



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.11.2022 Bulletin 2022/48

(51) International Patent Classification (IPC):
D01H 13/18 (2006.01)

(21) Application number: **21382483.2**

(52) Cooperative Patent Classification (CPC):
D01H 13/185

(22) Date of filing: **28.05.2021**

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

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(54) **ROVING STOP ASSEMBLY FOR A DRAFTING FRAME OF A RING SPINNING MACHINE AND RING SPINNING MACHINE INCLUDING THE ROVING STOP ASSEMBLY**

(57) Roving stop assembly (1) for a drafting frame (3) of a ring spinning machine, including at least a roving detent element (4) arranged to be able to act, in an active position, on one of said pair of rear drafting rollers (3a) or middle drafting rollers (3b), trigger means (5, 9) operably connected to the at least roving detent element (4) to trigger actuation of the at least roving detent element

(4) to an active position, and reset means (6) for resetting by means of a resetting mechanism the at least roving detent element (4) to an inactive position to resume the supply of roving. The roving stop assembly is characterized in that the reset means include a reset actuator arm (10) arranged at the front (F) of the drafting frame (3).

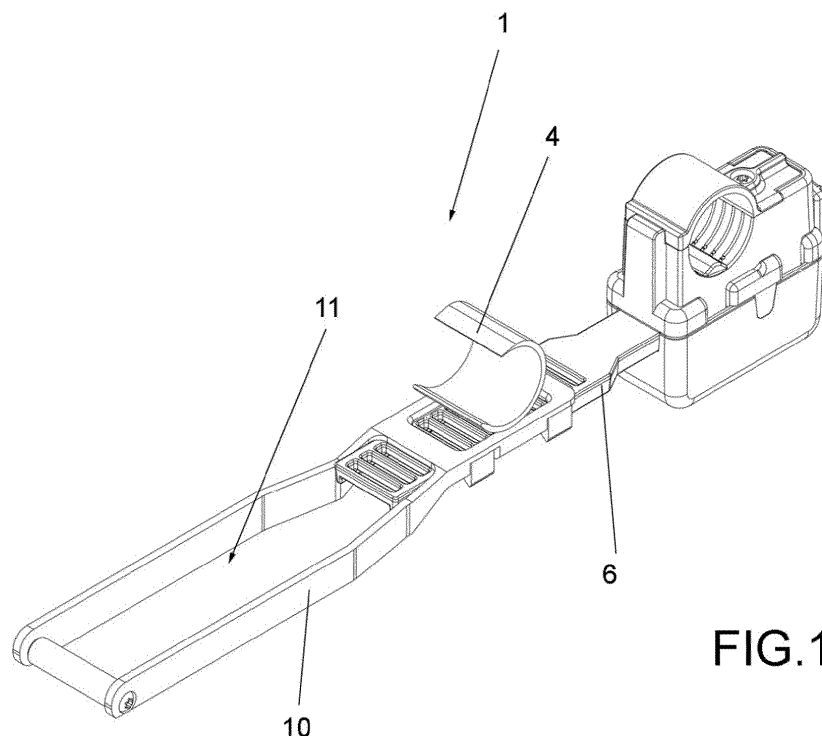


FIG.1

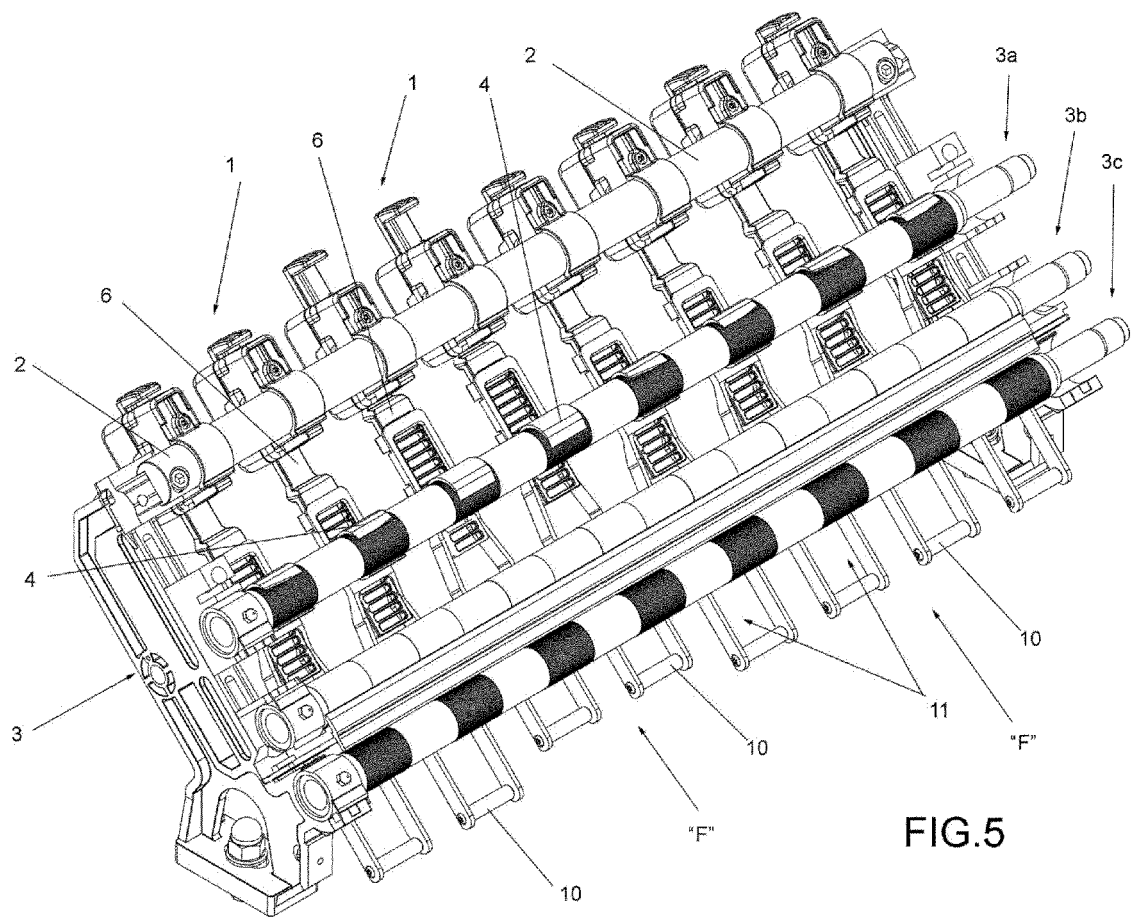


FIG.5

Description

[0001] The present invention generally relates to a roving stop assembly for interrupting the supply of roving when manufacturing yarn at spinning station of a ring spinning machine. It also relates to a ring spinning machine comprising a drafting frame with a plurality of spinning stations and a roving stop assembly at each of those spinning stations.

Background of the invention

[0002] It is well known to monitor the breakage of yarn to be fed to a spindle assembly at a spinning position of a ring spinning machine.

[0003] Known spinning systems use roving stop devices to stop the supply of roving in time to prevent the loss of roving upon breakage of the yarn while the spinning machine keep operating. These roving stop devices include roving detent elements configured to act on rear drafting rollers to detent movement of rear upper drafting roller upon detection of a signal coming either from an electrical or electro-magnetic sensor monitoring the breakage of yarn passing through the spindle assembly.

[0004] Document CN2844159 Y discloses an existing spinning machine including one of the above-mentioned known roving stop devices, wherein the roving detent element is articulated attached to a slide member and said slide member is susceptible to be released to a fired position by a trigger member upon breakage of yarn. In the active position of the detent element, the roving is clamped between the pair of rear drafting rollers whereby a roving break occurs to prevent the supply of roving upon breakage of yarn.

[0005] The manufacture of "Core" yarn by means of the continuous spinning process is also well known. This type of yarn combines one or two continuous filaments with elastic properties on a single spool, covered with the fibres from a cotton roving or similar roving. For the manufacture of "Core" yarn, it is common to employ continuous filaments of elastomeric material, such as elastane or spandex fibre, as is the case of the Lycra[®] brand. It is well known that these continuous filaments break easily, it being necessary in the event of a breakage to stop the supply of roving in time, to prevent the manufacture of a defective yarn lacking the continuous filaments forming its core.

[0006] In the state of the art, there exists also roving stop devices for "Core" yarn spinning machines to stop the supply of roving in time to prevent the manufacture of defective yarn lacking the continuous filaments. Many of these roving stop devices employ electrical sensors monitoring the passage of the first and/or second continuous filaments. These sensors detect breakage of one of these continuous filaments, and send a roving stop signal to an electromagnetic actuator associated to a trigger member to trigger actuation of at least one roving detent element to an active position to stop the supply of

roving upon breakage of one continuous filament. The roving detent element acts in its active position on the pair of rear drafting rollers whereby the roving is clamped in between.

[0007] The above-mentioned roving stop devices include reset means for resetting by way of a resetting mechanism the roving detent element to its inactive position to resume the supply of roving before an operator initiates repair of the broken yarn or broken filaments.

[0008] However, in the production of yarn on a ring spinning machine, the spindle gauge or distance between spindle positions is so narrow that it makes difficult for an operator to carry out handling operations intended to reset the roving detent element to its inactive position to resume supply of roving. In particular, when producing "Core" yarn, handling operations in between spindles positions require extremely caution in order for the handling not to cause breakage of the very thin continuous filaments feeding the adjacent spindles assemblies.

[0009] It is, therefore necessary to provide an alternative to the state of the art, which covers the gaps found therein, by the provision of a roving stop assembly, which overcomes the above-mentioned shortcomings, and significantly improves the reliability of the handling operations to be carried out during production of yarn in a ring spinning machine.

Description of the invention

[0010] To that end, the present invention relates, in a first aspect, to a roving stop assembly for interrupting the supply of roving during production of yarn in a ring spinning machine, wherein the drafting frame of the ring spinning machine comprises a pair of front drafting rollers, a pair of middle drafting rollers and a pair of rear drafting rollers, said roving stop assembly including;

- at least a roving detent element arranged to be able to act, in an active position, on one of said pair of rear drafting rollers or middle drafting rollers to stop the supply of roving at a spinning station of the ring spinning machine,
- trigger means operably connected to the at least roving detent element to trigger actuation of the at least roving detent element to an active position and,
- reset means for resetting by way of a resetting mechanism the at least roving detent element to an inactive position to resume the supply of roving.

