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(54) Title: AN ATTENDING DEVICE FOR A RING OR AIR-JET SPINNING MACHINE FOR PRODUCING YARN, A RING OR AIR-JET SPINNING MACHINE FOR PRODUCING YARN AND A METHOD OF USING THIS ATTENDING DEVICE

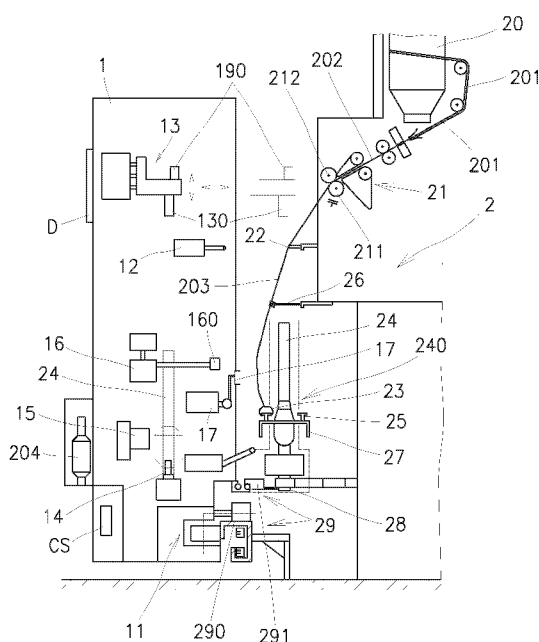


Fig. 2

(57) Abstract: The invention relates to an attending device for a ring or air-jet spinning machine, which comprises a frame on which are mounted means (11) allowing displaceable mounting on the spinning machine means for moving along a row of workstations (2) of the machine service means (SM) for performing attending operations at the workstations (2) and which further comprises a power supply system and a control system (CS). At least one temperature sensor (18) and/or at least one humidity sensor (19) and/or at least one common air temperature and humidity sensor (190) is/are mounted in the frame of the attending device (1). This sensor/these sensors being adapted for data transmission. In addition, the invention relates to a ring or air-jet spinning machine for producing yarn on which such an attending device is located and a method of using the attending device on the ring or air-jet spinning machine.

An attending device for a ring or air-jet spinning machine for producing yarn, a ring or air-jet spinning machine for producing yarn and a method of using this attending device

5 Technical field

The invention relates to an attending device for a ring or air-jet spinning machine for producing yarn, which comprises a frame on which are mounted means allowing displaceable mounting and moving along a row of workstations of the machine, service means for performing attending operations at the workstations of the machine and which further comprises a power supply system and a control system.

In addition, the invention relates to a ring or air-jet spinning machine for producing yarn provided with the above-mentioned attending device and to a method of using the attending device on a ring or air-jet spinning machine comprising at least one row of workstations, in which the attending device is moving along at least one row of workstations or is stopped at a workstation to perform attending operations.

Background art

The spinning of staple yarns in textile plants, so-called spinning mills on ring, air-jet or rotor spinning machines, requires certain climatic conditions to ensure reliable operation, both in terms of air humidity and temperature. Air conditioning technology, i.e., air temperature and humidity control in textile plants, has become an integral part of the textile industry. The purpose of the air conditioning process is to stabilise the moisture content of the processed textile fibres and to seasonally adjust the temperature and relative humidity of the air in order to meet the target moisture content of the textile fibres to be transformed into staple yarn in the spinning process. Another problem that occurs in spinning mills, the solution of which is also related to maintaining a certain level of air humidity in the area of processing textile fibres into yarn, is the occurrence of static electricity. Due to the usually large spaces of textile plants, it is often difficult to ensure uniform conditions in terms of air

temperature and humidity throughout the spinning mill, in order to meet the requirements for a reliable and efficient process of spinning staple yarns.

To ensure the required air temperature and relative air humidity, textile plants are usually closed spaces, wherein the air conditioning technology for the entire closed space is then realized by central heating or cooling and by distributing humidifying water, whether in the form of mist or vapour. The entire air conditioning system is then usually controlled on the basis of information obtained from temperature and humidity sensors, suitably distributed in the spinning mill area. Unfortunately, even the relatively large number of sensors distributed throughout the spinning mill cannot guarantee that the information on temperature and humidity conditions at specific locations in all spinning units is sufficiently accurate and relevant. There may therefore be a situation where some spinning stations work in an environment outside the required parameters of temperature and/or air humidity, and thus the technological process of yarn spinning is negatively affected. This results in the production of inferior yarn, an increase in the yarn breakage rate, or the formation of wrap yarns on some components of the spinning units.

Certain technical solutions are known from patent literature which seek to achieve an even distribution of temperature and humidity in the spinning mill by means of movable devices provided with temperature and humidity sensors. CN111515918, for example, describes the implementation of an unmanned autonomous attending device for a spinning mill, which includes a separate chassis, a data acquisition module equipped with temperature and humidity sensors, and a wireless communication module. While moving independently, the attending device collects temperature and humidity data in the spinning mill environment. At the same time, the attending device ensures the collection of dust and impurities from the floor of the spinning mill. To control its movement, the attending device is provided with a complex navigation method and uses a GPS system, an ultrasonic sensor and a LIDAR laser navigation system and through wireless communication ensures the transmission of measured data to the air conditioning system. The disadvantages of this solution include the necessity to implement a relatively complex navigation system, the need for an individual power source at the attending device and the need to ensure

separate communication between the attending device and the air conditioning system of the spinning mill.

CN112799450 discloses an inspection attending device with a walking chassis which can move slowly around a production line, for example a spinning machine. An on-board electronic control device includes an on-board control unit electrically connected to a motor driving the walking chassis. The attending device is provided with means for measuring climatic conditions and at the same time comprises means for humidifying the air in the spinning mill and heating it. The entire construction is very complex, the attending device must include its own water tank for humidifying the air. A sufficient supply of electricity must be ensured for all planned functions, especially for heating.

CN113324299 describes a humidifying attending device for textile plants, which solves the technical problem of inconvenient filling of water in the reservoir of the attending device in the event that the humidified space of the spinning mill is too large and the supply of water in the attending device is insufficient. The problem is solved by placing a guide track on the floor of the spinning mill, and a guided transport means is adapted to move along the guide track, the guide track being provided with several points where the humidifying attending device replenishes the supply of humidifying fluid. Communication between the liquid refill points and the humidifying attending device is ensured by means of a laser transmitter and receiver.

CN202836623 discloses a ZigBee-based spinning mill temperature and humidity control system consisting of a cart that can move freely around the spinning mill and is equipped with temperature and humidity sensors connected to a controller circuit that is connected via a ZigBee wireless communication module to the control computer. Based on the ZigBee network, the spinning mill temperature and humidity control system is able to collect real-time temperature and humidity data, as well as to analyze the composition of gases inside the spinning mill, which makes it easier for managers to regulate the indoor environment of the spinning mill. The disadvantage of this solution is the necessity to implement a separate autonomous device for moving around the spinning mill, including drive elements, power sources and wireless communication. All this leads to relatively high costs.

A common disadvantage of all the known above-mentioned solutions is the fact that additional supplementary devices are designed for the space of the spinning mill and certain conditions must be created for the movement of these separate devices around the spinning mill, for example, a special track or at least sufficient space for their movement. There is also a risk of collision with other attending devices (spinning or doffing automats, blowing devices, etc.). Moreover, the risk of a collision with service personnel is not negligible. From the technological point of view of the production of staple yarns, it appears to be a significant disadvantage that the temperature and humidity sensors on these mobile devices are located relatively far from the actual spinning units, i.e., the places where the technological process of yarn production, which is dependent on the optimal climate, actually takes place. Thus, there may be a situation where the climate at the point of measurement by the attending device, i.e., essentially near the centre of the aisle, is found to be satisfactory, but due to various circumstances, the climate at the workstation of the textile spinning machine may be different. Since textile spinning machines for producing yarn comprise a plurality of workstations arranged next to each other, they are in many cases provided with attending devices which are movable along the row of workstations of the machine and comprise means for carrying out attending operations at the workstation, in particular means for resuming spinning at the workstations. For air-jet spinning machines and rotor spinning machines, attending devices are a normal part of these machines, unless rotor spinning machines designed for manual operation only are supplied. In the case of ring spinning machines, the attending device is either also part of the supplied ring spinning machine or is supplied separately with the option of arranging it on a ring spinning machine which was originally designed for manual operation.

The object of the invention is to contribute to solving the problem of air conditioning in spinning mills, so that, as far as possible, all workstations on all machines will operate in optimal temperature and humidity conditions, and to achieve this object, to provide an attending device intended for ring or air-jet spinning machines.

Principle of the invention

The object of the invention is achieved by an attending device comprising means allowing for displaceable mounting on a ring or air-jet spinning machine and for moving along a row of workstations on the machine according to
5 independent claim 1.

In ring spinning machines and air-jet spinning machines, the decisive area in terms of air temperature and humidity is the area of a roving drafting device in which the yarn is thinned by stretching, its fibres are arranged in parallel to form a fibre ribbon and downstream of the drafting device, the fibre
10 ribbon is transformed into yarn by twist insertion.

