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(54) A SPINNING SYSTEM AND METHOD OF SPINNING PLAIN YARN OR FANCY YARN WITH SAID SPINNING SYSTEM

(57) Spinning system for a ring spinning machine comprising a drafting assembly having a first removable drafting roller (4) attached to a drafting frame (7) of said ring spinning machine in a forward position to be able to act at a spinning position (S1, S2) as a middle bottom drafting roller over an existing middle bottom drafting roller (12) of said spinning machine, a second removable drafting roller (5) attached to the said drafting frame (7) in a backward position with respect said first removable drafting roller (4) to be able to act at the said spinning position (S1, S2) as a back bottom drafting roller over an existing back bottom drafting roller (12) of said spinning machine, and a roving stop device comprises means (16, 17, 27, 28) for stopping movement of said first and second removable bottom drafting rollers (4, 5) upon breakage of yarn at the spinning position (S1, S2) of said first and second removable drafting rollers (4, 5).

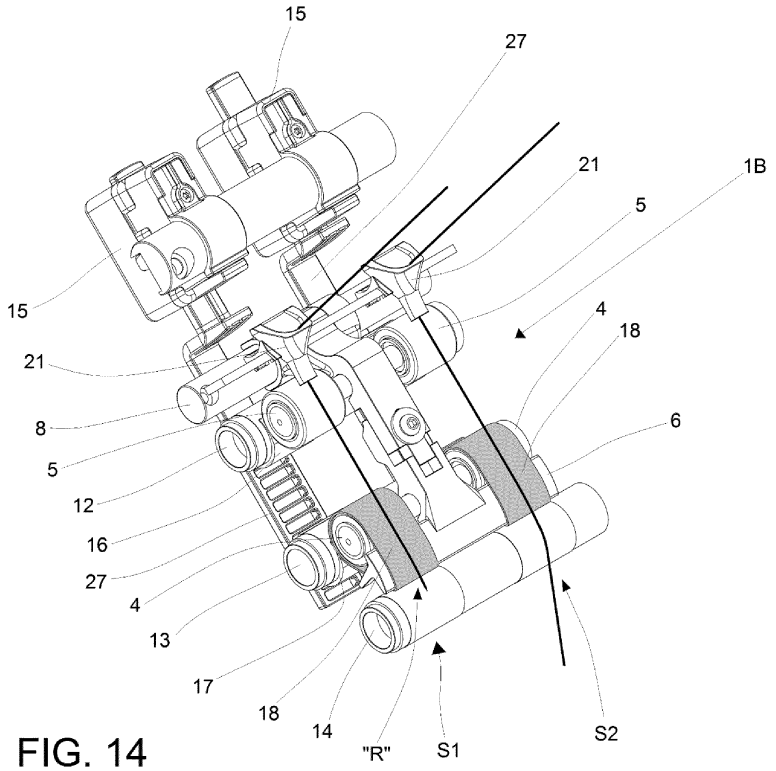

FIG. 14

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Description

[0001] The present invention generally relates to a spinning system for spinning either fancy yarn or plain yarn in a ring spinning machine. In particular, the present invention relates also to a method of spinning plain yarn o fancy yarn with the claimed spinning system.

Background of the invention

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

[0003] Existing spinning machines for manufacturing plain yarn (i.e. a yarn that combines pre-drafting and main drafting of fibres) include roving stop devices with detent elements configured to act on back drafting rollers to detent movement of back upper drafting roller upon detection of a signal coming either from a mechanical or electrical or electromagnetic sensor monitoring the breakage of yarn passing through the spindle assembly. Patent document US 4501114A discloses one of these existing spinning machines. In the active position of the detent element, the roving that is being fed is clamped between the pair of back drafting rollers whereby a roving break occurs. The broken stretch of roving keeps caught between the front pair and middle pair of drafting rollers. On restarting operation of the drafting assembly, this broken stretch of roving must be air suctioned by means of pneumatic suctioning devices arranged below the front pair of drafting rollers. The suction of air prevents the broken stretch of roving from being bundled around the bottom front roller, however suctioning devices have the drawback that entail continuous energy consumption.