[0011] In contrast to the known roving stop assemblies, in the one proposed by the first aspect of the present invention, in a characteristic manner, the reset means include a reset actuator arm arranged at the front of the drafting frame. Said reset actuator arm is mounted to cooperate with the resetting mechanism operably connected to the at least roving detent element to allow the at least roving detent element to be displaced to the inactive position, for resuming the supply of roving when

actuating the reset actuator arm at the front of the drafting frame.

[0012] By the expression "at the front of the drafting frame" shall be understood at the most forward position of the drafting frame, preferably, at a position next or close to the front rollers of the drafting frame

[0013] Thanks to the claimed features, the present invention provides a roving stop assembly wherein resetting operation of the roving detent element is made much easier and reliable by means of a reset actuator arm arranged at the front of the drafting frame to cooperate with the resetting mechanism.

[0014] Indeed, with the claimed roving stop assembly, the supply of roving is resumed by simple actuating the reset actuator arm at the front of the drafting frame. Hence, the operator does not need to access inside the drafting frame to reset the roving detent element to its inactive position. Thus, handling operations in between spindles positions are made much easier and reliable.

[0015] Preferably, the roving stop assembly comprises actuating means for automatically actuating the reset actuator arm at the front of the drafting frame of the ring spinning machine, to resume the supply of roving before an operator, or a robotic arm, is ready to initiate repair of the broken yarn or broken filament, for example, ready to initiate a piecing operation.

[0016] According to one embodiment, the actuating means comprises an actuating device arranged on an automatic service station mounted displaceable along a row of spinning stations with an option of stopping at a selected spinning station requiring a service operation.

[0017] Thanks to these claimed features, preferably, the present invention provides a roving stop assembly dispensing with the presence of an operator for manually resetting the roving detent element to resume the supply of roving upon breakage of yarn and/or breakage of continuous filament.

[0018] Advantageously, the actuating device may consist for example, of a piston and cylinder assembly, or consist of other equivalent actuating assembly or device, arranged or not on the automatic service station to actuate the reset actuator arm at the front of the drafting frame at the spinning station requiring a service operation.

[0019] Again advantageously, the actuating means comprise an actuating tool for actuating the reset actuator arm, said actuating tool being attachable to a robotic arm.

[0020] The robotic arm may have at least six degree of freedom of motion to allow the actuating tool to be positioned in front of the drafting frame to actuate (to push or to pull) automatically the reset actuator arm at the front of the drafting frame.

[0021] According to a preferred embodiment, the actuating tool is for example, a yarn handling tool of a yarn piecing system and, preferably, the yarn handling tool is attachable to a robotic arm of a yarn piecing system carrying out an automatic piecing operation.

[0022] Advantageously, the actuating tool or yarn handling tool is provided with a gripping element, for example

a gripping element configured as a protrusion or nipple, for actuating or engaging the reset actuating arm at the front of the drafting frame.

[0023] Preferably, the trigger means of the roving stop assembly comprise a trigger member mounted to cooperate with the resetting mechanism to release the resetting mechanism to a fired position upon breakage of yarn, or breakage of a continuous filament, and to retain the resetting mechanism to an unfired position after actuating the reset actuator arm.

[0024] Thus, when actuating the reset actuator arm, the resetting mechanism is displaced to acquire the unfired position and the mentioned trigger member cooperates to retain the resetting mechanism on this unfired position wherein the at least roving detent element is in an inactive position to allow resuming the supply of roving.

[0025] According to a preferred embodiment, the resetting mechanism comprises a slide member associated to the reset actuator arm, and said slide member is mounted displaceable along a longitudinal direction to allow the at least roving detent element to displace to the inactive position when actuating the reset actuator arm.

[0026] For the mentioned preferred embodiment, the trigger member is mounted to cooperate with the slide member so that;

- the slide member is susceptible to be retained on an unfired position by the trigger member after actuating the reset actuator arm and,
- the slide member is susceptible to be released to a fired position by the trigger member upon breakage of yarn and/or continuous filament

[0027] Preferably, the slide member is capable of accumulating potential energy when displaced by the reset actuator arm until retained in the unfired position by the trigger member. The accumulated potential energy is susceptible to be transmitted as movement to the at least roving detent element when the trigger member releases the slide member upon breakage of yarn and/or breakage continuous filament.

[0028] Advantageously, the slide member is capable of accumulating potential energy derived from the compression force applied to a spring or applied to an equivalent or similar element permitting recovery of the position of the slide member.

[0029] For one embodiment, the slide member comprises a notch or recess to interact with the trigger member and a spring arranged to be compressed by displacing the slide member to the unfired position, until the trigger member locks the slide member.

[0030] Preferably, the reset actuator arm is configured so that it extends longitudinally to the front of the drafting frame, for example, to a position next to the bottom front roller.

[0031] Again preferably, the reset actuator arm is integrally attached to the slide member so that when the reset

actuator arm is actuated (pulled or pushed) the slide member displaces along the longitudinal direction.

[0032] For one embodiment, the reset actuator arm is configured to form a single piece with the slide member to extend longitudinally to the front of the drafting frame.

[0033] However, according to an alternative embodiment, the reset actuator arm constitutes a separate piece removable attached to the slide member to extend longitudinally to the front of the drafting frame.

[0034] This alternative embodiment has the advantage that allows an existing roving stop assembly to be easily adapted or converted to the claimed roving stop assembly.

[0035] Preferably, a distal portion of the reset actuator arm comprises or forms a passage adapted for the passage of at least one drafting apron wrapped around a bottom middle drafting roller and/or at least one suction tube for suctioning broken fibres or filaments.

[0036] Again preferably, the roving stop assembly comprises;

- detecting means arranged to detect absence or change of movement of a traveller along a ring of a spindle assembly upon breakage of yarn, and/or detecting means to detect absence of a continuous filament at a spinning position upon breakage of a continuous filament during production of "Core" yarn, and
- process and control means configured for;
 - receiving a yarn and/or filament breakage signal coming from the detecting means,
 - forwarding the yarn and/or filament breakage signal to the trigger means to trigger actuation of the at least roving detent element to an active position to stop the supply of roving, and subsequently,
 - before a piecing operation, forwarding a roving reset signal to the actuating means for automatically actuating the reset actuator arm at the front of the drafting frame of the ring spinning machine, to cause the at least roving detent element to be displaced to the inactive position to resume the supply of roving.

[0037] For one embodiment wherein the roving stop assembly comprises an automatic service station including the actuating means for the reset actuator arm, the process and control means are further configured for;

- forwarding a service signal to an automatic service station mounted displaceable along a row of spinning stations with an option of stopping at a selected spinning station requiring a service operation.

[0038] Additionally, if the actuating tool is attached to a robotic arm, the processing and control means are configured;

- to provide a roving reset signal to the robotic arm to allow the robotic arm to position the actuating tool at the reset actuator arm for pushing or pulling by means of the actuating tool the reset actuator arm at the front of the drafting frame.

[0039] Advantageously, the detecting means include an optical sensor arranged close to the spindle assembly to detect movement of the traveller and to output the signal of absence or change of movement of the traveller upon breakage of the yarn.

[0040] It is well known that once drafted, the roving or yarn passes down to the spindle assembly, where it is threaded through a small ring called the traveller. The traveller moves along a ring arranged coaxially a spindle. From there the yarn is attached to the existing yarn on the spindle. The traveller and the spindle share the same axis but rotate at different speeds. The spindle is driven and the traveller drags behind thus distributing the rotation between winding up on the spindle and twist into the yarn. The cited optical sensor controls continuously the status and RPM of each spinning position, and the data collected from the optical sensor is delivered to a monitoring software that sends the roving stop signal to the processing and control means of the roving stop assembly. The optical sensor has the advantage that provides superfast detection and communication because it allows detecting breakage of the yarn in less than one second to activate interruption of the roving instantaneously.

[0041] Preferably, the trigger means comprise an electromagnetic actuator for actuating the trigger member, wherein said electromagnetic actuator is configured to be energized when receiving the yarn and/or filament breakage signal.

[0042] Advantageously, the actuating tool is a yarn handling tool attached to a robotic arm, wherein said yarn handling tool includes at least one gripping element configured to actuate the reset actuator arm at the front of the drafting frame, and preferably, also configured to fasten auxiliary yarn on outside a yarn feeding nozzle.

[0043] By gripping element, it shall be understood to mean an element for holding or grasping the yarn on outside the yarn feeding nozzle. This gripping element may be configured as a protrusion or nipple attached to the yarn handling tool, for example, a gripping element configured or adapted either to engage the reset actuator arm or to hold or grasp a portion of yarn on outside the yarn feeding nozzle.

[0044] Thanks to these features, a same tool attached to a robotic arm can be used for automatically resetting the at least roving detent element to resume supply of roving and for carrying out threading and piecing operations.

[0045] Preferably, the at least roving detent element is configured as a wedge, for example a wedge with a curved surface, arranged to be inserted, in its active position, between a pair of rear or middle drafting rollers to stop the supply of roving. Advantageously, the at least

roving detent element is articulated attached to the slide member. Nevertheless, according to another embodiment, the roving detent element may be integrally attached to a different member of the resetting mechanism associated to the reset actuator arm.

[0046] A second aspect of the invention relates to a ring spinning machine comprising a drafting frame with a plurality of spinning stations and a claimed roving stop assembly at each of those spinning stations, wherein each roving stop assembly includes;

- the at least roving detent element,
- the trigger means operably connected to the at least roving detent element, and
- the reset actuator arm arranged at the front of the drafting frame at each spinning position,
- wherein said reset actuator arm is mounted to cooperate with the resetting mechanism operably connected to the at least roving detent element to allow the at least roving detent element to be displaced to the inactive position to resume the supply of roving when actuating the reset actuator arm at the front of the drafting frame.