The at least one temperature and/or at least one humidity sensors and/or at least one common air temperature and humidity sensor of the attending device are coupled to the control system of the attending device, which comprises means for generating and recording information about the climatic conditions in
15 the areas of interest at the individual workstations of the ring or air-jet spinning machine for which the attending device is intended. Said sensor/s is/are adapted for data transmission.

In the first step, using the means of the attending device, it is determined what climatic conditions prevail at the respective workstation in the vicinity of
20 the yarn-producing working means are determined, and it is only in the next step/steps that is this information used to set the climatic conditions at that workstation and/or at part of the row of workstations of the textile spinning machine and/or at the entire monitored row of workstations of the textile spinning machine for which the attending device is intended, and/or in the entire
25 spinning mill in which at least one machine is installed for which the attending device is intended.

The attending device according to the invention is primarily intended for ring spinning machines and can also be used for air-jet spinning machines, only it will comprise other service means for resumed spinning at the workstation.

30 The attending device according to the invention can be used, without exerting inventive effort, on other textile machines comprising at least one row

of workstations on which there is or will be a need to monitor climatic conditions, such as rotor spinning machines or winding machines.

The attending device according to the invention comprises a frame on which are mounted means allowing displaceable mounting and moving along a
5 row of workstations of the machine.

The temperature sensor and/or humidity sensor and/or common temperature and humidity sensor, have a sensing side which, when mounted on the attending device, faces the front side of the attending device, in front of which is formed a sensing area of air temperature and/or humidity, which is
10 situated at least partially outside the ground plan of the attending device in front of the front side. The sensing area is passing through the front side of the attending device into the space in which, on the ring or air-jet spinning machine for which the attending device is intended, there will be areas of interest for individual workstations of the machine in which climatic conditions will be
15 monitored, and their intersection with the sensing area will create the monitored area of the workstation of the machine.

From the determined climatic conditions in the areas of interest and/or in the monitored areas at individual workstations of the row, or of a selected part of the row of workstations, or the entire row of workstations of the ring or air-jet
20 spinning machine for which the attending device is intended, the evaluation means of the control system of the attending device create a digital map of the microclimate, being able to assign information on the climatic conditions to the workstation where it was determined and store this information.

The control system of the attending device is further provided with means
25 for identifying the workstations of the ring or air-jet spinning machine for which the attending device is intended in which the climatic conditions do not comply with the technological process of yarn production and to mark these workstations in the digital map of the microclimate in the areas of interest of the workstation, or to draw attention to this information in another way.

30 In order to display the information on the climatic conditions at the individual workstations of the ring or air-jet spinning machine for which the attending device is intended, the attending device is equipped with a display

with a graphical user interface which is coupled to the control system of the attending device.

To extend the possibilities of controlling the air conditioning conditions on ring or jet spinning machines for which the attending device according to the invention is intended, the temperature sensor and/or humidity sensor and/or common temperature and humidity sensor of the attending device are provided with or coupled to communication means to transmit information from them to the control system of the ring or air-jet spinning machine for which the attending device is intended and/or to the control system of the air-conditioning system of the spinning mill, in which at least one ring or air-jet spinning machine will be installed, for which the attending device is intended and on which it will be installed. In this embodiment, the information on temperature and humidity from the areas of interest of the individual workstations of the machine for which the attending device is intended is processed by the control system of the ring or air-jet spinning machine and/or by the control system of the air-conditioning system of the spinning mill. In addition, this information may also be partially processed by the control system of the attending device.

In an embodiment of the invention the attending device comprises a frame, on which are mounted means allowing displaceable mounting and moving the attending device along a row of workstations of the machine, service means for performing attending operations at the workstations of the machine and a power supply system and a control system, wherein the attending device further comprises a front side, a rear side and two lateral sides, wherein the front side is adapted to be arranged against the row of workstations of the machine and is intended for the passage of the service means when performing attending operations at the workstation of the machine, and to the control system of the attending device is coupled at least one temperature sensor and/or at least one humidity sensor and/or at least one common air temperature and humidity sensor, which are mounted on the attending device, preferably in the frame/the structure of the attending device and have a sensing area of air temperature and/or humidity, which is situated at least partially outside the ground plan of the attending device in front of the front side of the attending device.

In another embodiment, provided with communication means is the control system of the attending device in which information is evaluated and collected on the climatic conditions at the individual workstations of the ring or air-jet spinning machine on which the attending device is installed, and this information from the control system of the attending device is transmitted to the control system of the ring or air-jet spinning machine, and/or to the control system of the air-conditioning system of the spinning mill, in which are installed ring or air-jet spinning machines which are equipped with attending devices according to the invention.

The attending device according to the invention is intended and adapted to be mounted on the ring spinning machine and its control system is further coupled to service means for resuming spinning at the workstation of the ring spinning machine for which the attending device is intended. The service means comprise a tilting mechanism of a yarn guiding eyelet, a tube handling device, a device for searching the yarn end on the cop, a yarn manipulator and a yarn threading head for threading yarn into a traveller of the workstation of the ring spinning machine for which the attending device is intended.

Preferably, the temperature sensor and/or humidity sensor and/or common temperature and humidity sensor are mounted on one of the service means of the attending device.

The object of the invention is also achieved by a ring or air-jet spinning machine on which at least one of the above-mentioned attending devices is installed.

The object of the invention is also achieved by a method of using the attending device on the ring or air-jet spinning machine comprising at least one row of workstations in which the attending device is moving along at least one row of workstations or is standing at a selected workstation for performing attending operations. During the movement or the stopping of the attending device, at least one temperature sensor and/or at least one humidity sensor and/or at least one common sensor of air temperature and humidity which are mounted on the attending device and which are coupled to the control system of the attending device, monitor the climatic conditions in at least one sensing area in the vicinity of the attending device, wherein this sensing area has an

intersection with the area of interest of the workstation of the machine which constitutes the monitored area of the workstation of the machine, information is obtained from the detected data on the climatic conditions in the monitored area of the respective workstation (2) of the machine and this information is used to
5 create a digital microclimate map in the monitored areas (MA) of the individual workstations (2) of the machine within the entire row of workstations (2) or within the selected part of the row of workstations (2). The digital microclimate map indicates areas of the workstations where the observed climatic conditions are outside the predetermined range and therefore do not comply with the
10 technological process of yarn production on the respective ring or air-jet spinning machine, and so the climatic conditions need to be adjusted, whether by heating, cooling or humidification.

In a preferred embodiment, the digital microclimate map is conveniently designed to be displayed at least on the display of the attending device.

15 Further improvement of yarn production on ring or air-jet spinning machines is achieved by comparing information on the microclimate in the area of interest and/or monitored area at individual workstations with information on yarn breakage at the corresponding workstations of the machine and recording this information in a digital microclimate map. In the event of increased yarn
20 breakage in a certain area of the workstations where there is also a deviation in the microclimate compared to the normal yarn breakage, the microclimate in the respective area of the machine workstations will be adjusted.

Brief description of the drawings

25 The invention is schematically represented in drawings, wherein Fig. 1 shows a view of a row of workstations of a ring spinning machine arranged next to each other, Fig. 2 shows a side view of the workstation of the ring spinning machine with a partial schematic section of an attending device, Figs. 3a to 3e show a schematic section of the attending device in various variants of sensors,
30 their sensing areas and the intersection of the sensing areas with the areas of interest, Fig. 4 shows a schematic section of the attending device intended for the ring spinning machine with the intersection of the sensing area of the

common temperature and humidity sensor and the area of interest comprising a drafting device of the workstation of the machine and Fig. 5 shows a schematic section of the attending device intended for an air-jet spinning machine with the intersection of the sensing area of the common temperature and humidity sensor and the area of interest comprising the drafting device of the workstation of the machine.

Examples of embodiment

An attending device **1** is adapted and intended to be displaceable mounted along a row of workstations **2** of a textile spinning machine for producing yarn and comprises a frame on which are mounted means **11** which are provided for mounting the attending device **1** on the machine for which the attending machine is intended and means for moving the attending device along the row of workstations of the machine for which the attending device is intended. The attending device **1** further comprises a front, rear and two lateral sides, the front side being adapted to be arranged against (in the sense of facing the workstations) the row of workstations **2** of the machine and intended for the passage of service means **SM** of the attending device **1** which are adapted to perform attending operations at the workstations **2** of the machine for which the attending device **1** is intended.

The textile spinning machine for which the attending device **1** is intended is a ring or air-jet spinning machine. In each of these textile machines, working means for producing yarn are arranged at each workstation **2**. The air temperature and humidity in the area of the working means for producing yarn have an impact on the technological operations at the workstation **2** during the twisting of textile fibres into yarn. In particular, the temperature and humidity of the air in the area of a roving drafting device, in which roving is thinned by drafting and its fibres are arranged in parallel to form a ribbon of fibres which is transformed by twisting into yarn downstream of end rollers, have a major influence on the technological operations taking place at the workstation **2** during yarn production. To achieve the object of the invention, i.e., solving the problem of air conditioning in spinning mills, it is important that, as far as possible, all the workstations **2** on all the ring or air-jet spinning machines work

in optimal temperature and humidity conditions. Therefore it is necessary to obtain information on the climatic conditions at the individual workstations 2 in the vicinity of the working means producing yarn, especially in the vicinity of the roving drafting device, subsequently evaluate this information and use it to inform the operator and/or to set the climatic conditions in the vicinity of the workstations 2 of part of the ring or air-jet spinning machine for which the attending device is intended, and/or in the vicinity of the workstations of the entire monitored row of the workstations of the monitored machine and/or to set the climatic conditions in the entire spinning mill, in which at least one ring or air-jet spinning machine for which the attending device is intended is installed. Due to the plurality of means producing yarn at the workstation 2 of the ring or air-jet spinning machine on which the attending device 1 is to be used, and due to their technological dimensions, it is appropriate to determine in advance at least one area of interest IA of the workstation 2 of the machine for each machine in which the climatic conditions will be monitored. The basic/usual area of interest IA, in which the climatic conditions will be monitored, is the area in the vicinity of the drafting device 21 of the workstation 2 of the ring or air-jet spinning machine for which the attending device 1 is intended.