[0004] The production of fancy yarn of the type that it combines the use of two types of roving or fibres of different colours or nature is known. Patent WO2015/033811 discloses a production method of fancy yarn wherein the feeding of a first type of roving and a second type of roving is operated to form a yarn that combines different blending ratios of these two types of roving. This fancy yarn production method requires the use of a drafting assembly with a middle bottom apron wrapped around a middle bottom drafting roller and an apron profile, and a back bottom apron arranged adjacent the middle bottom apron and wrapped around the back bottom drafting roller and the same apron profile. Top aprons of the same drafting assembly are wrapped around upper middle and back drafting rollers and apron cradles mounted on a top arm of the drafting assembly.

[0005] Known spinning machines for spinning fancy yarn with the method of the above-mentioned patent require special roving stop devices arranged upstream of the drafting assembly. This is because aprons wrapped around back and middle bottom drafting rollers make it difficult for the detent elements of standard roving stop devices to effectively act on the back bottom drafting rollers to stop the feed of roving.

[0006] It is known special roving stop devices arranged upstream of the drafting assembly cause a roving break at the entry of the drafting assembly so that roving ends are found at a backward position whereby reengagement becomes a manual task consuming much more time. Moreover, longer broken stretches of roving, which need to be air suctioned on restarting operation, keep held fixed between back, middle and front drafting rollers.

Description of the invention

[0007] The objective of the present invention is that of providing a spinning system for a ring spinning machine, and a method for spinning plain yarn and fancy yarn with the claimed system, that overcome the above-mentioned shortcomings.

[0008] In accordance with this objective, according to a first aspect, the present invention provides a spinning system for a ring spinning machine, comprising a drafting assembly and a device for stopping the supply of roving to said drafting assembly upon breakage of a yarn intended to be fed to a spindle assembly, characterised in that said drafting assembly comprises;

- a first drafting roller removable attached to a drafting frame of the ring spinning machine in a forward position to be able to act at a spinning position as a middle bottom drafting roller over an existing middle bottom drafting roller of said spinning machine,
- a second drafting roller removable attached to the said drafting frame in a backward position with respect said first drafting roller to be able to act at the said spinning position as a back bottom drafting roller over an existing back bottom drafting roller of said spinning machine, and
- a drafting frame of the spinning machine with a working position of the existing front bottom drafting roller, or with a working position of the existing middle and back bottom drafting rollers, configured such that said first and second drafting rollers are able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers of the spinning machine, and in that;

said roving stop device comprises means for stopping the movement of said first and second removable drafting rollers upon breakage of the yarn intended to be fed to a spindle assembly at the spinning position of said first and second drafting rollers.

[0009] In the present invention, a spinning system is provided with a drafting assembly wherein removable first and second drafting rollers are able to operate as middle and back bottom rollers over the existing bottom rollers of the ring spinning machine. Thus, middle and back bottom drafting aprons can be wrapped around

those first and second drafting rollers so that existing middle and back bottom drafting rollers keep clear of aprons to allow two detent elements of a roving stop device to act on said first and second removable drafting rollers upon breakage of a yarn to stop the supply of roving to the drafting assembly.

[0010] Thanks to the claimed features, in the active position of the roving stop device, the roving that is being fed is held fixed between the apron pair in the main drafting zone so that a roving break occurs close to the front drafting rollers. Thus, in the claimed system the roving ends are found at an easy accessible and forward position whereby reengagement can be done very easy. Besides broken stretches of roving which need to be air suctioned on restarting operation are practically inexistent so that the ring spinning machine may dispense with fibre air suctioning devices. The spinning system is particularly advantageous when spinning fancy yarn since this method of spinning supplies two adjacent strands of roving at each spinning position. Upon breakage of a yarn, the claimed system allows both adjacent roving ends to be found in the main drafting zone close to the front drafting rollers.

[0011] Preferably, said first and second drafting rollers are coupled to a roller apron support removable attached to the drafting frame of the spinning machine and, advantageously, said roller apron support includes an apron profile for at least one apron to be wrapped around said first drafting roller and/or said second drafting roller and said apron profile.