[0047] A third aspect of the present invention relates to a method of monitoring the supply of roving at a spinning position of a ring spinning machine by means of the claimed roving stop assembly, wherein the assembly comprises actuating means for actuating the reset actuator arm, and the method comprises the step of;

- a) before initiating repair of a broken yarn and/or broken continuous filament, for example, before initiating a piecing operation, forwarding a roving reset signal to the actuating means for automatically actuating the reset actuator arm at the front of the drafting frame of the ring spinning machine.

[0048] The broken yarn that must be repair may be for example a plain yarn or a "Core" yarn. In the present invention;

[0049] By Plain yarn, it shall be understood to mean a yarn manufactured including pre-drafting and main drafting of at least a roving by means of single middle bottom drafting apron wrapped around a middle bottom drafting roller.

[0050] By "Core yarn", it shall be understood to be a yarn combining a core of one, two or as many as three continuous filaments with a bundle of roving fibres covering the filaments.

[0051] By "Duo core" yarn, it shall be understood to be a yarn combining a core of two continuous filaments with a bundle of roving fibres covering the filaments.

[0052] By "continuous filament", it should be understood to be a filament of textile fibre of an indefinite length; preferably, a length of synthetic fibre obtained by extrusion, for example a filament of elastane or of polyester.

[0053] By "Roving" or "bundle of roving fibres" shall be

understood to be a bundle of cut cotton, wool, or viscose fibres, or another similar natural or artificial cut fibre, intended or not for the coating of one or more continuous filaments in the spinning of core yarn.

[0054] By threading operation shall be understood preferably the operation of creating or forming a threading section of auxiliary yarn on outside the yarn feeding nozzle, and handling the threading section at the flange of the ring of the ring spinning machine for said threading section is threaded into the ring traveller of the ring spinning machine.

[0055] By piecing operation shall be understood the operation of positioning the yarn handling tool for piecing threaded auxiliary yarn on the roving issuing the front drafting rollers of the drafting assembly of the ring spinning machine.

[0056] By the expression "at the front of the drafting frame" shall be understood at the most forward position of the drafting frame, preferably, at a position next or close to the bottom front roller

Brief description of the drawings

[0057] The previous and other advantages and features will be more fully understood from the following detailed description of embodiments, with reference to the attached drawings, which must be considered in an illustrative and non-limiting manner, in which summarizing;

[0058] In detail:

Figure 1 shows a perspective view of an embodiment of the roving stop assembly showing the reset actuator arm attached to the slide member of the resetting mechanism operably connected to the roving detent element.

Figure 2 is a partial exploded perspective view of the roving stop assembly of figure 1 showing the reset actuator arm configured as a separate piece removable attachable to the slide member, and the roving detent element configured as a wedge to be inserted in between a pair of rear or middle drafting rollers susceptible to deliver roving.

Figure 3 is a schematic perspective view showing two roving stop assemblies of figure 1 mounted at two spinning stations of a drafting frame of a ring spinning machine with the bottom drafting apron of each middle bottom drafting roller crossing the passage provided on the distal portion of each reset actuator arm. This figure shows the roving detent element of both roving stop assemblies acting on the pair of rear drafting rollers in an active position interrupting the supply of roving. The slide members of each resetting mechanism are released to a fired backwards position upon breakage of yarn.

Figure 4 is a schematic perspective view analogous to the perspective of figure 3 above, showing in this case the two roving stop assemblies with the roving detent element in an inactive position to permit the

supply of the roving (not represented). The slide members of each resetting mechanism have been actuated by pulling the reset actuator arms, until retained in an unfired forwards position.

Figure 5 is a schematic perspective view of a drafting frame showing a plurality of roving stop assemblies at each spinning position. The roving detent elements of some of the roving stop assemblies are in an active position and others in an inactive position. The reset actuator arms of the roving stop assemblies with the roving detent elements in the active position have a fired backwards position waiting for actuation to resume supply of roving. For the reasons of clarity, the upper drafting rollers and the drafting aprons of the middle bottom drafting rollers have not been represented.

Figure 6 is a schematic lateral view of the roving stop assembly of figure 1 with the roving detent element acting on the pair of rear drafting rollers in an active position interrupting the supply of roving upon having received a yarn breakage signal. The slide member of the resetting mechanism and the reset actuator arm are both in a fired backwards position. The figure shows the representation of an actuating tool provided with a gripping element in the form of a protrusion for engaging the reset actuator arm at the front of the drafting frame. For this embodiment, the actuating tool is a yarn handling tool attached to a robotic arm of a yarn piecing system.

Figure 7 is the schematic lateral view of the roving stop assembly of figure 6 showing the actuating tool pulling the reset actuator arm attached to the slide member of the resetting mechanism.

Figure 8 is a schematic lateral view of the roving stop assembly of figure 1 wherein both the slide member and the reset actuator arm are retained in an unfired forwards position. In this position, the roving detent element is in an inactive position allowing supply of the roving.

Figure 9 is a schematic longitudinal section of the roving stop assembly showing the reset actuator arm attached to the slide member of the resetting mechanism operably connected to the roving detent element, a trigger member mounted to cooperate with the resetting mechanism and an electromagnetic actuator for actuation the trigger member. For the embodiment shown in this figure, the resetting mechanism includes the slide member provided with a notch and a spring arranged to be compressed by displacing the slide member with the reset actuator arm until the trigger member locks the slide member in the notch.

Figure 10 is a schematic longitudinal section of the roving stop assembly analogous to the longitudinal section of figure 9. In this figure, the slide member of the resetting mechanism is released to a fired backwards position by the trigger member upon the electromagnetic actuator is energized, when receiv-

ing the breakage signal. The breakage signal comes, either from detecting means detecting absence or change of movement of a traveller along a ring of a spindle assembly upon breakage of yarn and/or from detecting means detecting absence of a continuous filament upon breakage of this filament during production of "Core" yarn.

Figure 11 is a schematic lateral view of a ring spinning machine configured for the production of "Duo Core" yarn with the claimed roving stop assembly. It shows left and right drafting frames, left and right roving holders and left and right creels with bobbins of two different continuous filaments arranged for "deroulee" unwinding. The first continuous filament may be for example an elastomer filament such as elastane Lycra® brand, and the second continuous filament may be for example, a continuous filament of elastomultiester T400® brand by INVISTA. The roving may be for example, cotton cut fibres. As represented in the figure, the ring spinning machine comprises the roving stop assembly of figure 1 at each spinning position of the drafting frames, with each of the assemblies including a reset actuator arm arranged at the front "F" of the drafting frame.

Description of preferred embodiments

[0059] Following is a description of the claimed invention with reference to drawings of figures 1 to 11 representing an exemplary embodiment of the invention, applicable to a ring spinning machine suitable for the production of yarn.

[0060] For example, the invention may be applicable to a ring spinning machine suitable for the production of "Duo Core" yarn as shown in figure 11. This ring spinning machine comprises a row of spinning stations arranged next to each other, and left and right drafting frames 3 with a pair of front drafting rollers 3c, a pair of middle drafting rollers 3b and a pair of rear drafting rollers 3a. A plurality of roving stop assemblies 1 are attached to a bar 2 of each drafting 3 frame of the ring spinning machine at each spinning station or position. Roving bobbins 16 hang from left and right roving holders 17, and left and right creels 18 are provided with bobbins 19 of two different continuous filaments arranged for "deroulee" unwinding.

[0061] Figure 5 shows a schematic perspective view of one of the drafting frames 3 of figure 11 showing the plurality of roving stop assemblies 1 attached to the bar 2. For the sake of clarity, this figure does not show the upper drafting rollers but only the bottom drafting rollers of the drafting frame 3.

[0062] Each of the claimed roving stop assemblies 1 includes;

- at least a roving detent element 4 arranged to be able to act, in an active position on the pair of rear, or middle, drafting rollers 3a responsible for deliver-

ing the roving to be drafted,

- trigger means operably connected to the roving detent element 4 to trigger actuation of the roving detent element 4 to the active position upon breakage of yarn or breakage of a continuous filament and,
- reset means for resetting by way of a resetting mechanism the at least roving detent element 4 to an inactive position to resume the supply of roving in order for an operator to be able to initiate repair of the broken yarn or broken filaments.

[0063] For an illustrated embodiment, the trigger means comprise a trigger member 5 mounted to cooperate with the resetting mechanism, and the resetting mechanism comprises a slide member 6 susceptible to be retained in an unfired forwards position by the trigger member 5. In particular, the slide member 6 comprises a notch 7 for the trigger member 5 and a spring 8 arranged to be compressed by displacing the slide member 6 until the trigger member 5 locks in the notch 7 the slide member 6 (see, figure 9).

[0064] In the unfired forwards position of figure 9, the slide member 6 is capable of accumulating potential energy derived from the compression force applied to the spring 8. This accumulated potential energy is susceptible to be transmitted as movement to the at least detent element 4 when the trigger member 5 releases the slide member 6 to a fired backwards position upon breakage of yarn or breakage of a continuous filament (see, figure 10).

[0065] For the illustrated embodiment, the trigger means comprise an electromagnetic actuator 9, for example an electromagnetic coil and piston assembly for actuating the trigger member 5. The electromagnetic actuator 9 is energized when receiving a yarn and/or filament breakage signal upon breakage of yarn and/or breakage of continuous filament. The breakage signal may come from detecting means, for example a sensor, detecting absence or change of movement of a traveller along a ring of a spindle assembly 20 upon breakage of yarn, or from detecting means, for example another sensor, detecting absence of a continuous filament upon breakage of this continuous filament.

[0066] In contrast to the known roving stop assemblies, in the one proposed by the invention, the reset means include a reset actuator arm 10 arranged at the front of the drafting frame 3, or at the most forward position of the drafting frame 3. In particular, the reset actuator arm 10 is configured to extend longitudinally from the resetting mechanism to the front of the drafting frame 3.

[0067] For the illustrated embodiment, the reset actuator arm 10 constitutes a separate piece removable attached to the slide member 6 and configured to extend longitudinally to the front of the drafting frame 3. This embodiment has the advantage that allows an existing roving stop assembly to be easily converted to the claimed roving stop assembly.