In order to find out the climatic conditions in the areas of interest IA at the individual workstations 2 of the ring or air-jet spinning machine for which the attending device 1 is intended, the attending device 1 in the embodiment shown in Figs. 2, 3a, 3b, 4 and 5 is provided with the common temperature and humidity sensor 190 which has the sensing area SA of the temperature and humidity the size of which varies according to the sensibility of the common temperature and humidity sensor 190 and which is situated at least partially outside the plan view of the attending device 1 towards the space in front of the front side of the attending device 1, wherein the front side of the attending device 1 is adapted to be arranged against the row of workstations 2 of the machine for which the attending device 1 is intended, and at least one sensing area SA of temperature and/or humidity is arranged such that, when the attending device 1 is placed on the machine it has an intersection with the at least one area of interest IA at the individual workstations 2 of the machine which constitutes the monitored area MA of the workstation 2 of the machine.

Therefore, when the attending device 1 is situated in front of the workstation 2 of the machine, the sensing area SA of the respective sensor 190 includes at least a part of the area of interest IA of the respective workstation and their intersection constitutes the monitored area MA from which information on the air temperature and humidity in this area is obtained. The common temperature and humidity sensor 190 is mounted in the internal structure of the attending device 1, either on a suitable service means SM, or on a frame or another suitable part of the attending device 1, or it is mounted on the outer part of the attending device 1, i.e., movable or immovable.

In an exemplary embodiment of Fig. 3e, the attending device 1 is provided with two common temperature and humidity sensors 190 whose sensing areas SA are directed through the front side of the attending device 1 to areas of interest IA which are predefined on the ring or air-jet spinning machine for which the attending device 1 is intended, wherein the areas that are common to the sensing area SA of each of the common sensors 190 and to the respective areas of interest IA at the individual workstations of the ring or air-jet spinning machine for which the attending device is intended constitute the monitored areas MA.

In an alternative embodiment of Fig. 3c, the common temperature and humidity sensor 190 is replaced with a temperature sensor 18 and a humidity sensor 19 which are arranged next to each other and **their** sensing area SA18 of the temperature sensor 18 and the sensing area SA19 from the humidity sensor 19 are formed in front of the sensing sides of both sensors and are directed through the open side of the attending device 1 to the area of interest IA, which is predefined on the ring or air-jet spinning machine for which the attending device 1 is intended. The temperature sensor 18 and the humidity sensor 19 are mounted in the inner space of the attending device 1, either on a suitable service means SM or on a frame or on another suitable part of the attending device 1, or they are mounted on the outer part of the attending device 1.

In another alternative embodiment of Fig. 3d, the temperature sensor 18 and the humidity sensor 19 are arranged separately, wherein the sensing area SA18 of the temperature 18 sensor and the sensing area SA19 of the humidity

sensor 19 are directed through the front side of the attending device 1 to the area of interest IA which is predefined on the ring or air-jet spinning machine for which the attending device 1 is intended. In this embodiment, humidity is monitored in the monitored area MA19 of humidity, which is a common part of the area of interest IA and the sensing area SA19 of the humidity sensor 19 and the temperature is monitored in the sensing area MA18 of the temperature, which is a common part of the area of interest IA and the sensing area SA18 of the temperature sensor 18.

In unillustrated embodiments, the temperature sensor 18, humidity sensor 19 and/or common temperature and humidity sensor 190 are mounted on the attending device 1 in any combinations which are suitable from the technological point of view and are not described above. This means the separate temperature sensor 18, or the humidity sensor 19 and/or the humidity sensor 19 in combination with the common temperature and humidity sensor 190. If it is only the temperature sensor 18 or only the humidity sensor 19 that is used, the missing value (humidity or temperature) is supplemented with an assumed or measured value from the space of the spinning mill.

All the above-mentioned temperature sensors 18, humidity sensors 19 and common temperature and humidity sensors 190 are mounted in the attending device 1 with their sensing areas SA in the direction through the front side of the attending device 1 into the space in which areas of interest IA are located on the ring or air-jet spinning machine for which the attending device 1 is intended, in which the climatic conditions will be monitored. The climatic conditions will then be monitored in the selected areas of interest IA of the workstations of the ring or air-jet spinning machine for which the attending device is intended.

In the attending device 1 according to another unillustrated alternative embodiment, assigned to the temperature sensor 18 and/or humidity sensor 19 and/or common temperature and humidity sensor 190 are means for supplying air from the area of interest IA of the respective workstation of the ring or air-jet spinning machine for which the attending device is intended, through the front side of the attending device 1 to the sensing areas SA of the respective sensors.

In the embodiment of Fig. 3a, the common temperature and humidity sensor 190 is connected to the control unit 10 of the attending device 1 in which the control system CS of the attending device 1 is implemented. The attending device 1 further comprises a power supply system to which the control unit 10 and the service means SM are connected. The control unit 10, or, more specifically, the control system CS of the attending device, is provided with or coupled to communication media CM for the transmission of the information to the control system 3 of the ring or air-jet spinning machine for which the attending device 1 is intended, and/or to the control system of the air-conditioning system 4 of the spinning mill in which is installed at least one ring or air-jet spinning machine for which the attending device 1 is intended.

In the embodiment of Fig. 4, the attending device 1 is intended for the ring spinning machine and comprises the common temperature and humidity sensor 190 arranged in the upper part of the attending device 1, so that, after placing the attending device 1 on the ring spinning machine, the sensing area SA of the sensor 190 is directed through the front side of the attending device 1 towards the area of interest IA, comprising the roving drafting device 21, and the intersection of the sensing area SA and the area of interest IA constitutes the monitored area MA.

Fig. 5 schematically represents an attending device 1 which is intended for an air-jet spinning machine. The attending device 1 comprises a temperature and humidity sensor 190, arranged in the structure of the attending device 1 in its lower half, so that its sensing area SA is directed after placing the attending device 1 on the air-jet spinning machine through the front side of the attending device 1 towards the area of interest IA comprising the drafting device. The intersection of the sensing area SA and the area of interest IA constitutes the monitored area MA.

In alternative embodiments, the temperature sensor 18 and/or humidity sensor 19 and/or common temperature and humidity sensor 190 are provided with or coupled to communications means CM for the transmission of detected information on temperature and/or humidity to the control system (control system) CS of the attending device 1 and/or to the control system 3 of the ring or air-jet spinning machine for which the attending device 1 is intended, and/or

to the control system 41 of the air-conditioning system 4 of the spinning mill, in which at least one ring or air-jet spinning machine for which the attending device 1 is intended will be installed. The air-conditioning system 4 of the spinning mill comprises a distribution system 42 of air and/or water, water mist
5 and/or water vapour arranged over the entire area of the spinning mill above the machines.

The sensing of temperature and/or humidity in the area of interest IA, or, more specifically, in the monitored area MA, at the individual workstations 2 of the ring or air-jet spinning machine for which the attending device 1 is intended
10 takes place after the installation and putting into operation of the attending device 1 on the respective ring or air-jet spinning machine, when the attending device 1 is stopped at the workstation 2 during the attending operations and/or while the attending device 1 is moving along the row of workstations 2 of the respective machine.

15 The attending device 1 is further provided with unillustrated means for identifying the workstation against which it is situated during the attending operation and/or by which it passes, wherein the workstations 2 are also provided with corresponding identifying means, so that the attending device 1 is able to assign the information on the climatic conditions to the workstation on
20 which it was detected and store this information.

In a preferred embodiment, the control system CS of the attending device 1 comprises means for processing information from the temperature sensor 18 and/or humidity sensor 19 and/or common temperature and humidity sensor 190 and the evaluation means for generating information on the climatic
25 conditions in at least one sensing area SA of the respective sensor. This information is intended to be processed by the evaluation devices of the control system CS of the attending device 1 into a digital map of the microclimate in at least one sensing area SA of temperature and/or humidity along at least a part of the row of workstations 2 of the ring or air-jet spinning machine for which the
30 attending device 1 is intended.

In the embodiments shown in Figs. 2, 3a to 3e, 4 and 5, the attending device 1 is provided with a display D with a graphical user interface, which is used to display information on the climatic conditions, obtained by evaluating

the information on temperature and/or humidity from the temperature sensor 18 and/or from the humidity sensor 19 and/or the common temperature and humidity sensor 190 from at least one sensing area SA for at least one workstation 2 of the ring or air-jet spinning machine for which the attending device 1 is intended, wherein, displayed are, for example, specific workstations where the climatic conditions are outside the predetermined range and do not comply with the technological process of yarn production on the ring or air-jet spinning machine for which the attending device is intended. When displaying a digital map of the microclimate, satisfactory and unsatisfactory areas are distinguished graphically and/or in colour, including the reasons why the climatic conditions are not satisfactory. For cases where the climatic conditions in the sensing areas SA for any workstations 2 or for groups of workstations 2 exceed the predetermined critical values, the attending device 1 is provided with a signalling device which alerts the operator with an audible and/or light signal.