[0012] The first and second removable drafting rollers may act as middle and back bottom rollers configured for spinning either plain yarn or fancy yarn over the existing bottom rollers of the ring spinning machine when the cited removable roller support is attached to the drafting frame of the ring spinning machine. Advantageously, middle and back bottom drafting aprons wrapped around those first and second drafting rollers, when manufacturing either plain yarn or fancy yarn, can be easily replaced by removing the roller apron support while the existing bottom rollers of the drafting frame keep running.

[0013] By virtue of the presence of said removable first and second drafting rollers which are able to act as middle and back bottom rollers, the claimed system allows a roving stop device to be arranged below the drafting assembly to act on said removable first and second drafting rollers. Thus, simultaneously detention of movement of the first and second drafting rollers can take place to stop the supply of roving either when manufacturing plain yarn or fancy yarn with the same roving stop device.

[0014] According to one embodiment suitable for predrafting and drafting fibres of a roving, for example, an embodiment for manufacturing plain yarn, the claimed system comprises one drafting apron configured for drafting a pre-drafted roving, wherein said drafting apron is wrapped around said first drafting roller acting as a middle bottom drafting roller over an existing middle bottom drafting roller of said spinning machine.

[0015] This embodiment is suitable for spinning a yarn wherein a pre-drafted roving is drafted in a spinning position by means of one drafting apron wrapped around said first drafting roller and the apron profile of the roller apron support. This single drafting apron is controlled for the start and stop thereof during spinning by controlling operation of the existing middle bottom rollers of the drafting frame which are responsible for operating the first and second drafting rollers attached to the roller apron support.

[0016] According to another embodiment suitable for manufacturing fancy yarn, the claimed system comprises;

- a first drafting apron wrapped around the first drafting roller acting as a middle bottom drafting roller, wherein said first drafting apron is configured for drafting a first roving, and
- a second drafting apron wrapped adjacent to the first drafting apron around said second drafting roller acting as a back bottom drafting roller, wherein said second drafting apron is configured for drafting a second roving in the same spinning position.

[0017] This embodiment is suitable for a production method of fancy yarn as the one disclosed in patent WO2015/033811 , wherein feeding of a first type of roving and a second type of roving is operated to form a yarn that combines different sections of these two types of fibres.

[0018] According to this method of production of fancy yarn, with the claimed system a first roving is drafted by means of a first drafting apron wrapped around the first drafting roller and said apron profile, and a second roving is drafted by means of said second drafting apron wrapped around the second drafting roller and the same apron profile. The first and second aprons are controlled for the start and stop thereof during spinning by controlling the operation of the existing back and middle bottom rollers of the drafting frame so that feeding of roving is interrupted alternately to combine sections of different types of fibres in a single yarn. The existing middle and back bottom rollers are responsible for operating the first and second drafting rollers attached to the roller apron support.

[0019] By virtue of the claimed system, upon breakage of the fancy yarn, both adjacent roving ends are found at an easy accessible forward position so that reengagement can take place automatically. Besides, as previously stated, broken stretches of roving are practically inexistent so loss of fibres is extremely reduced on restarting operation so is the energy consumption of the spinning machine.

[0020] Preferably, the roller apron support wherein the first and second drafting rollers are removable coupled comprises a support arm where said first and second drafting rollers are attached, and a rear end of said support arm pivotally attached to the drafting frame of the

spinning machine.

[0021] The roller apron support may be pivotally attached to a bar of the drafting frame which is arranged behind the back bottom drafting roller so that the support arm is able to rotate from a working drafting position to an upper resting position to facilitate removing the drafting aprons.

[0022] Advantageously, the removable roller apron support is a one-piece support wherein a first portion of said piece defines the apron profile and a second portion of the same piece defines this support arm.

[0023] Preferably, the body of the apron profile of the roller apron support defines a fitting for receiving at least one drafting apron at a spinning position.