[0068] As can be seen in the figures, the reset actuator

arm 10 extends longitudinally to the front of the drafting frame 3 with a distal portion of the reset actuator arm 10 forming a passage 11 adapted for the passage of a bottom drafting apron 12 of the bottom middle drafting roller 3b (see, figures 3 and 4). The same passage 11 may be also adapted for the passage of a suction tube 21 for suctioning broken fibres or filaments (see, figure 11).

[0069] Figure 3 shows a schematic view of a pair of roving stop assemblies mounted at two spinning stations of a drafting frame 3. In this figure, the roving detent element 4 of each roving stop assembly acts on the pair of rear drafting rollers 3a in an active position interrupting the supply of roving with the corresponding slide member 6 of the resetting mechanism released to a fired backwards position, upon breakage of yarn.

[0070] The reset actuator arm 10 is mounted to cooperate with the slide member 6 of the resetting mechanism. This slide member 6 is operably connected to the roving detent element 4 to allow the roving detent element 4 to be displaced to the inactive position upon actuation of the reset actuator arm 10, to resume the supply of roving (see figure 4).

[0071] As previously disclosed, with the claimed roving stop assembly the supply of roving is resumed by simple actuating the reset actuator arm 10 at the front of the drafting frame 3. Hence, the operator does not need to access inside the drafting frame 3 to reset the roving detent element 4, so that handling operations in between spindles positions are made much easier and reliable.

[0072] For a preferred embodiment shown in figures 6 and 7, the roving stop assembly comprises actuating means for automatically actuating the reset actuator arm 10 at the front of the drafting frame 3 to resume the supply of roving. In this manner, the roving stop assembly has the advantage that can dispense with the presence of an operator for manually resetting the roving detent element 4.

[0073] In the illustrated embodiment of figures 6 and 7, the actuating means include an actuating tool 13 attached to a robotic arm 14, and the robotic arm 14 is arranged on an automatic service station (not represented) mounted displaceable along a row of spinning stations with an option of stopping at a selected spinning station requiring a service operation.

[0074] The robotic arm 14 may have at least six degree of freedom of motion to allow the actuation tool 13 to be positioned at the front of the drafting frame 3 to engage the reset actuator arm 10 for actuating the resetting mechanism.

[0075] Figure 6 shows an actuating tool 13 that is configured as a yarn handling tool of a yarn piecing system. In the illustrated embodiment, the yarn handling tool is provided with a gripping element 15 configured as a protrusion for engaging the reset actuator arm 10 at the front of the drafting frame 3 (see, figure 7). Afterwards, the same yarn handling tool is used for fastening auxiliary yarn (not represented) on outside a yarn feeding nozzle for carrying out a threading and piecing operation to re-

pair the broken yarn.

[0076] Below it follows the description of a method of monitoring the supply of roving at a spinning station of a ring spinning machine using the claimed roving stop assembly by reference to the illustrated figures 1 to 11.

[0077] The breakage of yarn, or breakage of a continuous filament, is detected by means of at least one sensor (not represented) arranged to detect either the absence or change of movement of a traveller along a ring of a spindle assembly 20, and/or the absence of a continuous filament being fed to the drafting frame 3.

[0078] In a first step, the process and control means of the roving stop assembly 1 receive a yarn and/or filament breakage signal coming from the sensors detecting breakage of yarn and/or continuous filament at a spinning station.

[0079] Then, in a second step, the process and control means forward the yarn and/or filament breakage signal to energize the electromagnetic actuator 9 to trigger actuation of the trigger member 5. Actuation of the trigger member 5 causes the slide member 6 to release to a fired backwards position wherein the roving detent element 4 is in an inactive position interrupting the supply of roving.

[0080] In a third step, the process and control means forward a service signal to an automatic service station (not represented) mounted displaceable along the row of the spinning stations to stop at the selected spinning station requiring service operation. The service station includes the actuation tool 13 for actuating the reset actuator arm 10. For one embodiment, the actuation tool 13 is attached to the robotic arm 14 and includes the gripping element 15 for engaging the reset actuator arm 10.

[0081] In a fourth step, before initiating repair of the broken yarn and/or broken continuous filament, or before piecing, the process and control means forward a roving reset signal to the robotic arm 14 to position the gripping element 15 of the actuating tool 13 to engage the reset actuator arm 10 at the front of the drafting frame 3. For the illustrated embodiment, pulling of the reset actuator arm 10 causes displacement of the slide member 6 to an unfired forwards position and displacement of the roving detent element 4 to the inactive position to resume the supply of roving.

[0082] As previously stated, with the claimed roving stop assembly, the supply of roving is resumed by simple actuating the reset actuator arm 10 at the front of the drafting frame. Hence, the operator, or an actuating device, does not need to access inside the drafting frame 3 to reset the roving detent element 4 to its inactive position. Thus, handling operations in between spindles positions are made much easier and reliable.

[0083] A person skilled in the art could introduce changes and modifications in the embodiments described without departing from the scope of the invention as it is defined in the attached claims. For example, although it has been disclosed an embodiment where the

reset actuator arm 10 is mounted to cooperate with a slide member 6 of the resetting mechanism, it would be possible that the reset actuator arm 10 was mounted to cooperate with a resetting mechanism of different configuration. In any case, the resetting mechanism should be operably connected to the roving detent element to allow displacing the roving detent element to the inactive position to resume supply of roving. Likewise, although it has been disclosed a roving detent element 4 configured in the shape of a wedge articulately attached to the slide member 6, it would be possible to provide a roving detent element of different configuration, for example a roving detent element of different configuration that was integrally fixed to the resetting mechanism. It would be also possible that the roving stop assembly included not only one roving detent element, but also two roving detent elements arranged to act on different bottom drafting rollers of the same drafting frame.

Claims

1. Roving stop assembly (1) for a drafting frame (3) of a ring spinning machine, wherein said drafting frame (3) comprises a pair of front drafting rollers (3c), a pair of middle drafting rollers (3b) and a pair of rear drafting rollers (3a), said roving stop assembly (1) including;

- at least a roving detent element (4) arranged to be able to act, in an active position, on one of said pair of rear drafting rollers (3a) and/or middle drafting rollers (3b) to stop the supply of roving at a spinning position of the ring spinning machine,
- trigger means (5, 9) operably connected to the at least roving detent element (4) to trigger actuation of the at least roving detent element (4) to an active position, and,
- reset means (6) for resetting by means of a resetting mechanism (6, 7) the at least roving detent element (4) to an inactive position to resume the supply of roving,

characterized in that;

- said reset means include a reset actuator arm (10) arranged at the front of the drafting frame (3), and **in that;**
- said reset actuator arm (10) is mounted to cooperate with the resetting mechanism (6, 7) operably connected to the at least roving detent element (4) to allow the at least roving detent element (4) to be displaced to the inactive position for resuming the supply of roving when actuating the reset actuator arm (10) at the front (F) of the drafting frame (3).

2. Roving stop assembly according to claim 1, wherein it comprises actuating means (13, 14, 15) for actuating the reset actuator arm (10) at the front (F) of the drafting frame (3) of the ring spinning machine to resume the supply of roving. 5
3. Roving stop assembly according to claim 2, wherein said actuating means comprises an actuating device arranged on an automatic service station mounted displaceable along a row of spinning stations with an option of stopping at a selected spinning station requiring a service operation. 10
4. Roving stop assembly according to any of claims 2 to 3, wherein said actuating means comprise an actuating tool (13) for actuating the reset actuator arm (10), said actuating tool (13) being attachable to a robotic arm (14). 15
5. Roving stop assembly according to claim 4, wherein said actuating tool (13) is a yarn handling tool attachable to a robotic arm (14) of a yarn piecing system. 20
6. Roving stop assembly (1) according to claim 5, wherein said yarn handling tool includes at least one gripping element (15) configured to actuate the reset actuator arm (10) at the front (F) of the drafting frame, and preferably configured to fasten auxiliary yarn on outside a yarn feeding nozzle. 25
7. Roving stop assembly (1) according to any of claims 1 to 6, wherein the trigger means comprise a trigger member (5) mounted to cooperate with the resetting mechanism (6, 7); 30
 - to release the resetting mechanism (6, 7) to a fired position upon breakage of yarn and/or breakage of a continuous filament, and
 - to retain the resetting mechanism (6, 7) to an unfired position when the reset actuator arm (10) is actuated. 35
8. Roving stop assembly (1) according to any of claims 1 to 7, wherein the resetting mechanism comprises a slide member (6) associated to the reset actuator arm (10), and wherein said slide member (6) is mounted displaceable along a longitudinal direction upon actuation of the reset actuator arm (10) to allow the at least roving detent element (4) to displace to the inactive position. 40
9. Roving stop assembly according to any of claims 7 to 8, wherein the reset actuator arm (10) is removable attached to the resetting mechanism, preferably, removable attached to the slide member (6) of the resetting mechanism. 45
10. Roving stop assembly according to any of claims 1 to 9, wherein the reset actuator arm (10) is configured to longitudinally extend to the front of the drafting frame (3), and wherein a distal portion of the reset actuator arm (10) comprises a passage (11) adapted to allow passage of a drafting apron (12) and/or passage of a suction tube (21) for suctioning broken fibres or filaments. 50
11. Roving stop assembly according to claims 7 and 8, wherein the trigger member (5) is mounted to cooperate with the slide member (6) so that; 55
 - the slide member (6) is susceptible to be retained by the trigger member (5) on an unfired position when the reset actuator arm (10) is actuated and,
 - the slide member (6) is susceptible to be released to a fired position by the trigger member (5) upon breakage of yarn and/or breakage of continuous filament.
12. Roving stop assembly (1) according to any of claims 1 to 11, when dependent of claim 2, wherein it comprises;
 - detecting means arranged to detect absence or change of movement of a traveller along a ring of a spindle assembly (20) upon breakage of yarn intended to be fed at a spinning position, and/or detecting means to detect absence of a continuous filament upon breakage of a continuous filament during production of "Core" yarn, and
 - process and control means configured for;
 - receiving a yarn and/or filament breakage signal coming from the detecting means,
 - forwarding the yarn and/or filament breakage signal to the trigger means (5, 9) to trigger actuation of the at least roving detent element (4) to an active position to stop the supply of roving, and subsequently,
 - before a piecing operation, forwarding a roving reset signal to the actuating means (13, 14, 15) for actuating the reset actuator arm (10) at the front (F) of the drafting frame (3), to cause the at least roving detent element (4) to be displaced to the inactive position to resume the supply of roving.
13. Roving stop assembly according to claim 12, wherein it comprises an automatic service station including the actuating means (13, 14, 15) for actuating the reset actuator arm (10), and the process and control means are further configured for;
 - forwarding a service signal to an automatic service station mounted displaceable along a

row of spinning stations with an option of stopping at a selected spinning station requiring a service operation.