When the attending device 1 is placed on the machine, the respective sensing area SA is arranged so as to intersect with the area of interest IA of the workstation 2 in front of which the attending device 1 is standing, or successively with all the areas of interest IA of the row of workstations 2 along which the attending device 1 is moving. The intersection of the sensing area SA and the area of interest IA forms the monitored area MA of the workstation 2 of the machine.

In an alternative embodiment, the control system CS of the attending device 1 is provided with means for comparing climatic conditions in the sensing areas SA and/or in the areas of interest IA and/or in the monitored areas MA at the individual workstations 2 of the ring or air-jet spinning machine for which the attending device 1 is intended, with information on breakage at the respective workstations 2 of the ring or air-jet spinning machine for which the attending device 1 is intended, after the installation of the attending device on such a ring or air-jet spinning machine. In this way, the means of the attending device 1 obtain an overview of the relationship between the climatic conditions at the workstations 2 and the breakage of the yarn 203 at the corresponding workstations 2 of the machine for which the attending device 1 is intended.

Based on the information on the climatic conditions in the sensing areas SA and/or in the areas of interest IA of the workstations 2, or the information on the climatic conditions in the respective monitored areas MA, based on the information from the control system CS of the attending device 1 of the ring or air-jet spinning machine on which the attending device 1 is installed or based on the digital microclimate map from the same control system CS, the operator can adjust the climatic conditions in the areas where the climatic conditions are unsatisfactory by adjusting the air temperature and/or humidity, or such adjustment may be carried out automatically by the control system 41 of the air-conditioning system 4 of the spinning mill, to which this information is transmitted by the operator or by the communication means CM of the attending device 1. At the same time, the temperature sensor 18 and/or humidity sensor 19 and/or common temperature and humidity sensor 190 and/or the control system CS of the attending device 1 are provided with the communication means CM, or they are coupled to the communication means CM.

Alternatively, this information is intended to be transmitted by means of communication means CM which are superior to the control systems, i.e., to the control system 3 of the ring or air-jet spinning machine for which the attending device 1 is intended, and/or to the control system 41 of the air-conditioning system 4 of the spinning mill in which is installed at least one ring or air-jet spinning machine for which the attending device 1 is intended.

The superior control system 3 of the ring or air-jet spinning machine on which the attending device 1 according to the invention is installed is provided with means for processing the information from the temperature sensor 18 and/or humidity sensor 19 and/or common temperature and humidity sensor 190 and/or for processing information from the control system CS of the attending device 1 and is also provided with evaluation means for generating information on the climatic conditions in the sensing area SA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves, and/or in the areas of interest IA and/or in the monitored areas MA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves. This information is intended

to be processed by the evaluation means of the control system 3 of the respective spinning machine into the digital map of the microclimate at the individual workstations 2 and/or of the selected part of the row of workstations 2 and/or or of the entire row of workstations 2 of the respective machine.

5 Information on the climatic conditions in the sensing area SA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves, and/or in the areas of interest IA, and/or in the monitored areas MA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves, which is obtained
10 by evaluating the information on temperature and/or humidity from the temperature sensor 18 and/or from humidity sensor 19 and/or common temperature and humidity sensor 190 by means of the control system CS of the attending device 1 and transmitted to the machine on which the attending device 1 is installed, are displayed on the display 30 of the respective ring or
15 air-jet spinning machine, showing, for example, specific workstations 2, or a group of workstations 2, in which the climatic conditions are in the sensing area SA and/or in the area of interest IA and/or in the monitored area MA outside the predetermined range and do not comply with the technological process of yarn 203 production. When displaying the digital map of the microclimate,
20 satisfactory and unsatisfactory areas are distinguished graphically and/or in colour, including the reasons why the climatic conditions are not satisfactory. For cases where the climatic conditions at some workstations 2 exceed the predetermined critical values, the respective ring or air-jet spinning machine is provided with a signalling device which alerts the operator to this fact with a
25 sound and/or light signal.

 In an alternative embodiment, the superior control system 3 of the ring or air-jet spinning machine on which the attending device 1 is installed is provided with means for comparing the climatic conditions in the sensing areas SA and/or in the areas of interest IA and/or in the monitored areas MA at the
30 individual workstations 2 of the respective machine to the information on breakage at the respective workstations 2 of the ring or air-jet spinning machine. This provides an overview of the relationship between the climatic

conditions at the workstations 2 of the machines and the level of yarn breakage at the corresponding workstations 2 of the machines.

Based on the information on the climatic conditions in the sensing areas SA and/or in the areas of interest IA of the workstations 2 and/or the information
5 on the climatic conditions in the respective monitored areas MA from the control system 3 of the ring or air-jet spinning machine on which the attending device 1 is installed, or based on the digital image map from the same control system 3 of the machine, the operator can adjust the climatic conditions in areas where the climatic conditions are unsatisfactory by adjusting the temperature and/or
10 humidity of the air in the spinning mill, or such adjustment can be performed automatically by the control system 41 of the air-conditioning system 4 of the spinning mill.

The superior control system 41 of the air-conditioning system 4 of the spinning mill in which at least one ring or air-jet spinning machine is installed, on
15 which the attending device 1 according to the invention is installed, is provided with means for processing the information from the temperature sensor 18 and/or humidity sensor 19 and/or common temperature and humidity sensor 190 of the attending device 1 and/or for processing the information from the control system CS of the attending device 1 and/or the information from the
20 control system 3 of the ring or air-jet spinning machine on which the attending device 1 according to the invention is installed. The control system 41 of the air-conditioning system 4 of the spinning mill is further provided with evaluation means for generating information on the climatic conditions in the sensing area SA for the individual workstations 2 of the machine in front of which the
25 attending device 1 stands or along which it moves and/or in the areas of interest IA and/or in the monitored areas MA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves. This information is intended to be processed by the evaluation means of the control system 41 of the air-conditioning system 4 of the spinning mill into the
30 digital map of the microclimate at the individual workstations 2 and/or of the selected part of the row of workstations 2 and/or of the entire row of workstations 2 of at least one ring spinning machine and/or a group of ring or

air-jet spinning machines on which the attending devices 1 according to the invention are installed.

Information on the climatic conditions in the sensing area SA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves and/or in the areas of interest IA and/or in the monitored areas MA for the individual workstations 2 of the machine in front of which the attending device 1 stands or along which it moves, which is obtained by evaluating the above-mentioned information, is displayed by the control system 41 of the air-conditioning system 4 of the spinning mill on the display of the control system 41 of the air-conditioning system 4 of the spinning mill for the respective ring or air-jet spinning machines on which the attending devices 1 according to the invention are installed, wherein displayed are, for example, groups of workstations 2 or the entire row of workstations 2 of the respective ring or air-jet spinning machines in which the climatic conditions in the sensing area SA and/or in the area of interest IA and/or in the monitored area MA are outside the predetermined range and do not comply with the technological process of the yarn 203 production.

It is obvious to a person skilled in the art that groups of workstations and/or rows of workstations of the respective ring or air-jet spinning machines on which the climatic conditions comply with the technological process of yarn production, may be displayed simultaneously or subsequently. When displaying the digital microclimate map, satisfactory and unsatisfactory areas are distinguished graphically and/or in colour, including the reasons why the climatic conditions are not satisfactory.

The sensing area SA, when the attending device 1 is **placed** on the machine, has an intersection with the area of interest IA of the workstation 2 in front of which the attending device 1 stands or has intersections successively with all the areas of interest IA along which the attending device 1 moves, wherein the intersection of the sensing area SA and the areas of interest IA at the respective workstation 2 of the machine constitutes the monitored area MA of the workstation 2 of the machine. In the event that the climatic conditions in some sensing areas SA and/or in the areas of interest IA and/or the monitored areas MA, or in groups of any of these areas of workstations 2 of any of the ring

or air-jet spinning machines exceed the predetermined critical values and do not comply with the technological process of yarn production, the climatic conditions in the respective areas of the spinning mill are adjusted automatically by the control system 41 of the air-conditioning system 4 of the spinning mill or
5 by the operator according to the information displayed on the display of the control system 41 of the air-conditioning system 4 of the spinning mill.

The invention will be described in detail on an exemplary embodiment of the attending device 1 intended to be mounted displaceable along a row of identical workstations of the ring spinning machine for producing yarn.