[0024] According to an embodiment suitable for the production of fancy yarn, or for the production of other type of yarn different from fancy yarn (for example, plain yarn), the support arm of the roller apron support is extendable for varying the distance between the first drafting roller and the second drafting roller attached to the support arm of the roller apron support.

[0025] In this manner, the roller apron support adapts to different distances between existing middle and back bottom rollers of the existing drafting frame. The distance between bottom drafting rollers of an existing drafting frame may be modified depending on the kind of fibres used to manufacture the yarn so as to obtain a yarn of maximum quality.

[0026] According to an embodiment particularly suitable for the production of fancy yarn, the claimed system preferably comprises;

- a first fibre condenser component removably attached to the roller apron support so that it remains located between said first drafting roller and said second drafting roller for receiving a first bundle of fibres at a spinning position, and advantageously, it also comprises;
- an apron guiding component removably attached to the roller apron support so that it remains located between said first drafting roller and said second drafting roller, for guiding the second drafting apron at a spinning position.

[0027] The claimed spinning system has the advantage that allows most of the components needed for the production of fancy yarn to be removably attached to the roller apron support, which in turn is also removably attached to the drafting frame. Thus, handling drafting components is easier and maintenance works consume much less time.

[0028] Optionally, the claimed system comprises at least one second fibre condenser component removably attached to the roller apron support so that it remains located behind the second removable drafting roller at a spinning position.

[0029] This second fibre condenser component may be attached to the roller apron support by means of a bar that is removably attached to the back end of the roller apron support. This second fibre condenser component helps joining fibres of a bundle entering the drafting assembly.

[0030] According to the aforesaid embodiment suitable for spinning fancy yarn, preferably, the first removable drafting roller comprises a first roller portion with a recess for receiving the first drafting apron for drafting the first roving, and the second removable drafting roller also comprises a first roller portion with a recess for receiving the second drafting apron for drafting the second roving at the same spinning position.

[0031] Advantageously, each of said first and second drafting rollers comprises a first roller portion of greater radius provided with the cited recess for receiving and guiding one drafting apron, and a second roller portion of smaller radius. Thanks to these features, adjacent drafting aprons remain in a correct and optimum working position without the risk one drafting apron overlaps the other.

[0032] Preferably, the drafting assembly of the claimed system comprises a drafting frame wherein the working position of the existing front bottom drafting rollers is configured for said first and second drafting rollers to be able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers by means of a raiser. This raiser is arranged to raise the working position of the existing front bottom drafting roller for said existing front bottom drafting roller to be able to receive a roving coming from said first and/or second drafting rollers. Alternatively, the working position of the existing middle and back bottom drafting rollers can be modified to a lower position whereas the working position of the existing front bottom drafting roller is not modified.

[0033] The use of a raiser has the advantage that allows the working position of the existing front roller to be easily adapted to receive bundles of fibres coming from the removable first and second drafting rollers mounted on the roller apron support. In this manner, the working position of the existing back and middle bottom drafting rollers does not need to be modified to a lower position, nor the corresponding actuation and transmission mechanisms.

[0034] For a preferred embodiment, the drafting assembly of the claimed system is suitable for working two adjacent spinning positions with a common removable roller apron support. Said drafting assembly comprises;

- a pair of first removable drafting rollers for a pair of adjacent spinning positions of said ring spinning machine, said pair of first drafting rollers being coupled, preferably removable coupled, to said roller apron support in a forward position to be able to act on each spinning position as middle bottom drafting rollers over existing middle bottom rollers of said ring spinning machine,
- a pair of second removable drafting rollers for said pair of adjacent spinning positions of said ring spin-

ning machine, said pair of second drafting rollers being coupled, preferably removable coupled, to said same roller apron support in a backward position with respect the pair of first drafting rollers to be able to act on each spinning position as back bottom drafting rollers over existing back bottom rollers of said ring spinning machine, and

- an apron profile of the roller apron support dimensioned to extend between said adjacent spinning positions, for at least one drafting apron to be wrapped around one of said first drafting rollers and/or one of said second drafting rollers on each of said adjacent spinning positions.

