique généré par ladite portion magnétisée (72) dudit élément de guidage (71) durant le coulissement dudit élément curseur (62) sur ledit élément de guidage (71).

2. Unité d'enroulement (8) selon la revendication 1, **caractérisée en ce que** lesdits moyens (12) comprennent au moins une portion magnétisée dudit élément curseur (12).

3. Unité d'enroulement (8) selon la revendication 2, **caractérisée en ce que** ladite au moins une portion magnétisée comprend un aimant permanent.

4. Unité d'enroulement (8) selon la revendication 1, **caractérisée en ce que** ledit élément curseur (62) comprend un matériau ferromagnétique.

5. Unité d'enroulement (8) selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend un élément de support (13; 83) pour ledit élément de guidage (11).

6. Unité d'enroulement (8) selon la revendication 5, **caractérisée en ce que** lesdits moyens (92) comprennent au moins une portion magnétisée (92) dudit élément de support (83) et ledit élément curseur (62) comprend un matériau apte à varier l'intensité du champ magnétique généré par ladite portion magnétisée (92) dudit élément de support (83) durant le coulissement dudit élément curseur (62) sur ledit élément de guidage (11).

7. Unité d'enroulement (8) selon la revendication 6, **caractérisée en ce que** ledit élément curseur (62)

comprend un matériau ferromagnétique.

8. Unité d'enroulement (8) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ledit élément curseur (12; 62) coulisse dans une piste dudit élément de guidage (11; 71).

9. Unité d'enroulement (8) selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend un élément détecteur (21) de ladite variation d'intensité du champ magnétique.

10. Unité d'enroulement (8) selon la revendication 9, **caractérisé en ce que** ledit élément détecteur (21) est en mesure de détecter l'induction magnétique jusqu'à un seul Gauss.

11. Unité d'enroulement (8) selon la revendication 10, **caractérisée en ce que** ledit élément détecteur (21) comprend un capteur à effet Hall (21a) ou un enroulement de matériau conducteur enroulé autour d'un noyau en matériau ferromagnétique.

12. Unité d'enroulement (8) selon la revendication 10 ou 11, **caractérisée en ce qu'**elle comprend une unité d'acquisition et de traitement reliée audit détecteur (21).

13. Appareil pour le filage (1) du type comprenant une unité d'enroulement (8) apte à enrouler un fil autour d'une bobine (2) et un système de détection (20; 60; 80), **caractérisé en ce que** ladite unité d'enroulement (8) est réalisée selon l'une quelconque des revendications précédentes.

14. Appareil selon la revendication 13, **caractérisé en ce qu'**il comprend une unité d'alimentation (3) de fibres (4) et une unité d'étirage (6) desdites fibres (4) aptes à coopérer pour générer un fil (15) pour ladite unité d'enroulement (8).