10 As shown in Figs. 1 and 2, each workstation 2 of the ring spinning machine comprises means for producing yarn which comprise a roving bobbin 20, from which the roving 201 is drawn off to a drafting device 21 by which it is refined into a ribbon 202 of fibrous material which is further guided through a guiding eyelet 22 and over a traveller 23 to a rotating tube 24 on
15 which it is already wound as yarn 203 with a twist, which is formed between the exit from the drafting device 21 and the traveller 23 as a result of the movement of the tube 23 on the ring 25, caused by the rotational movement of the tube 24 during the winding of the yarn 203. Between the guiding eyelet 22 and the traveller 23, the yarn passes 203 through a balloon separator 26. The ring 25
20 and the balloon separator 26 are mounted on a ring plate 27 which is vertically reciprocally movable. The tube 24 is mounted on a drive mandrel 28 which is rotatably mounted on the machine frame and coupled to a drive by some of the known methods. When wound on the tube 24, the yarn 203 is distributed across the tube 24 by the movement of the ring plate 27 and its package forms
25 together with the tube 24 the so-called cop 240.

Along the length of the ring spinning machine, a traveling track 29 for the attending device 1 is created in a suitable place which, in the illustrated exemplary embodiment, includes a traveling rail 290 and a stabilizing rail 291.

30 The attending device 1, intended for the ring spinning machine, comprises a control unit 10 which is coupled to means 11 for moving the attending device 1 along the travelling track 29 along the row of workstations 2 of the machine with the possibility of stopping at the workstation 2, requiring service. The attending device 1 further comprises service means SM for

resuming spinning at the workstation 2 of the ring spinning machine for which the attending device 1 is intended, wherein the resumption of spinning by the attending device 1 at the serviced workstation 2 of the ring spinning machine takes place in the following steps:

- 5 - tilting the guiding eyelet 22 of yarn by the tilting mechanism 12 of the attending device 1
- extension of the expander 130 of the handling device 13 above the tube 24 mounted on the drive mandrel 28 of the workstation
- grasping the tube 24 by the expander 130 of the handling device 13 and lifting
- 10 the tube above the drive mandrel 28 of the workstation and the ring plate 27
- moving the tube 24 to the attending device 1 and placing it on the auxiliary drive mandrel 14 in the attending device 1 towards the yarn 203 end finding device 15 on the tube 24
- finding the yarn 203 end by the finding device 15, or in cases when there is not
- 15 enough yarn on the tube 24, using auxiliary yarn 204
- stretching yarn 203 in a defined path between the tube 24 and the yarn end finding device 15
- moving the mouth of the suction device 160 of the yarn 203 manipulator 16 towards this tensioned yarn 203
- 20 - sucking the yarn 203 into the suction device 160 and receiving it by the manipulator 16 from the yarn end finding device 15
- returning the tube 24 back onto the drive mandrel 28 of the workstation
- tilting the threading head 17 towards the yarn 203 between the tube 24 and the suction device 160 of the yarn 203 manipulator 16
- 25 - formation of a threading section of yarn 203 and pushing it to the ring 25 with the traveller 23
- setting the traveller 23 in motion along the ring 25 in the desired direction and threading the inclined threading yarn section 203 into the traveller 23
- returning the threading head 17 of yarn 203 to its initial position in the
- 30 attending device 1 and moving the yarn manipulator 16 towards the roving

drafting device 21 and during this movement also moving sideways to guide the yarn 203 into the working path and between the end rollers 211, 212 of the roving drafting device 21

- starting the spinning process.

5 For performing these steps, the attending device 1 according to the invention intended for the ring spinning machine is provided with service means SM which comprise

- a tilting mechanism 12 of the yarn guiding eyelet 22, which is mounted on the attending device 1 in a retractable and attachable manner to the tilting lever of
10 the yarn guiding eyelet 22;

- a tube 24 handling device 13, comprising an expander 130 which is mounted on the attending device 1 retractable above the tube 24 and insertable into the tube 24, wherein the expander 130 is adapted to grasp the tube 24, wherein the handling device 13 is adapted to move the tube 24 into the attending device 1
15 and to be seated on the auxiliary drive mandrel 14 in the attending device 1 to the yarn end 203 finding device 15 203 on the tube 4 and to move the tube 24 back to the drive mandrel 28 of the workstation 2

- yarn manipulator 16 provided with a suction device 160 to suck and hold the yarn 203 during yarn 203 manipulation.

20 - a threading head 17 for threading yarn 203 into the traveller 23 of the serviced workstation 2

- a package of auxiliary yarn 204.

Several attending devices 1, for example two, can be mounted on the ring spinning machine, as shown in Fig. 1.

25 In the embodiment of the attending device 1 shown in Fig. 2, the common temperature and humidity sensor 190 is used, which is mounted in the attending device 1 on the movable part of the tube handling device 13, namely on the arm of the expander 130, wherein the common temperature and humidity sensor 190 is mounted with its sensing side facing the open side of the
30 attending device 1. In front of the sensing side of the common temperature and humidity sensor 190, the temperature and humidity sensing area SA, shown in

Figs. 3a, 3b and 4, which after the installation of the attending device 1 on the ring spinning machine and at the moment of the presence of the attending device 1 in front of the workstation 2 of the machine, is directed through the front side of the attending device 1 towards the area in the vicinity of the drafting device 21 of the respective workstation 2 which constitutes the area of interest IA of the respective workstation 2 of the ring spinning machine. The intersection of the sensing area SA of the temperature and humidity sensor 190 and the area of interest IA of the workstation 2 forms the monitored area MA, from which information on the air temperature and humidity in this area of interest.

10 Since the temperature and humidity sensor 190 is in this specific embodiment of the attending device 1 mounted on the expander 130 arm of the tube handling device 13, temperature and humidity sensing takes place in both the retracted position of the expander 130 arm, and the extended position of the expander 130 arm, wherein in the extended position, the temperature and humidity in the

15 sensing area SA and/or in the area of interest IA and/or in the monitored area MA are monitored when the attending device 1 is stopped in front of the workstation 2 during the attending operation, and in the retracted position of the expander 130 arm, the temperature and humidity are monitored in the sensing area SA and/or in the areas of interest IA and/or in the monitored areas MA of

20 the workstations 2 when the attending device 1 passes by them. The information obtained is assigned to the respective workstation 2 of the machine and stored for the necessary period of time in the control system CS of the attending device 1 or in the memory assigned to this control system CS, or in another means of the attending device 1 intended for this purpose. In an

25 alternative embodiment, this information is assigned to the respective workstation 2 of the machine and stored for the necessary period of time in the control system 3 of the ring spinning machine, or in the control system 41 of the air-conditioning system 4 of the spinning mill.

In unillustrated embodiments, the temperature sensor 18, humidity sensor 19 and common temperature and humidity sensor 190 are mounted on the attending device 1 which is intended exclusively for the ring spinning machine in any combinations which are suitable from the technological point of view.

In an alternative embodiment of the attending device **1** which is intended for the ring spinning machine, the temperature sensor **18** and/or humidity sensor **19** and/or common temperature and humidity sensor **190** are mounted on another suitable service means **SM**, which is adapted for performing attending operations at the workstation **2** of the ring spinning machine, or in another suitable place in the inner space of the attending device **1**, wherein they are oriented with their sensing area **SA** towards the front side of the attending device **1**, or are coupled to unillustrated means for supplying air from the area of interest **IA** of the respective workstation **2** of the ring spinning machine.

Similar to ring spinning machines is the case with the well-known air-jet spinning machine, whose workstation **2** is shown schematically in Fig. 5 together with an associated attending device **1**, wherein the attending device **1** is provided with a temperature sensor **18** and/or a humidity sensor and/or a common a temperature and humidity sensor which are mounted in the attending device **1** with their sensing areas **SA** in the direction through the front side of the attending device **1** into the space in which is arranged a drafting device on the air-jet spinning machine in which fibrous material is thinned by stretching, its fibres are arranged in parallel to form a ribbon of fibres from which yarn is subsequently formed in a spinning nozzle under the action of an air stream. The area around the drafting device is also an area of interest **IA**. The intersection of the sensing area **SA** and the area of interest **IA** forms the monitored area **MA**. Since the attending devices **1** on the air-jet spinning machines are mounted displaceable along the row of identical workstations and can be provided with temperature and/or humidity sensors according to this invention, climatic conditions can be also monitored on these machines and digital climate maps can be generated as described above.

Industrial applicability

The invention can be applied to ring or air-jet spinning machines for producing yarn, equipped with a movable attending device for spinning-in broken yarn and/or for replacing full bobbins with empty tubes, for detecting, monitoring and controlling climatic conditions in the spinning mill in order to achieve optimal conditions for the process of spinning staple yarns.