[0035] For this preferred embodiment, the support arm of the roller apron support is arranged centred between each pair of said first and second removable drafting rollers, and advantageously, the apron profile is dimensioned to extend between two adjacent spinning positions.

[0036] As regards the roving stop device, preferably, the means for stopping the movement of the first and second removable drafting rollers comprise;

- a first detent element arranged to be able to act, in an active position, on the first removable drafting roller to stop the supply of roving,
- a second detent element arranged to be able to act, in an active position, on the existing back bottom drafting roller to stop the supply of roving and,
- means for activating the displacement of said first and second detent elements to its active positions upon breakage of the yarn intended to be fed to a spindle assembly at the spinning position of said first and second drafting rollers.

[0037] According to one embodiment, said first and second detent elements are configured as a wedge arranged to be inserted, in its active position, between an existing middle or back bottom drafting roller and its corresponding first or second drafting roller, to stop the supply of roving upon breakage of the yarn.

[0038] The existing middle and back bottom drafting rollers operate as drive rollers. In its active position the wedge is inserted to raise the first or second drafting roller so that said first and second removable drafting rollers can loss transmission of movement from the driver rollers to detent the supply of roving.

[0039] Preferably, said means for activating the displacement of said first and second detent elements comprise a slide arranged to cooperate with a trigger activating the displacement of said slide upon breakage of the yarn.

[0040] Advantageously, the first and second detent elements are articulately attached to said slide so that upon the trigger activates the movement of the slide said first and second detent elements rotate to its active position in which these detent elements become inserted between the existing middle and back bottom drafting rollers and its corresponding first and second removable drafting roller.

[0041] Again preferably, said means for activating the displacement of said first and second detent elements to its active positions comprise process and control means for detecting a signal coming from an optical sensor arranged to detect absence or change of movement of the spindle upon breakage of the yarn intended to be fed to said spindle at a spinning position.

[0042] It is know that once drafted, the roving 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 the spindle. From here the thread is attached to the existing thread 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 is arranged to detect absence or change of movement of the traveller upon breakage of the yarn. For a preferred embodiment, the optical sensor comprises a light emitter (for example a LED) and a light receiver (for example a photo-transistor) configured to receive light reflected from the traveller to detect movement of said traveller along the ring arranged coaxially the spindle. Advantageously, the optical sensor is arranged within a casing integrated within a support, the light emitter and light receiver protruding from the support to detect movement of the traveller.

[0043] According to a second aspect, the present invention provides a method of spinning plain yarn with the claimed system, comprising the steps of;

a) drafting a pre-drafted roving by means of one drafting apron wrapped around the first removable drafting roller of the drafting assembly,
b) simultaneously stopping, by means of the roving stop device, the movement of the first and second removable drafting rollers upon breakage of the plain yarn intended to be fed to a spindle assembly at the spinning position of said first drafting roller, and
c) resuming movement of said first and second removable drafting rollers upon reengagement of the plain yarn, wherein said step c) is carried out without air suctioning broken stretches of roving.

[0044] According to a third aspect, the present invention provides a method of spinning fancy yarn comprising the steps of;

a) drafting a first roving by means of the first drafting apron wrapped around the first removable drafting roller of the drafting assembly,
b) drafting a second roving by means of the second drafting apron wrapped around the second removable drafting roller of the drafting assembly, and
c) simultaneously stopping, by means of the roving

stop device, the movement of said first and second removable drafting rollers upon breakage of the fancy yarn intended to be fed to a spindle assembly at the spinning position of said first and second drafting rollers.

d) resuming movement of said first and second removable drafting rollers upon reengagement of the fancy yarn, wherein said step d) is carried out without air suctioning broken stretches of roving.

[0045] Reengagement involves manually engaging the end of the yarn onto the front drafting rollers for the end of the yarn to re-join the roving ends upon resuming movement of the first and second removable drafting rollers. Movement of these first and second drafting rollers is resumed by reloading the roving stop device so that the first and second detent elements and the slide are displaced to a rest position.