14. Roving stop assembly according to any of claims 12 or 13, when dependent of claim 7, wherein the trigger means comprise an electromagnetic actuator (9) for actuating the trigger member (5), and wherein said electromagnetic actuator (9) is configured to be energized when receiving the yarn and/or filament breakage signal upon breakage of yarn and/or breakage of continuous filament. 5 10
15. A ring spinning machine comprising a drafting frame (3) with a plurality of spinning stations and the roving stop assembly (1) according to any of claims 1 to 14 at each of those spinning stations, wherein each roving stop assembly (1) includes; 15
- the at least roving detent element (4), 20
 - the trigger means (5, 9) operably connected to the at least roving detent element (4), and
 - the reset actuator arm (10) arranged at the front (F) of the drafting frame at each spinning position, 25
 - wherein said reset actuator arm (10) is mounted to cooperate with the resetting mechanism (6, 7) operably connected to the at least roving detent element (4), to allow the at least roving detent element (4) to be displaced to the inactive position to resume the supply of roving when actuating the reset actuator arm (10) at the front (F) of the drafting frame (3). 30

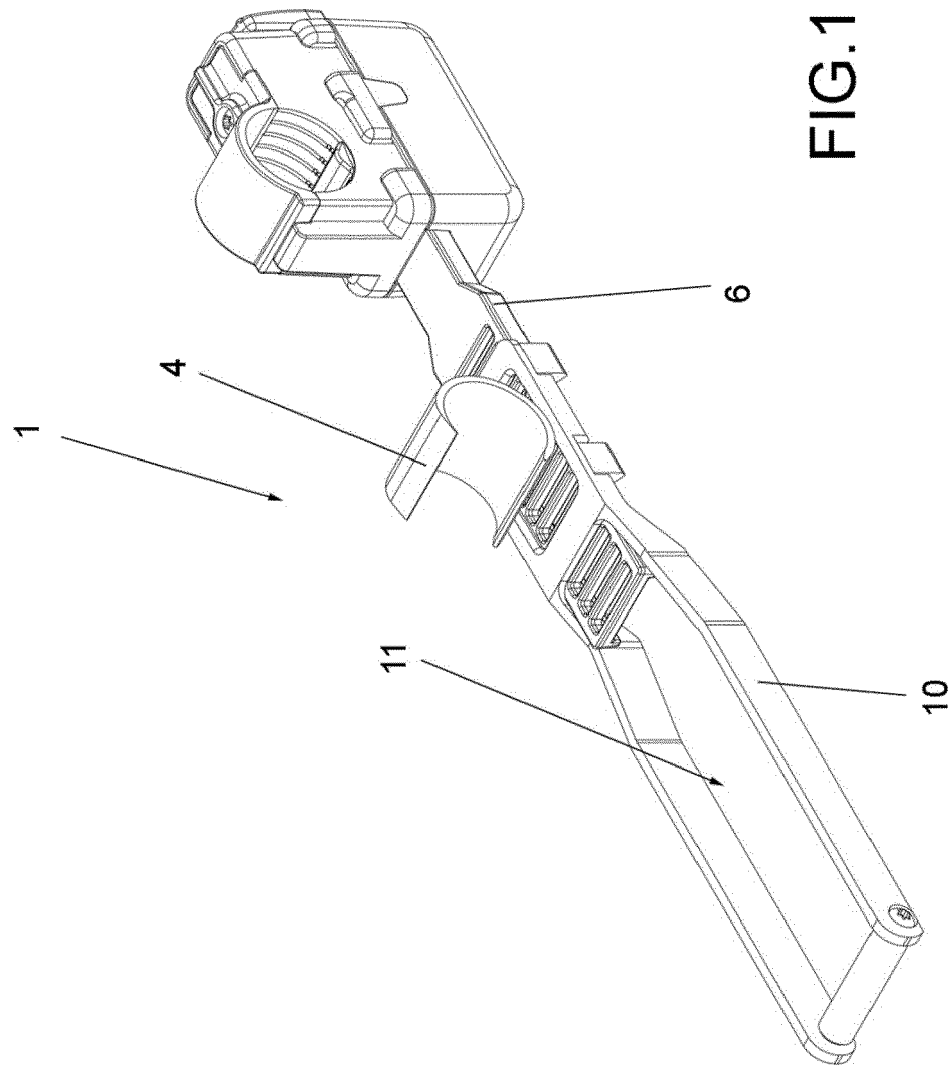
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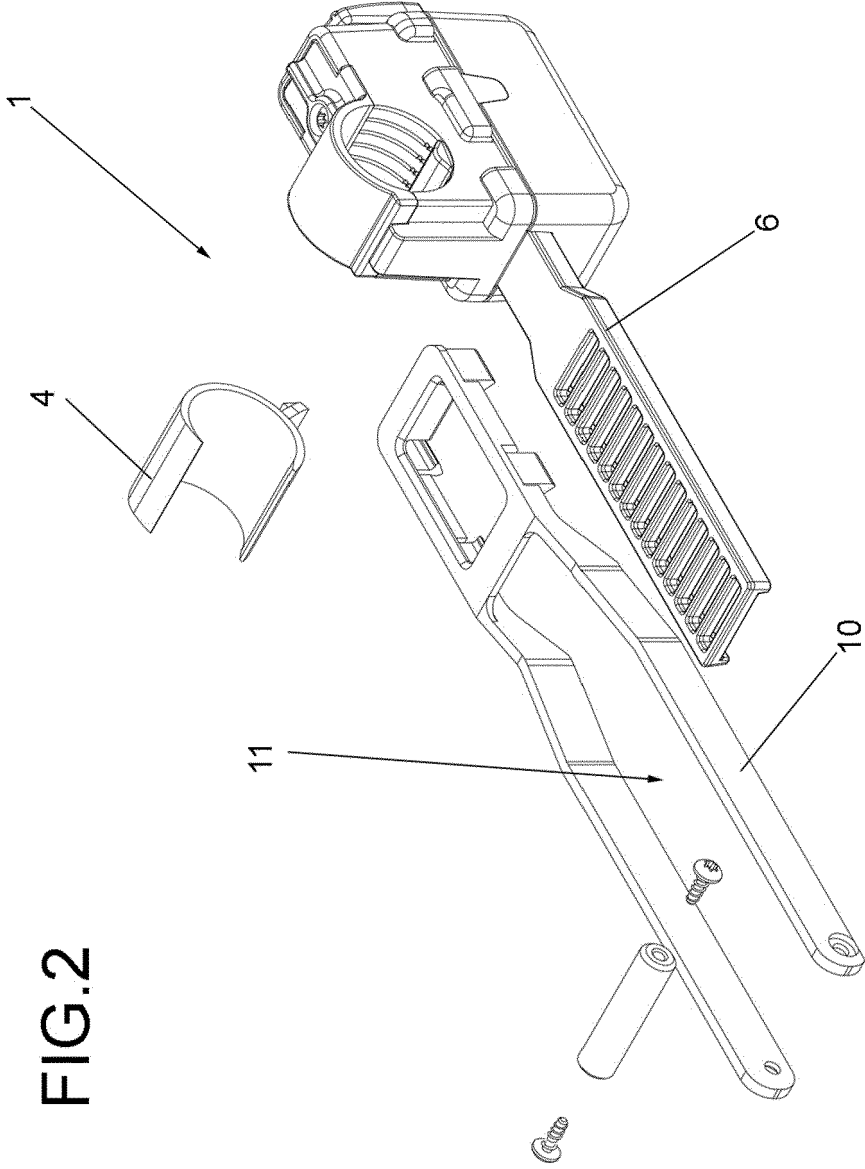