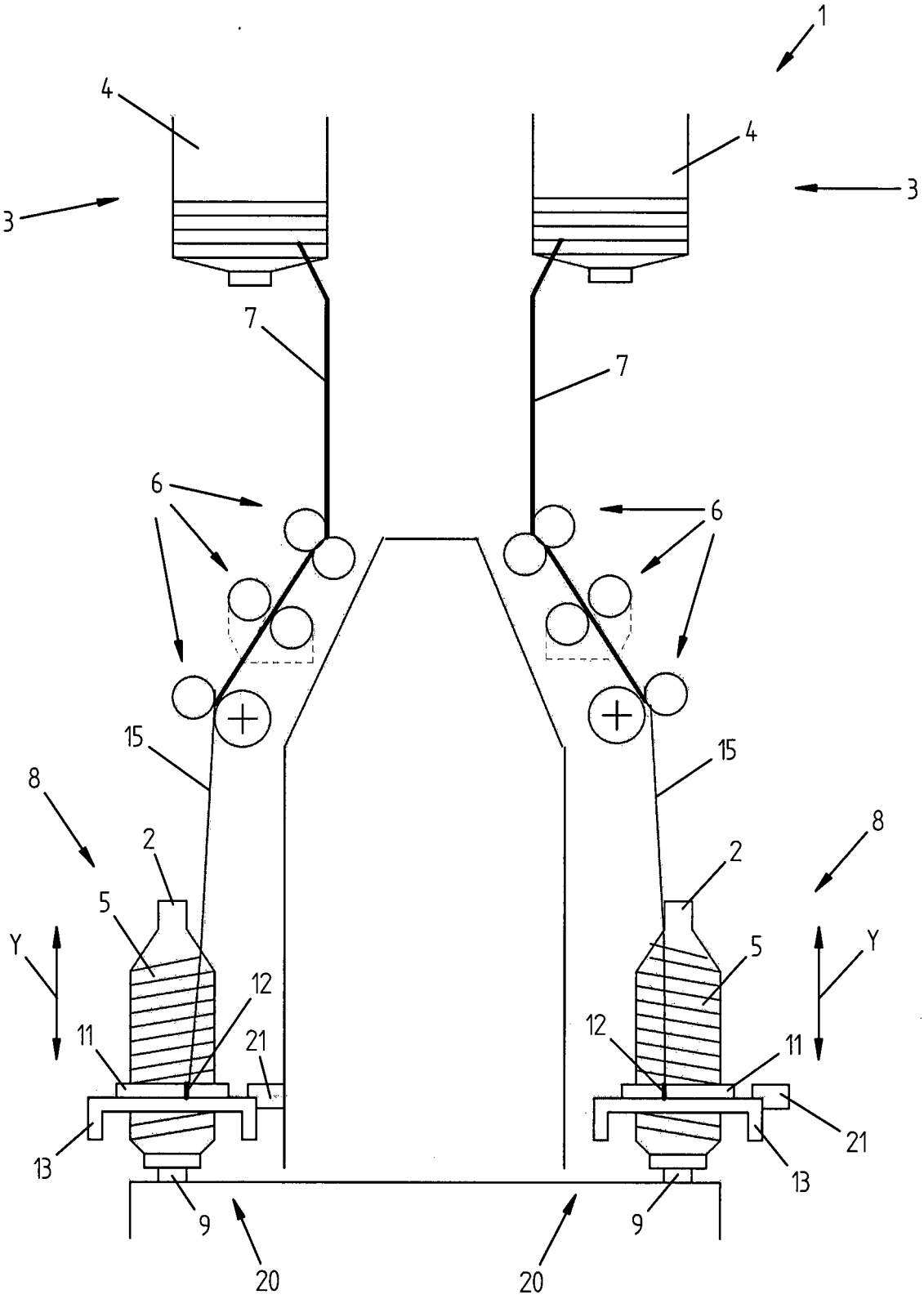


FIG. 1

FIG. 2

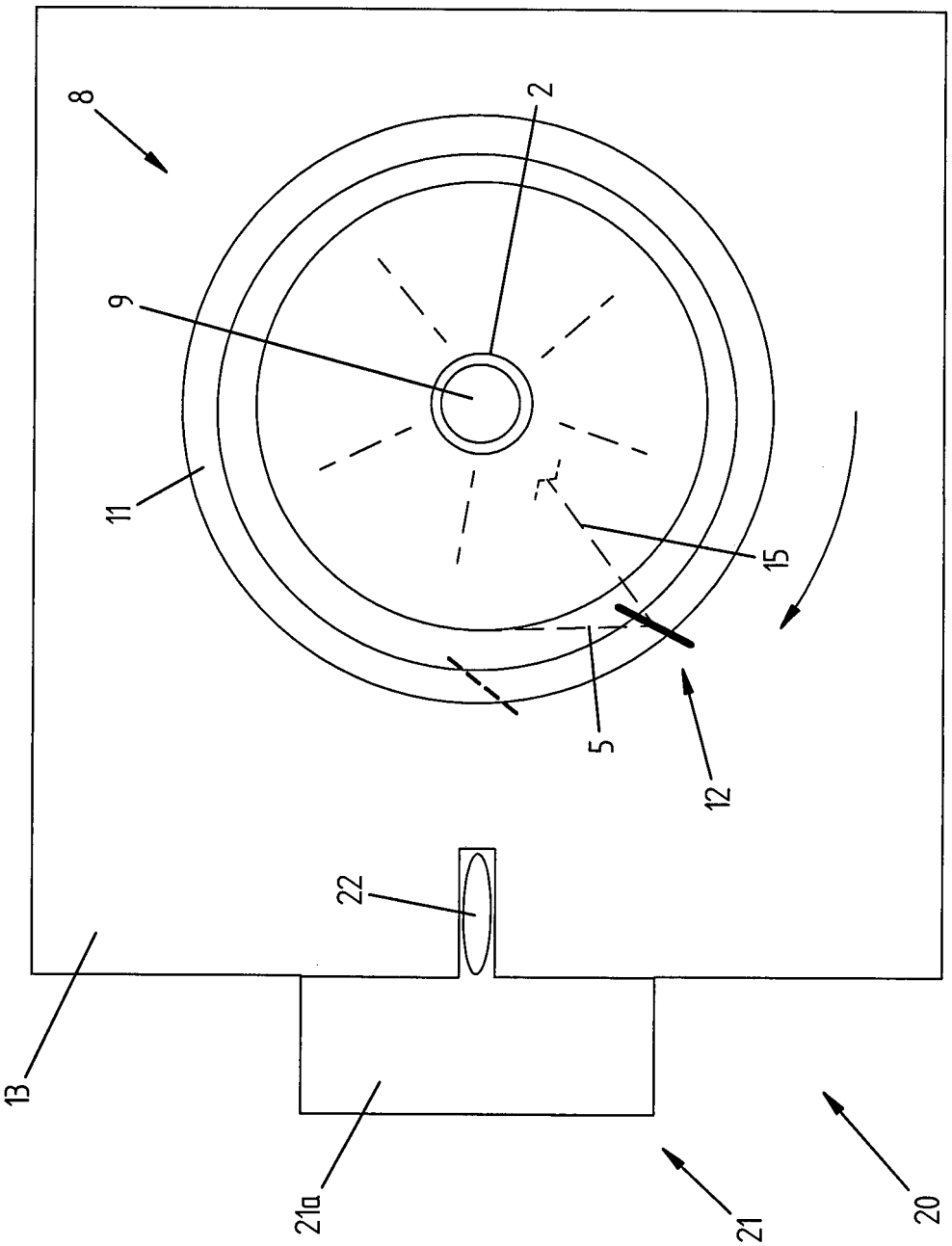