[0046] The present invention provides a method of spinning eitherfancy yarn or plain yarn by using roving stop devices to monitor the breakage of roving. The method dispenses with the use of fibre air suctioning devices. As a matter of fact, broken stretches of roving are practically inexistent with the claimed system so that there is no need of air suctioning devices to suction these broken stretches of roving.

[0047] According to a fourth aspect, the present invention provides a drafting kit for drafting fibres of a fancy yarn on a ring spinning machine, that in a characteristic manner comprises;

- a removable roller apron support configured for drafting fancy yarn at two adjacent spinning positions S1, S2,
- an apron profile attached to said removable roller apron support and dimensioned to extend between said adjacent spinning positions S1, S2,
- a pair of first removable drafting rollers for a pair of adjacent spinning positions S1, S2 of said ring spinning machine, said pair of first drafting rollers being removably coupled to said apron support in a forward position to be able to act at each spinning position S1, S2 as middle bottom drafting rollers over the existing middle bottom rollers of said ring spinning machine,
- a pair of second removable drafting rollers for said pair of adjacent spinning positions S1, S2 of said ring spinning machine, said pair of second drafting rollers being removably coupled to said same roller apron support in a backward position with respect the pair of first drafting rollers to be able to act at each spinning position S1, S2 as back bottom drafting rollers over the existing back bottom rollers of said ring spinning machine, and
- two pairs of first and second drafting aprons for drafting fibres at two spinning position S1 or S2, wherein each pair of first and second drafting aprons includes a first drafting apron configured for drafting a first roving when wrapped around one of said first drafting rollers and said apron profile, and a second drafting apron configured for drafting a second roving when wrapped, adjacent to the first drafting apron, around one of said second drafting rollers and the same apron profile.

[0048] This drafting kit constitutes in itself a claimable aspect of the present invention that can obtain independent protection. This drafting kit permits an existing drafting frame to be easily adapted to a method of production of fancy yarn at a lower cost. Besides, the maintenance operations such as the replacing of bottom drafting aprons can be done very easily whereas the drafting frame keeps running. Additionally, handling of components necessary for drafting fibres is extremely reduced. Indeed, this drafting kit allows the existing drafting frame to dispense with fixed attachments for fibre condensers.

[0049] Preferably, the above-mentioned drafting kit comprises;

- at least a first fibre condenser component removably attached to the roller apron support so that it remains located between one of said first removable drafting rollers and one of said second removable drafting rollers for receiving a first bundle of fibres at a spinning position, and advantageously, it also comprises;
- at least an apron guiding component removably attached to the roller apron support so that it remains located between one of said first removable drafting rollers and one of said second removable drafting rollers for guiding the second drafting apron at a spinning position.

[0050] Optionally, the drafting kit further comprises at least one fibre condenser component removably attached to the roller apron support behind one of said second removable drafting rollers.

[0051] According to one embodiment, said fibre condenser and apron guiding components are attached to the removable apron support by means of a bar susceptible to be attached to a roller support arm of the roller apron support.

[0052] Preferably, the body of the apron profile comprises a fitting for receiving both the first and second drafting aprons and, advantageously, said first and second removable drafting rollers each comprise a first portion of greater radius and a second portion of smaller radius, the first portion of greater radius including a recess for receiving one of said first or second drafting aprons.

[0053] According to a fifth aspect, the present invention provides a drafting kit for drafting fibres of a plain yarn on a ring spinning machine, that in a characteristic manner comprises;

- a removable roller apron support configured for drafting plan yarn at two adjacent spinning positions S1,

S2,

- an apron profile attached to said removable roller apron support and dimensioned to extend between said adjacent spinning positions,
- a pair of first removable drafting rollers for a pair of adjacent spinning positions S1, S2 of said ring spinning machine, said pair of first drafting rollers being removably coupled to said apron support in a forward position to be able to act at each spinning position S1, S2 as middle bottom drafting rollers over the existing middle bottom rollers of said ring spinning machine,
- a pair of second removable drafting rollers for said pair of adjacent spinning positions S1, S2 of said ring spinning machine, said pair of second drafting rollers being removably coupled to said same roller apron support in a backward position with respect the pair of first removable drafting rollers to be able to act at each spinning position S1, S2 as back bottom drafting rollers over the existing back bottom rollers of said ring spinning machine, and
- a pair of drafting aprons for said adjacent spinning positions S1, S2, wherein each one of said drafting aprons is configured for drafting at least one pre-drafted roving when wrapped around one of said first removable drafting rollers and said apron profile.