FIG.2

FIG.3

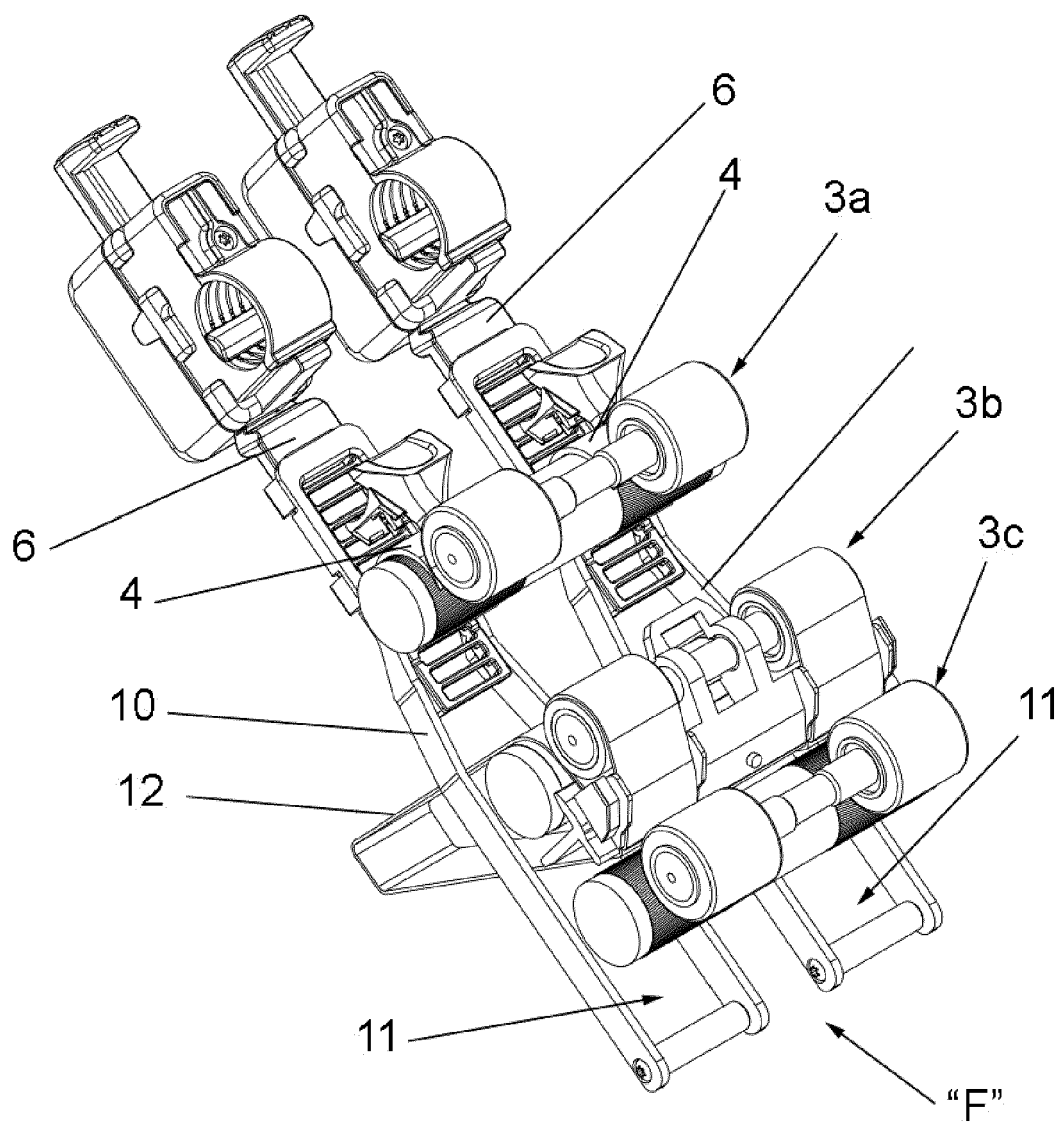
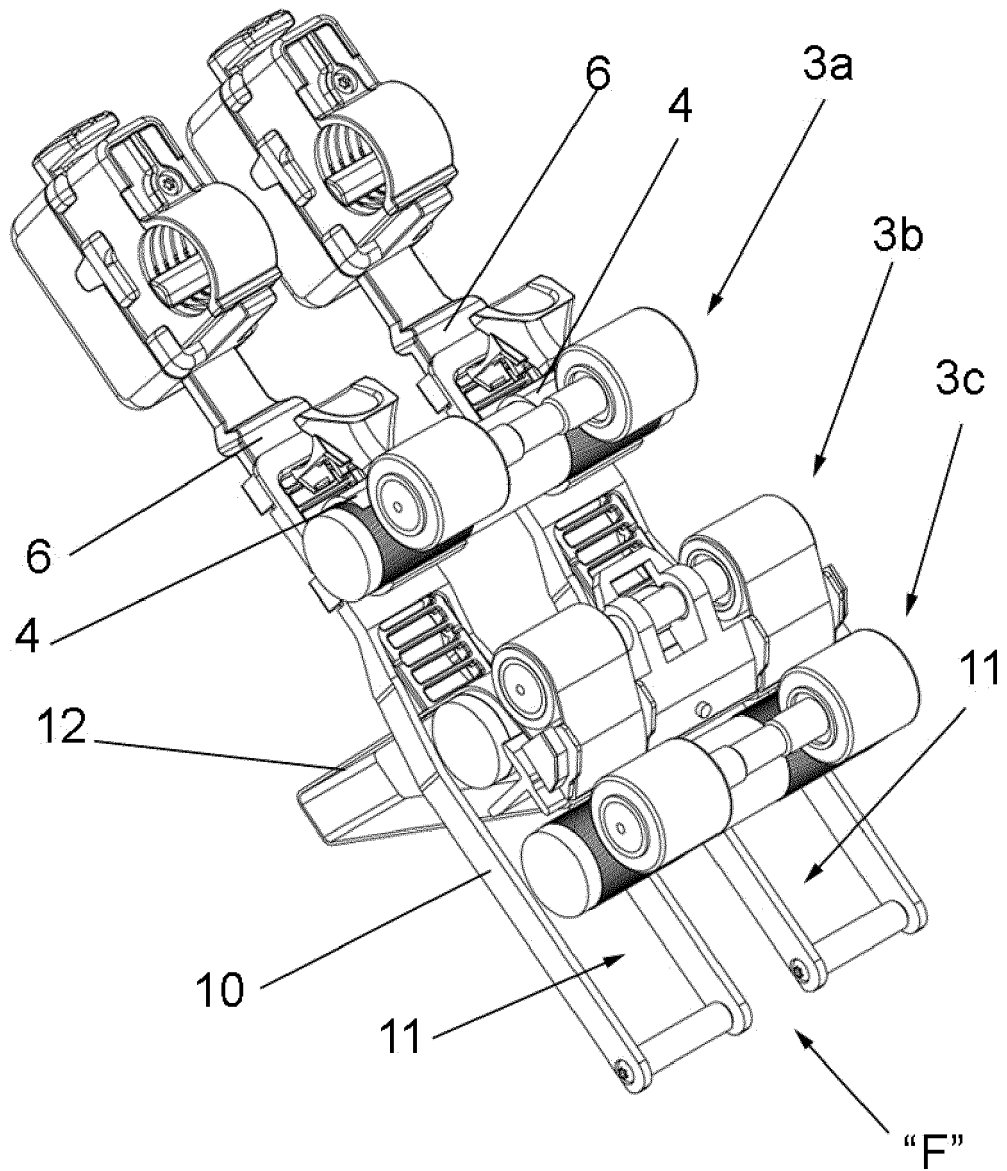