FIG. 3

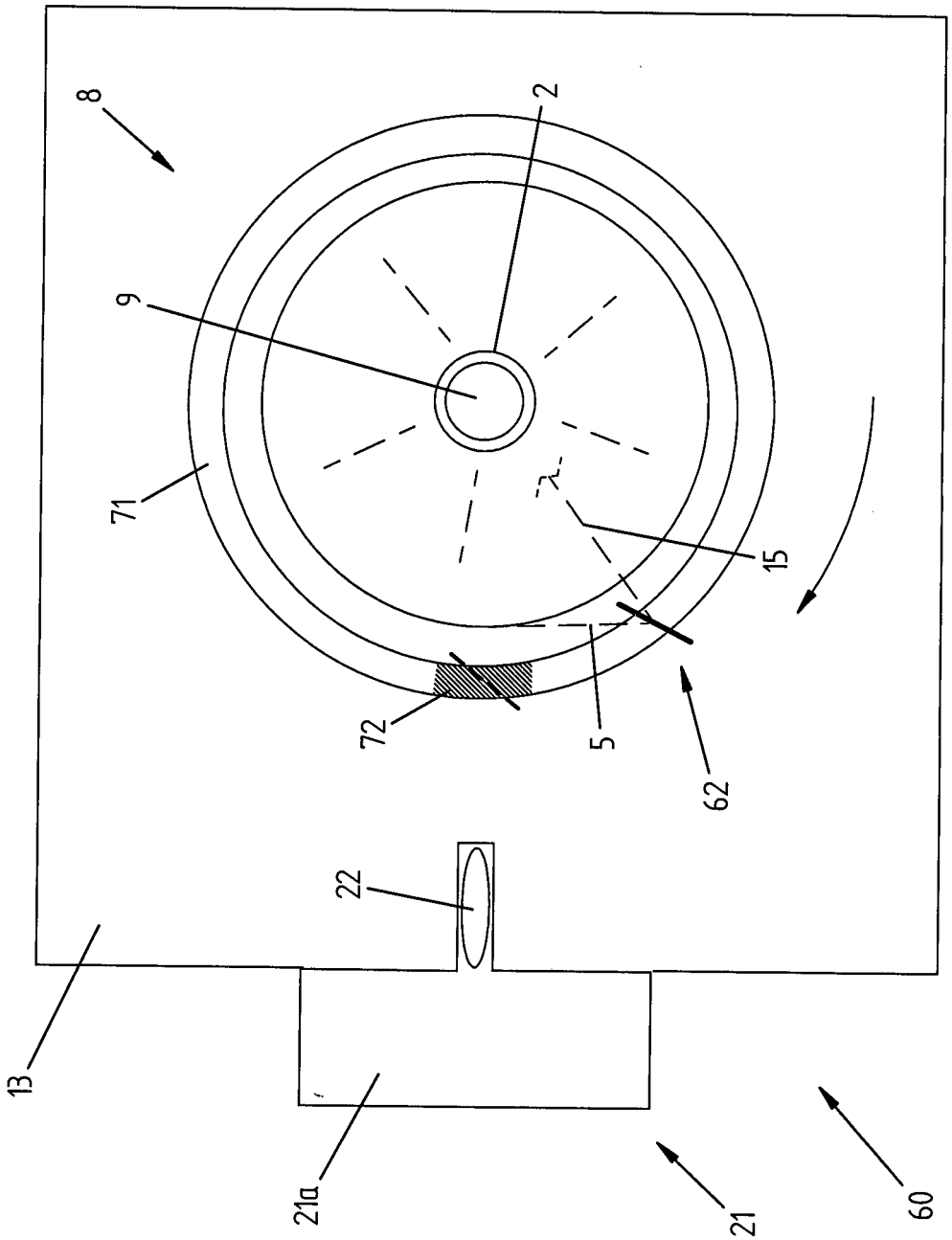
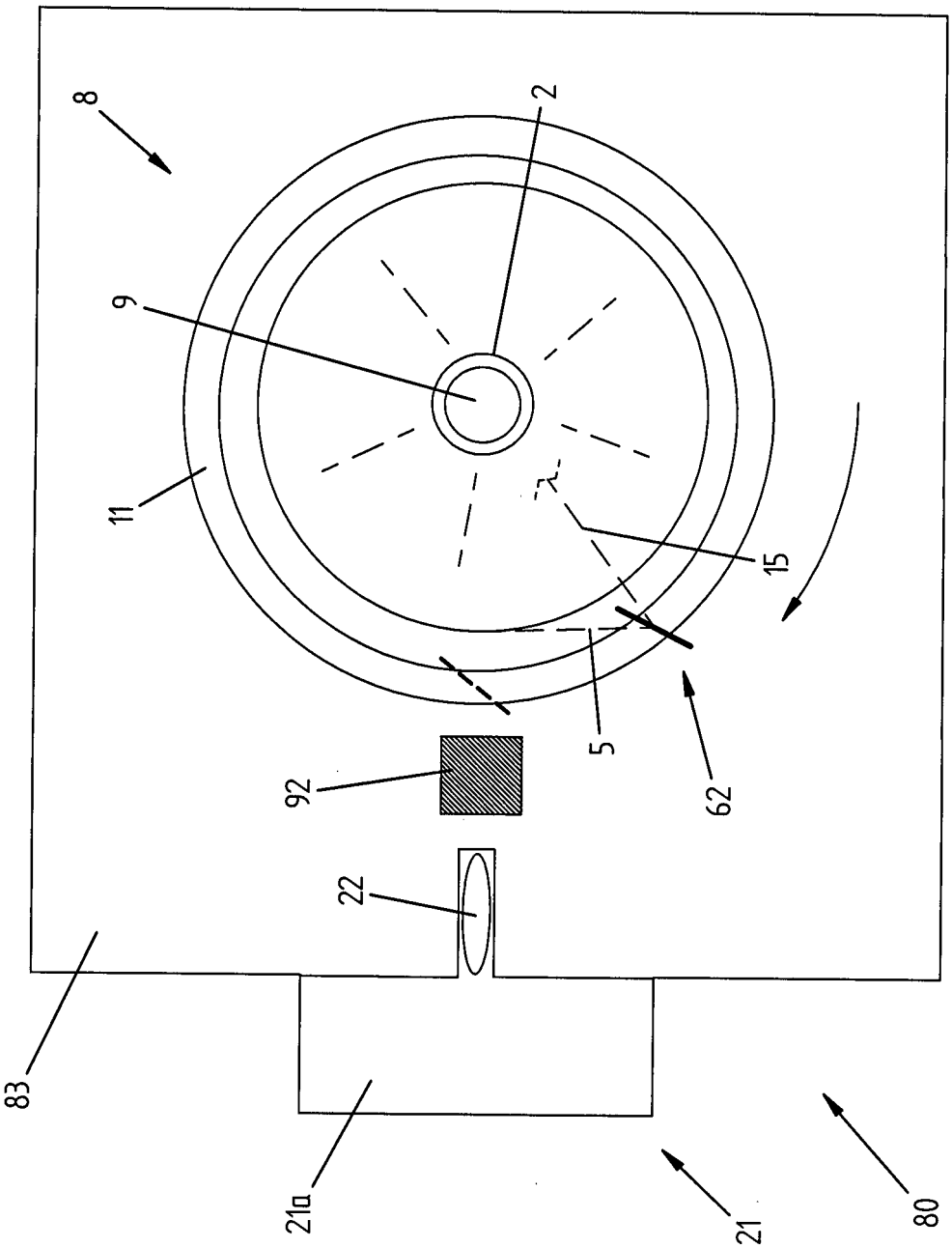


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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