List of references

- 1 attending device
- 10 control unit of the attending device
- 11 means for mounting the attending device on the ring spinning machine
- 5 and for moving it along the row of workstations of the machine
- 12 tilting mechanism of the yarn guiding eyelet
- 13 tube handling device
- 130 expander of the handling device
- 14 auxiliary drive mandrel of the tube on the attending device
- 10 15 yarn end finding device
- 16 yarn manipulator
- 160 suction device of the yarn manipulator
- 17 threading head
- 18 temperature sensor
- 15 19 humidity sensor
- 190 common temperature and humidity sensor
- SA sensing area of the sensor
- CM communication means
- SM service means on the attending device
- 20 CS control system of the attending device
- D display of the attending device
- SD signalling device of the attending device
- IA areas of interest of the workstation
- MA monitored area of the workstation
- 25 2 workstation of the ring spinning machine
- 20 roving bobbin
- 201 roving
- 202 ribbon of fibrous material
- 203 yarn
- 30 204 auxiliary yarn
- 21 roving drafting device
- 211 draw-off roller of the roving drafting device
- 212 pressure roller of the roving drafting device
- 22 guide yarn eyelet
- 35 23 traveller

- 24 tube
- 240 cop
- 25 ring
- 26 balloon separator
- 5 27 ring plate
- 28 drive mandrel of the workstation
- 29 travelling track for the attending device on the ring spinning machine
- 290 running rail
- 291 stabilizing rail
- 10 3 control system of the ring spinning machine
- 30 display of the ring spinning machine
- 4 air-conditioning system of the spinning mill
- 41 control system of the air-conditioning system of the spinning mill

PATENT CLAIMS

1. An attending device for a ring or air-jet spinning machine for producing yarn, which comprises a frame on which are mounted means (11) allowing
5 displaceable mounting on the ring or air-jet spinning machine, means for moving along a row of workstations (2) of the machine, service means (SM) for performing attending operations at the workstations (2) of the machine and which further comprises a power supply system and a control system (CS)
characterized in that at least one temperature sensor (18) and/or at least one
10 humidity sensor (19) and/or at least one common air temperature and humidity sensor (190) is/are mounted in the frame of the attending device (1), this sensor/these sensors being adapted for data transmission.

2. The attending device according to claim 1, **characterized in that** the temperature sensor (18) and/or humidity sensor (19) and/or common
15 temperature and humidity sensor (190) have a sensing area (SA) of air temperature and/or of air humidity and at least one temperature and/or humidity sensing area (SA) is located at least partially outside the plan view of the attending device (1) in front of the front side of the attending device (1), whereby the front side of the attending device (1) is adapted to be arranged
20 against the row of workstations (2) of the machine for which the attending device (1) is intended, and the at least one temperature and/or humidity sensing area (SA) is arranged such that, after placing the attending device (1) on the machine, it has an intersection with at least one area of interest (IA) at the individual workstations (2) of the machine which constitutes the monitored area
25 (MA) of the workstation (2) of the machine.

3. The attending device according to claim 1 or 2, **characterized in that** the control system (CS) of the attending device (1) comprises means at least for recording information about climatic conditions in at least one sensing area (SA) of temperature and/or humidity.

30 4. The attending device according to claims 1 to 3, **characterized in that** the control system (CS) of the attending device is provided with evaluation means for creating a digital map of the microclimate in at least one sensing area

(SA) of temperature and/or humidity along at least part of the row of workstations (2) of the machine for which the attending device (1) is intended.

5 5. The attending device according to any of the preceding claims 1 to 4, **characterized in that** the control system (CS) of the attending device (1) comprises means for evaluating/determining the occurrence of climatic conditions at the workstations of the machine outside the predetermined range and not suitable for the technological process of yarn production (203).

10 6. The attending device according to any of the preceding claims, **characterized in that** the control system (CS) of the attending device (1) is coupled to a display (D) with a graphical user interface which is arranged on the attending device (1).

15 7. The attending device according to any of the preceding claims, **characterized in that** the temperature sensor (18) and/or humidity sensor (19) and/or common temperature and humidity sensor (190) of the attending device (1) are provided with or coupled to communication means (CM) to transmit temperature and/or humidity information outside the control system of the attending device (1), in particular to the control system (3) of the machine for which the attending device (1) is intended and/or to the control system (41) of the air-conditioning system (4) of the spinning mill in which at least one machine
20 for which the attending device (1) is intended will be installed.

25 8. The attending device according to any of the preceding claims, **characterized in that** the control system (CS) of the attending device (1) is provided with or coupled to communication means (CM) for the transmission of information outside the attending device (1), in particular to the control system (3) of the machine for which the attending device (1) is intended, and/or to the control system of the air conditioning system (4) of the spinning mill, in which at least one machine for which the attending device (1) is intended will be installed.

30 9. The attending device according to any of the preceding claims, **characterized in that** the control system (CS) of the attending device (1), intended for the ring spinning machine, is coupled to service means (SM) of the attending device (1), which comprise a tilting mechanism (12) of a guiding eyelet (22) of yarn (203), a tube (24) handling device (13), a yarn (203) end

finding device (15) on the cop (240), a yarn manipulator (16) and a threading head (17) for threading yarn (203) into a traveller (23) at the workstation (2) of the ring spinning machine being attended to.

10. The attending device according to any of the preceding claims,
5 **characterized in that** the temperature sensor (18) and/or humidity sensor (19) or common temperature and humidity sensor (190) is/are mounted on one of the moving means of the attending device (1), especially on one of the service means (SM).

11. The attending device according to any of the preceding claims,
10 **characterized in that** the temperature sensor (18) and/or humidity sensor (19) or common temperature and humidity sensor (190) is/are mounted on the stationary part of the attending device (1), especially in the frame of the attending device (1).

12. A ring or air-jet spinning machine for producing yarn which comprises
15 at least one row of identical workstations (2) arranged next to one another, where each workstation (2) comprises means for producing and winding yarn (203) and at least one attending device (1) is arranged displaceable along at least one row of workstations (2) with the possibility of stopping at a selected workstation, **characterized in that** the attending device (1) is formed according
20 to any of the preceding claims.

13. A method of using an attending device on a ring or air-jet spinning machine, comprising at least one row of workstations, in which the attending device moves along at least one row of workstations or stands at a selected workstation for performing attending operations, **characterized in that** during
25 the movement or the standing of the attending device (1) with at least one temperature sensor (18) and/or at least one humidity sensor (19) and/or at least one common air temperature and humidity sensor (190) which are mounted on the attending device (1) and which are coupled to the control system (CS) of the attending device (1), monitor the climatic conditions in at least one sensing area
30 (SA) in the vicinity of the attending device (1), wherein this sensing area (SA) has an intersection with the area of interest (IA) of the workstation (2) of the machine which constitutes the monitored area (MA) of the workstation (2) of the machine, and from the detected data, information on the climatic conditions in

the monitored area of the respective workstation (2) of the machine is generated and from this information, a digital map of the microclimate in the monitored areas (MA) of the individual workstations (2) of the machine within the entire row of workstations (2) or within a selected part of the row of
5 workstations (2) is created.

14. The method according to claim 13, **characterized in that** information about the microclimate in the monitored area (MA) at the individual workstations (2) of the machine is recorded in the digital microclimate map for the areas of interest (IA) and/or the monitored area (MA) of the individual workstations (2) of
10 the machine, wherein the digital microclimate map is adapted to be displayed at least on the display (D) of the control system (CS) of the attending device (1).

15. The method according to any of claims 13 or 14, **characterized in that** simultaneously with generating information on the climatic conditions for the areas of interest (IA) of at least one row of workstations (2) of the machine, the number of yarn breaks (203) at the individual workstations (2) of this row of
15 the workstations (2) is monitored for evaluating the influence of the microclimate on yarn breakage rate (203) at individual workstations (2) and for possible adjustment of the operation of the air conditioning system of the spinning mill.