FIG.4



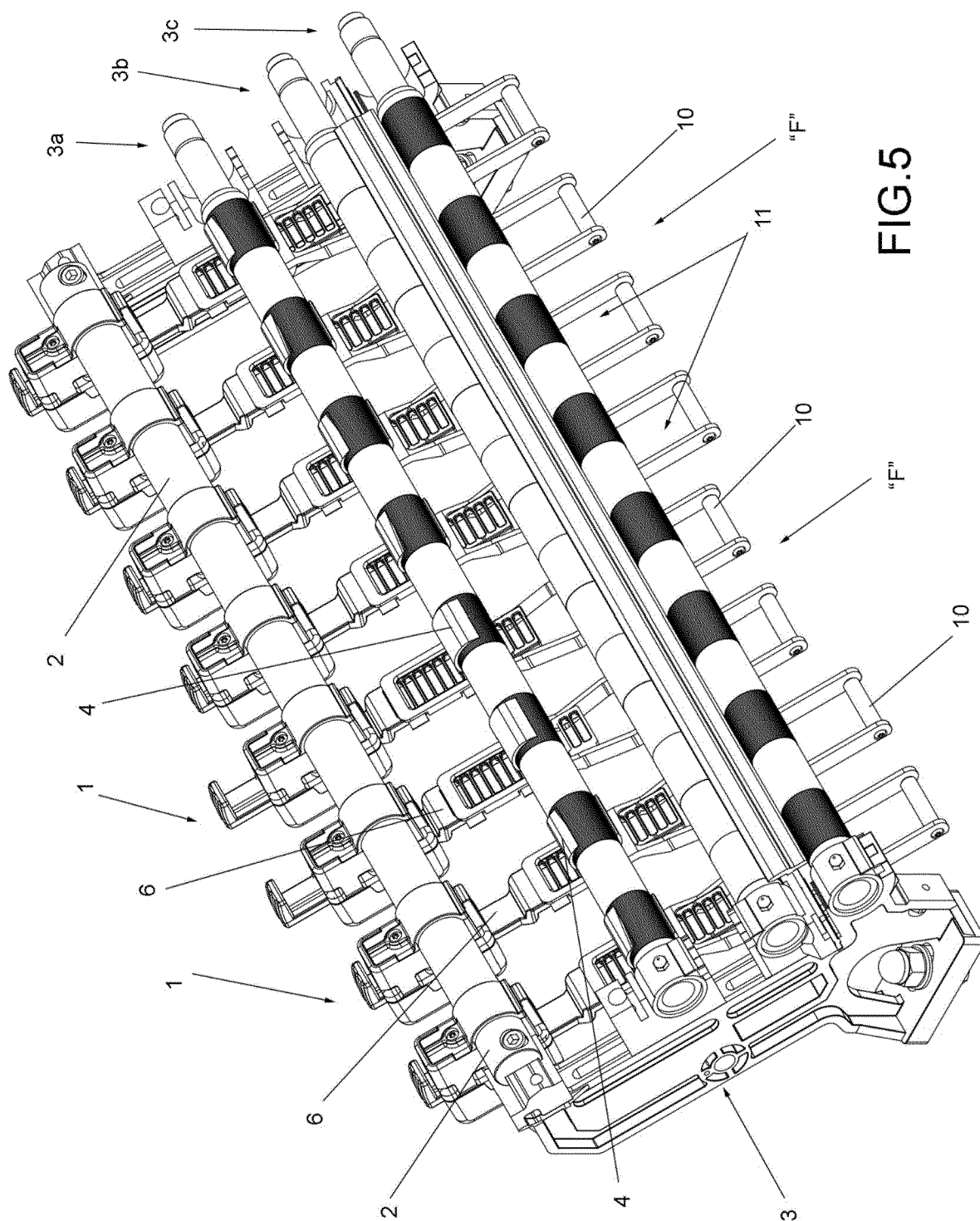


FIG. 5

FIG.6

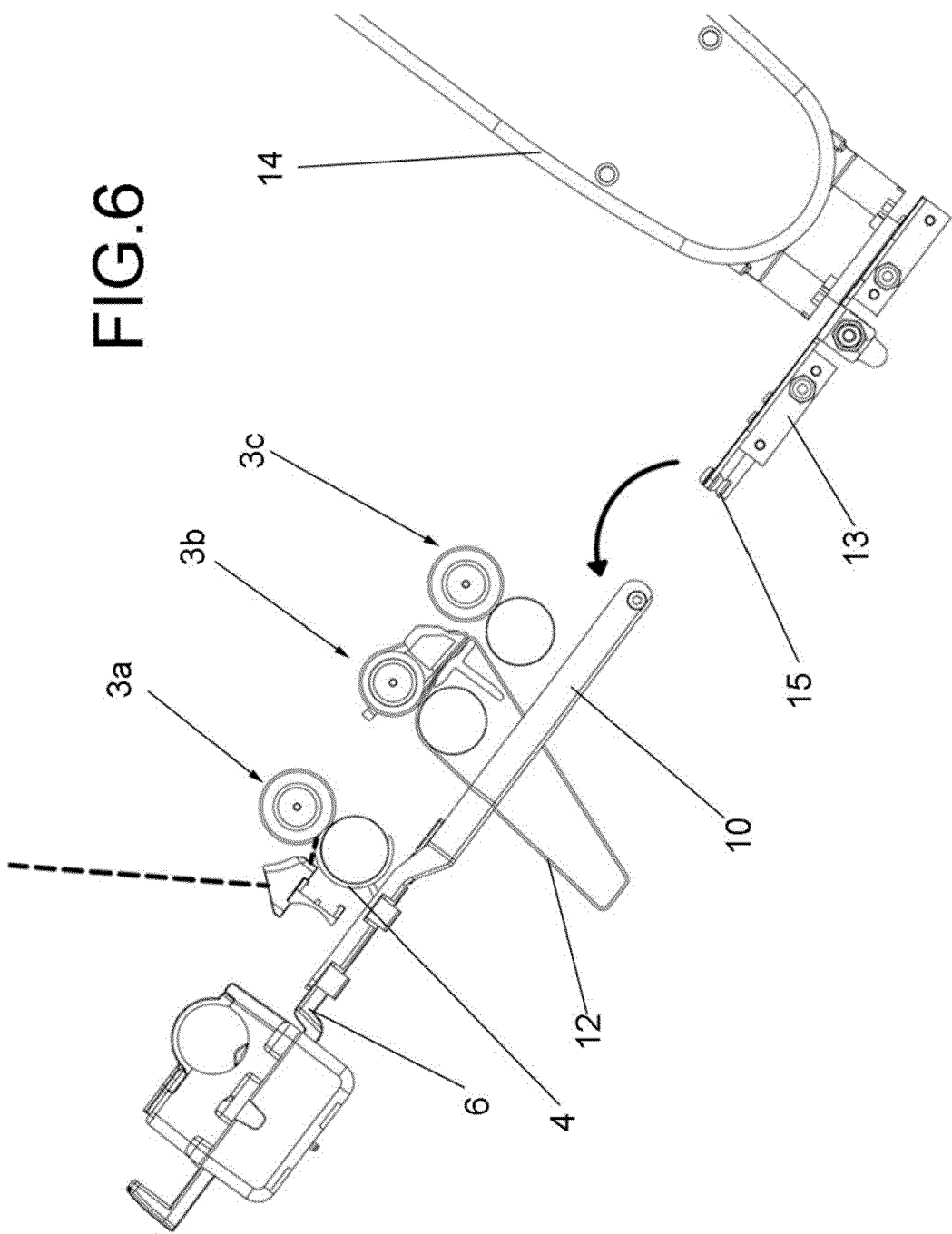


FIG.7

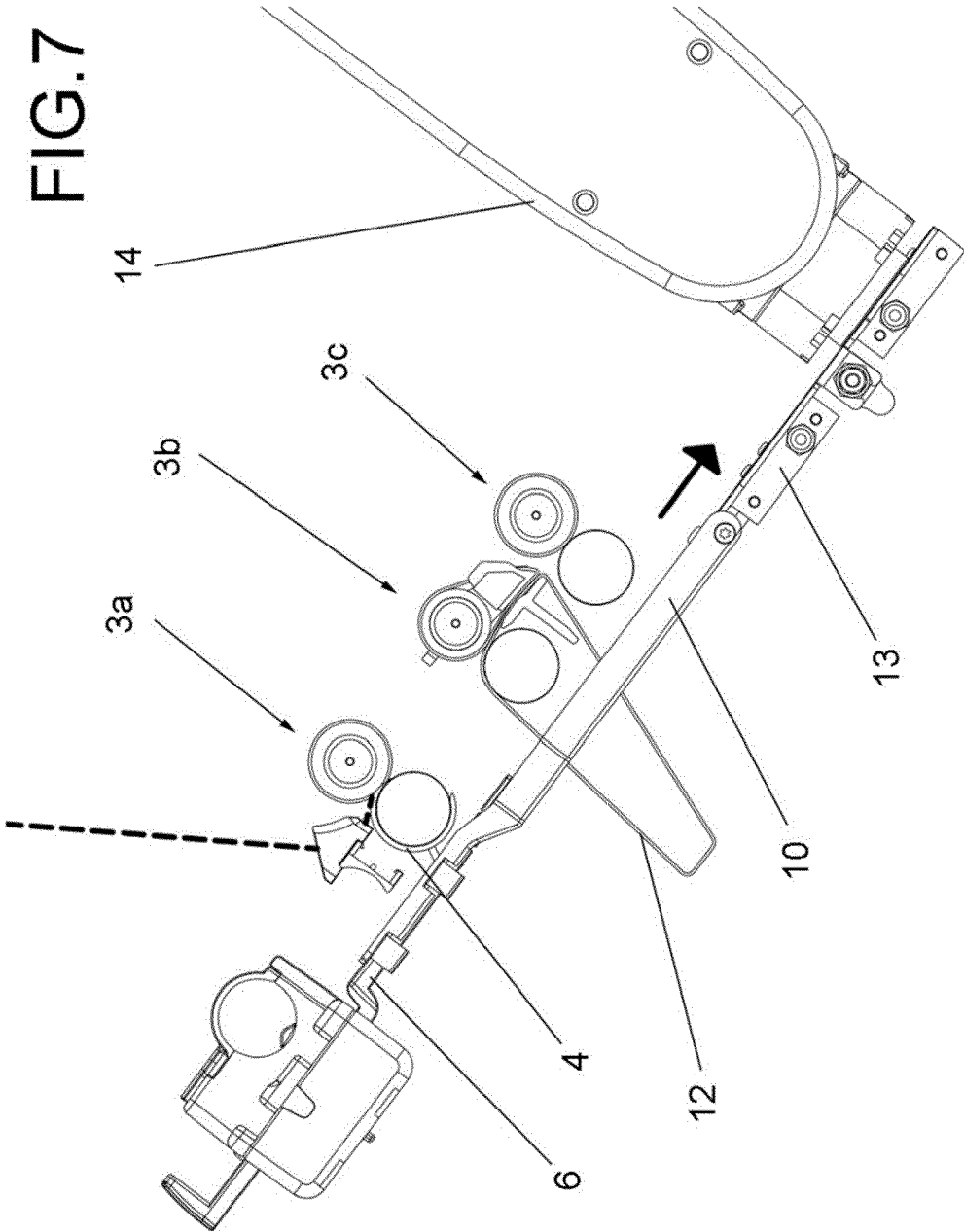
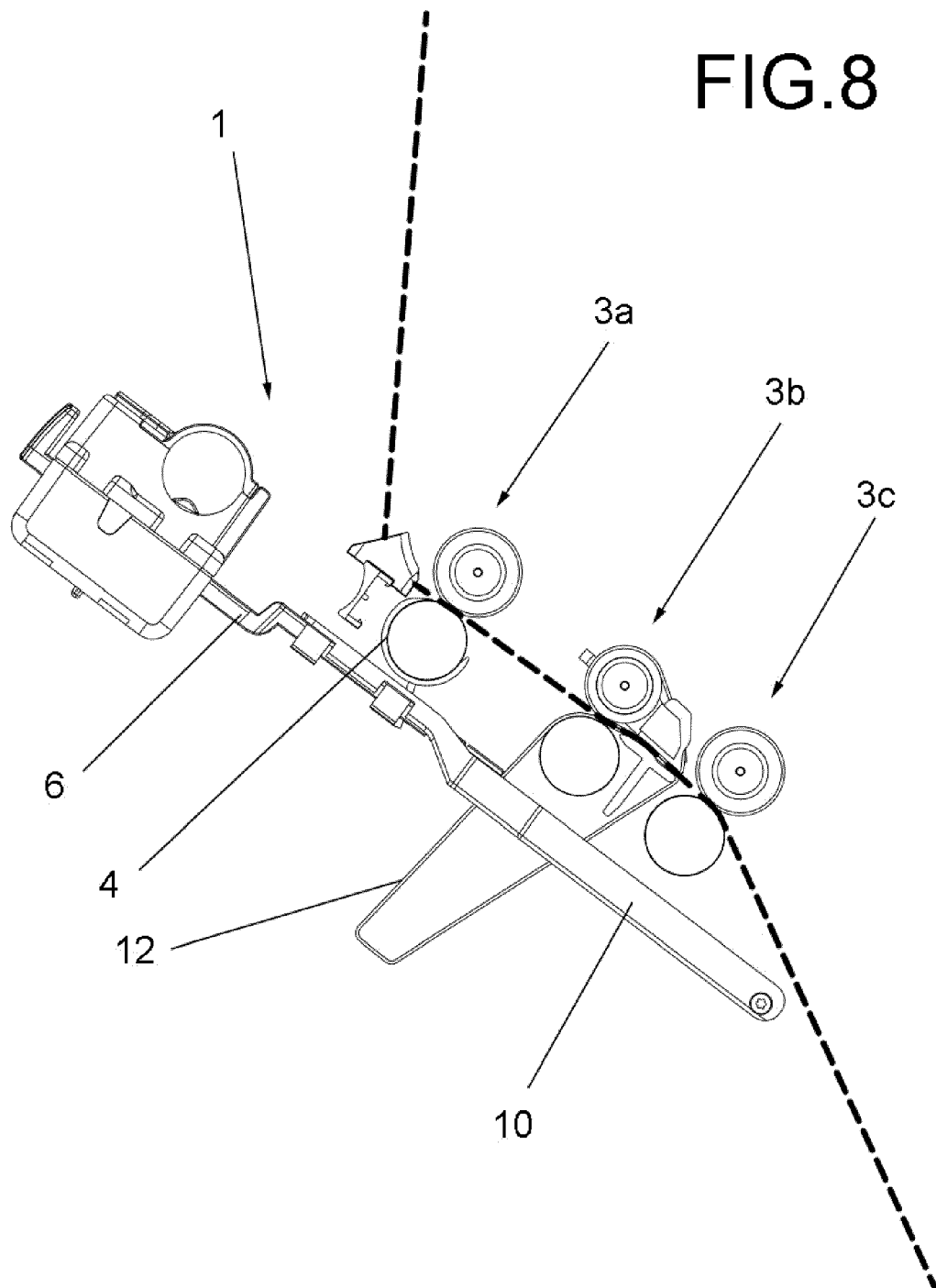