[0054] This drafting kit constitutes in itself a claimable aspect of the present invention that can obtain independent protection. This drafting kit permits an existing drafting frame to be easily adapted to a method of production of plain yarn at a lower cost. Besides, the maintenance operations such as the replacing of bottom drafting aprons can be done very easily whereas the drafting frame keeps running.

[0055] Preferably, each of said drafting kits includes a raiser configured to be able to raise the working position of an existing front bottom drafting roller of said ring spinning machine for said existing front bottom drafting roller to be able to receive when in its raised working position, at least a bundle of fibres coming from said first and/or second removable drafting rollers mounted on said removable roller apron support.

[0056] The present invention provides a claimed system wherein the existing drafting assembly is easily and quickly made compatible with different methods of production of yarn by means of the above-mentioned drafting kits. For example, the existing drafting assembly may be used either to produce a fancy yarn combining different sections of different roving or to produce plain yarn (i.e. a yarn that combines pre-drafting and main drafting of fibres).

[0057] Despite the fact that in this description reference has been made to a claimed system that refers to a drafting assembly and a roving stop device in combination, it is necessary to highlight that the drafting assembly is in itself also a claimable aspect of the claimed system that can obtain independent protection. In this sense, according to a sixth claimable aspect the present invention a drafting assembly for a ring spinning machine is provided wherein said drafting assembly comprises a roller apron support removably attached to the drafting frame of the ring spinning machine and, in a characteristic manner;

- a first drafting roller coupled to said removable roller apron support in a forward position to be able to act at a spinning position as a middle bottom drafting roller over an existing middle bottom drafting roller of said ring spinning machine,
- a second drafting roller coupled to said removable roller apron support in a backward position with respect to said first drafting roller to be able to act at the said spinning position as a back bottom drafting roller over an existing back bottom drafting roller of said ring spinning machine,
- an apron profile attached to said removable roller apron support for at least one drafting apron to be wrapped around said first removable drafting roller and/or said second removable drafting roller at a spinning position, and
- a drafting frame of the spinning machine with a working position of the existing front bottom drafting roller, or with a working position of the existing middle and back bottom drafting rollers, configured such that said first and second removable drafting rollers are able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers of the spinning machine.

[0058] By virtue of the presence of said removable first and second drafting rollers which are able to act as middle and back bottom rollers at a spinning position of the ring spinning machine, this drafting assembly is easily and quickly made compatible with different methods of production of yarn. For example, the claimed drafting assembly may be used either to produce a fancy yarn combining different sections of different bundles of fibres or to produce plain yarn (i.e. a yarn that combines pre-drafting and main drafting of fibres). This is because either the first and second removable drafting rollers, or the drafting aprons wrapped around said drafting rollers, may be easily replaced depending on the type of spinning method.

[0059] For a preferred embodiment suitable for working two adjacent spinning positions S1, S2 with a common removable roller apron support, the claimed drafting assembly comprises;

- a pair of first drafting rollers for a pair of adjacent spinning positions S1, S2 of said ring spinning machine, said pair of first drafting rollers being coupled to said roller apron support in a forward position to be able to act on each spinning position S1, S2 as middle bottom drafting rollers over existing middle bottom rollers of said ring spinning machine,
- a pair of second drafting rollers for said pair of adja-

cent spinning positions S1, S2 of said ring spinning machine, said pair of second drafting rollers being coupled to said same roller apron support in a backward position with respect the pair of first drafting rollers to be able to act on each spinning position S1, S2 as back bottom drafting rollers over existing back bottom rollers of said ring spinning machine,

- wherein said apron profile is dimensioned to extend between said adjacent spinning positions S1, S2, for at least one drafting apron to be wrapped around one of said first drafting rollers and/or one of said second drafting rollers on each of said adjacent spinning positions S1, S2, and
- a drafting frame of the spinning machine with a working position of the existing front bottom drafting roller, or with a working position of the existing middle and back bottom drafting rollers, configured such that said first and second removable drafting rollers are able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers of the spinning machine.