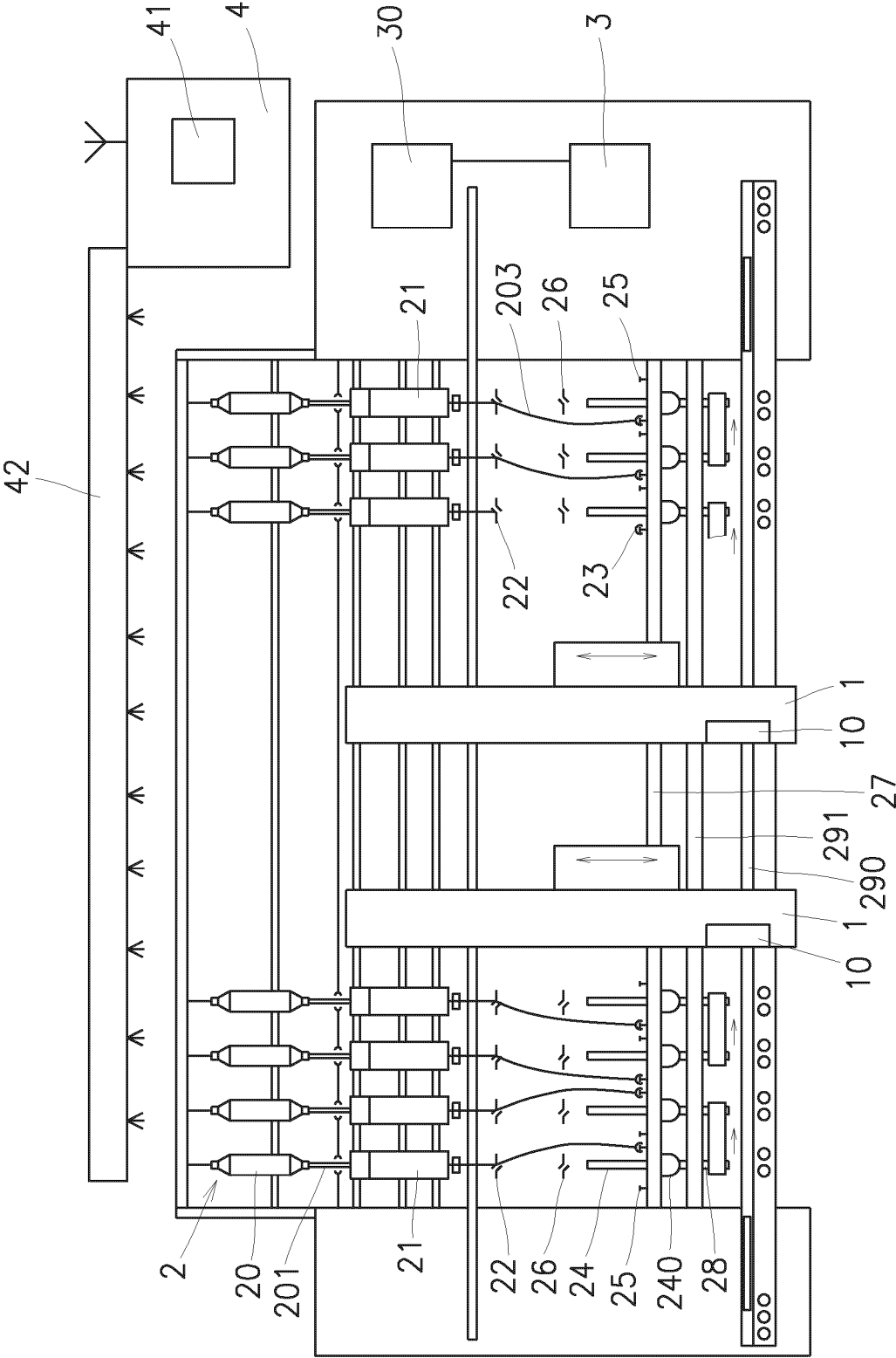


Fig. 1

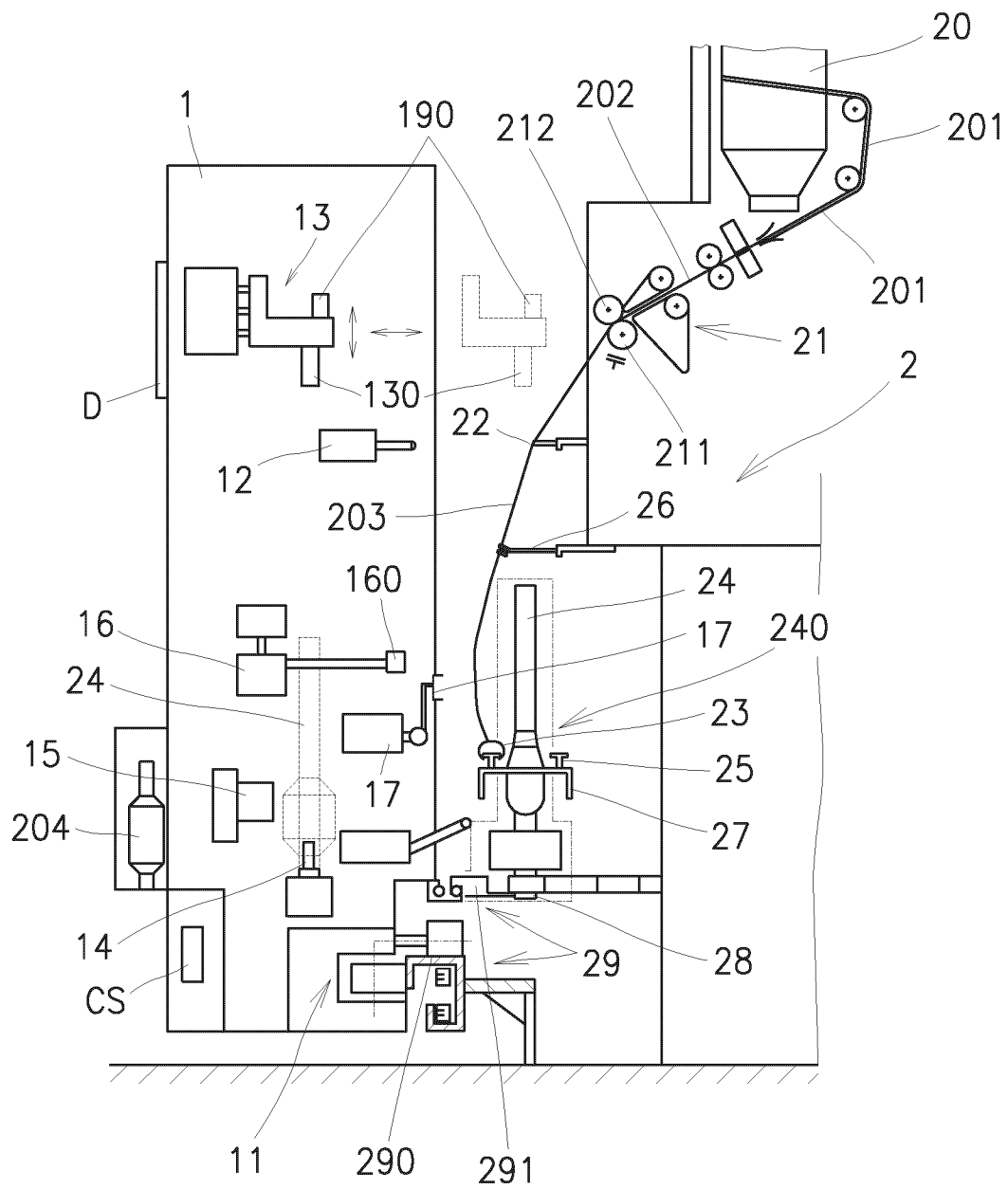


Fig. 2

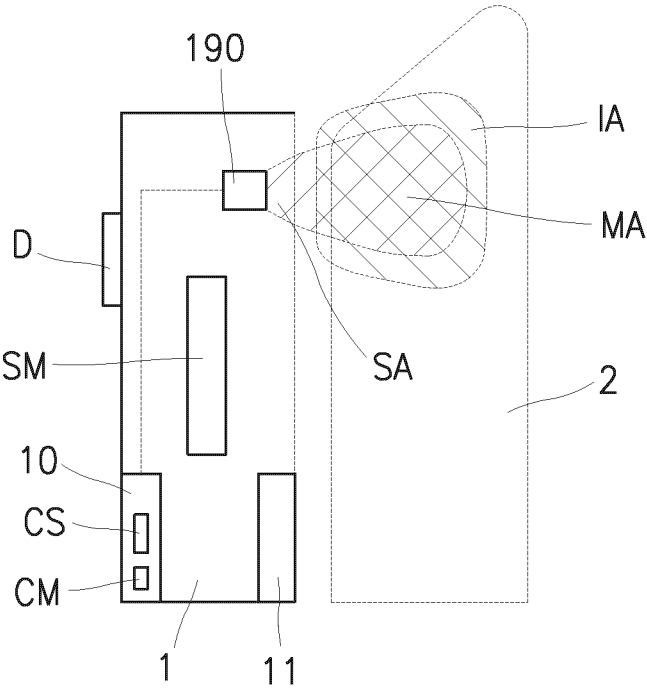


Fig. 3a

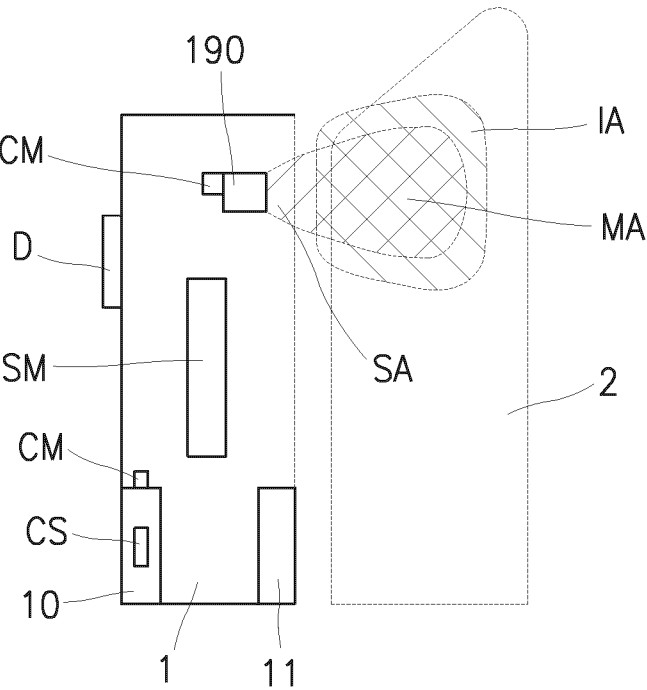


Fig. 3b

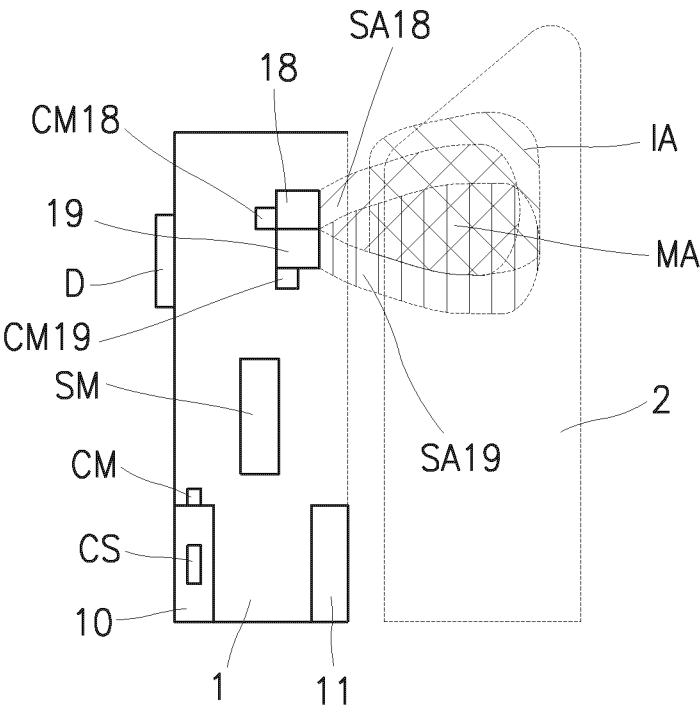


Fig. 3c

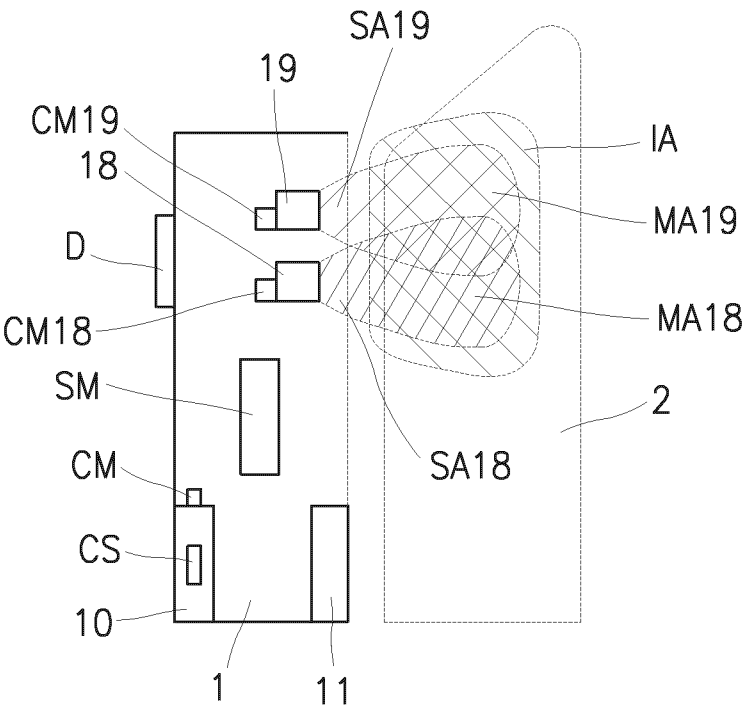


Fig. 3d

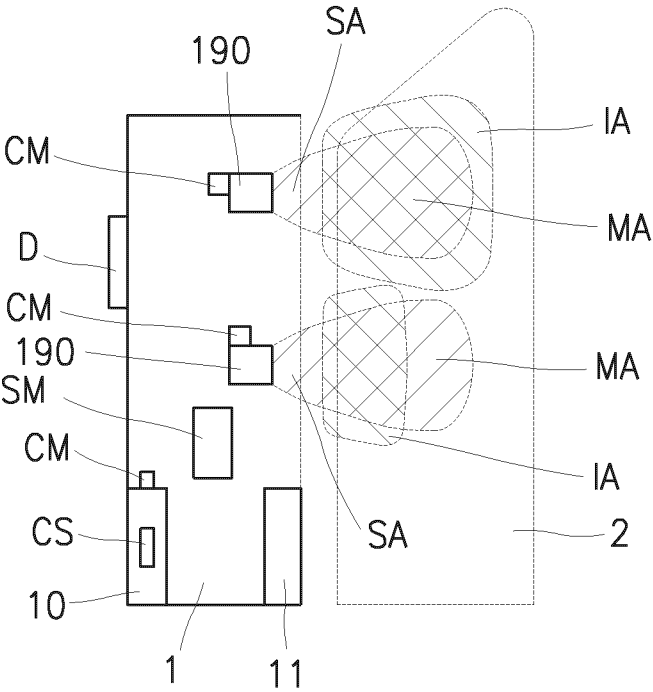


Fig. 3e

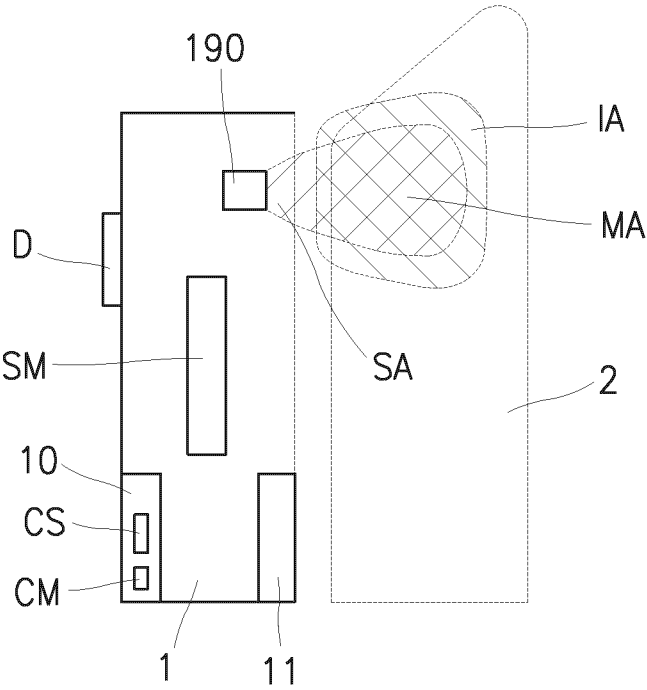


Fig. 4

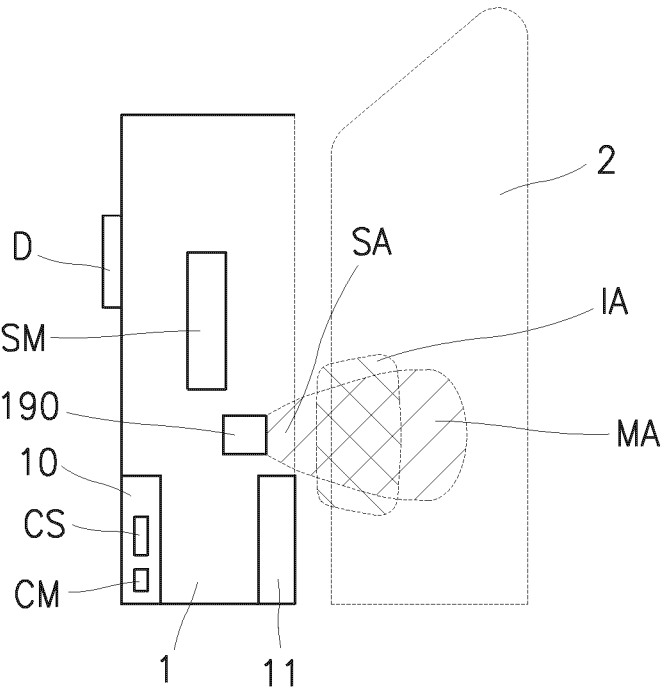


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/064869

A. CLASSIFICATION OF SUBJECT MATTER INV. D01H13/00 D01H13/32 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) D01H		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 102 995 193 A (UNIV TIANJIN POLYTECHNIC) 27 March 2013 (2013-03-27) paragraph [0001] paragraphs [0032], [0034]; figures 5-6 -----	1 - 15
X	EP 0 541 483 B1 (RIETER AG MASCHF [CH]) 14 August 1996 (1996-08-14) column 15, line 16 - column 17, line 21 -----	1, 13
X	CN 112 799 450 A (XUZHOU JIABO TEXTILE CO LTD) 14 May 2021 (2021-05-14) cited in the application paragraph [0053] - paragraph [0057]; figures 1-5 ----- - / - -	1, 13
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search 21 August 2024		Date of mailing of the international search report 18/09/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Todarello, Giovanni