FIG.8



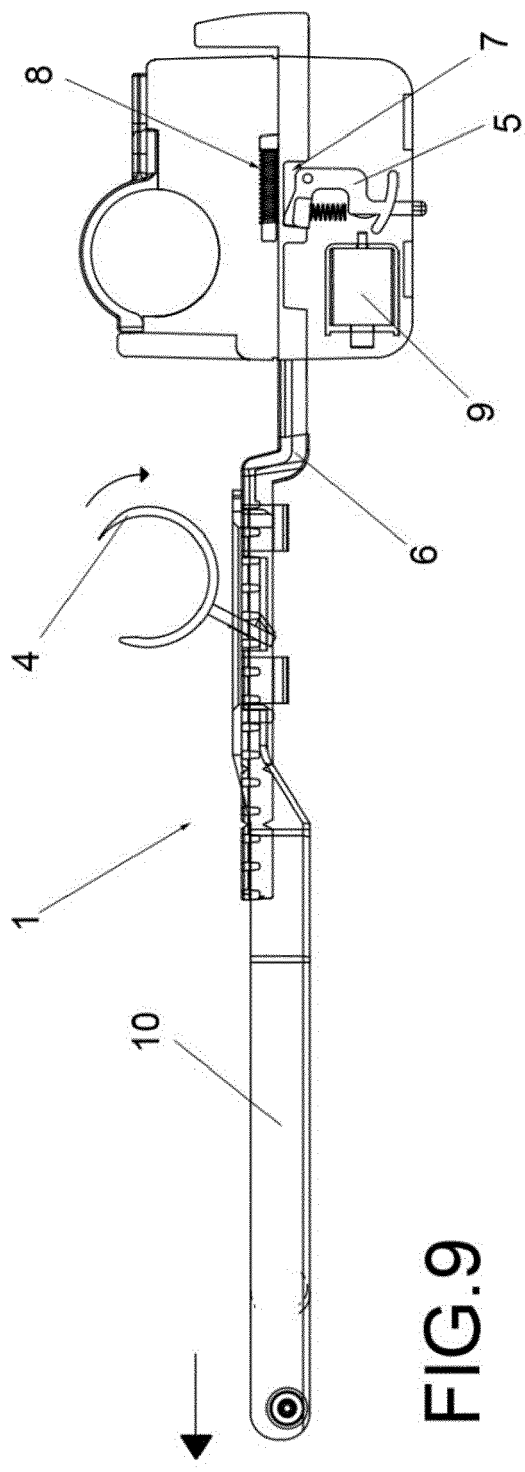


FIG.9

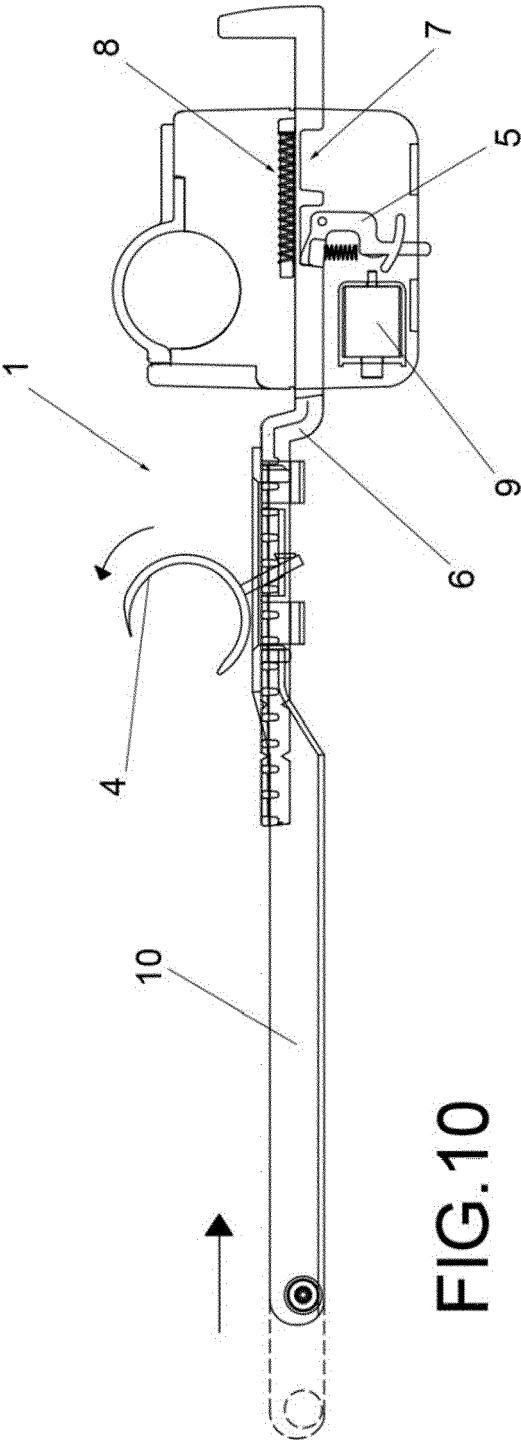


FIG.10

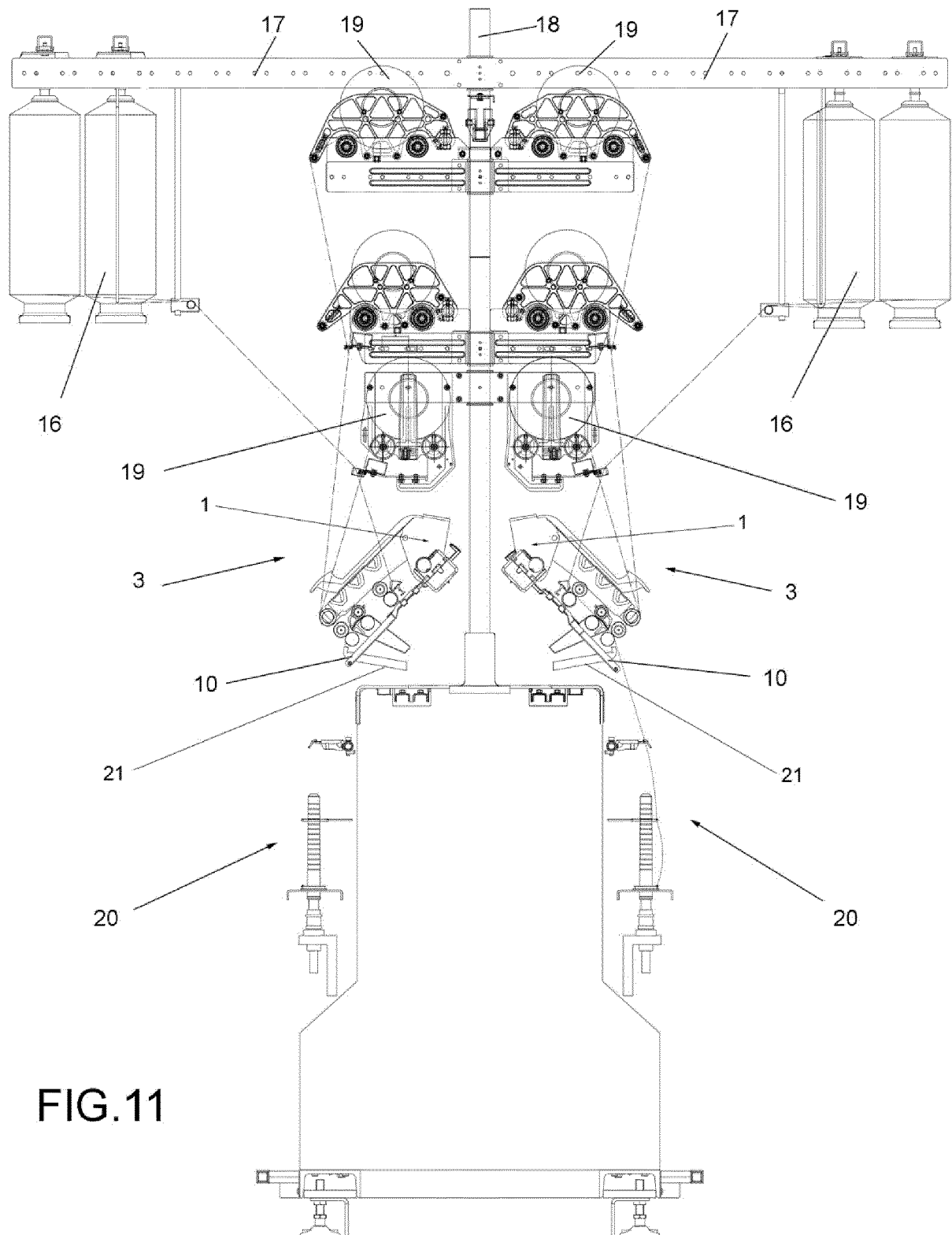


FIG.11



EUROPEAN SEARCH REPORT

 Application Number
 EP 21 38 2483

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 October 2021	Examiner Todarello, Giovanni
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EP 21 38 2483

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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25-10-2021

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