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2024/064869

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 757 262 A1 (RIETER AG MASCHF [CH]) 30 December 2020 (2020-12-30) paragraphs [0041] - [0045]; figure 4 paragraph [0024] -----	1, 13
X	CN 209 779 088 U (LI QIANG) 13 December 2019 (2019-12-13) paragraph [0044]; figures 1, 2 -----	1, 13
A	US 5 375 406 A (GOERLICH ROLAND [DE] ET AL) 27 December 1994 (1994-12-27) claims 1, 9 -----	1, 13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2024/064869

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 102995193	A	27-03-2013	NONE	

EP 0541483	B1	14-08-1996	CH 685125 A5	31-03-1995
			EP 0541483 A1	12-05-1993
			EP 0712949 A2	22-05-1996
			JP H06506507 A	21-07-1994
			WO 9309279 A1	13-05-1993

CN 112799450	A	14-05-2021	CN 112799450 A	14-05-2021
			CN 114510096 A	17-05-2022
			CN 114527812 A	24-05-2022

EP 3757262	A1	30-12-2020	CN 112111824 A	22-12-2020
			DE 102019116672 A1	24-12-2020
			EP 3757262 A1	30-12-2020

CN 209779088	U	13-12-2019	NONE	

US 5375406	A	27-12-1994	DE 4231728 A1	24-03-1994
			JP H06108321 A	19-04-1994
			US 5375406 A	27-12-1994