[0060] In the present invention;
Fancy yarn shall be understood to be yarn formed from a first type of bundle of fibres and a second type of bundle of fibres, said first type of bundle of fibres being, for example, a bundle selected from among natural, artificial or synthetic fibres, and said second type of bundle of fibres being, for example, a bundle selected from among natural, artificial or synthetic fibres.

[0061] Yarn different from Fancy yarn, or Plain yarn, 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.

[0062] Pre-drafting shall be understood to mean a drafting that takes place in between the back and the middle rollers. Main drafting shall be understood to mean a drafting that takes place in between the middle and the front rollers. Pre-drafting is necessary for ensuring quality of a yarn when this yarn is manufactured at each spinning position with a single drafting apron wrapped around a bottom middle roller.

[0063] Apron shall be understood to be an endless belt made from rubber or any other suitable material. The apron helps in guiding the fibres from one drafting roller pair to other drafting roller pair of a drafting assembly.

Brief description of the drawings

[0064] 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;

Figures 1 to 4 refer to a drafting kit for drafting fibres of fancy yarn to be used in the claimed system.
Figures 5 to 6 refer to a drafting kit for drafting fibres of plain yarn to be used in the claimed system.
Figures 7 to 9 refer to a drafting assembly for drafting fibres of fancy yarn to be used in the claimed system.
Figures 10 to 12 refer to a drafting assembly for drafting fibres of plain yarn to be used in the claimed system.
Figures 13 and 14 refer to an embodiment of the claimed spinning system for manufacturing plain yarn.
Figures 15 and 16 refer to an embodiment of the claimed spinning system for manufacturing fancy yarn.
Figure 17 refer to a roving stop device to be used in the claimed system.
Figures 18 and 19 refer to prior art drafting assemblies suitable for manufacturing fancy yarn and plain yarn, respectively.

[0065] In detail:

Figure 1 shows an isometric view of a drafting kit for manufacturing fancy yarn at two adjacent spinning positions of a spinning machine.
Figure 2 shows a plan view of the drafting kit of figure 1.
Figures 3 and 4 show upper and lower perspective views of the drafting kit of figure 1 wherein the drafting aprons are not depicted.
Figure 5 shows an isometric perspective view of a drafting kit for manufacturing plain yarn at two spinning positions of a spinning machine. This drafting kit includes a roller apron support with an extendable support arm.
Figure 6 shows a plan view of the removable apron support of figure 5.
Figure 7 shows an isometric view of a drafting assembly for a ring spinning machine wherein drafting kits for manufacturing fancy yarn according to figures 1 to 4 have been coupled over the existing drafting frame. For the sake of clarity top arm of the drafting frame bearing the upper drafting rollers is not shown.
Figure 8 shows a side view of the drafting assembly of figure 7.
Figure 9 shows a side view of the drafting assembly of figure 7 wherein a drafting kit for manufacturing fancy yarn is shown in an upper position suitable for allowing replacement of the drafting aprons.
Figure 10 shows an isometric view of a drafting assembly for a ring spinning machine wherein drafting kits for manufacturing plain yarn according to figures 5 and 6 have been coupled over the existing drafting frame. For the sake of clarity top arm of the drafting frame bearing the upper drafting rollers is not shown.
Figure 11 shows a side view of the drafting assembly of figure 10.
Figure 12 shows a side view of the drafting assembly of figure 10 wherein a drafting kit for manufacturing

plain yarn is shown in an upper position suitable for allowing replacement of the drafting aprons.

Figure 13 is a schematic representation of an embodiment of the claimed system suitable for the production of plain yarn wherein it shows a schematic side view of a drafting assembly including a drafting kit for manufacturing plain yarn coupled over the existing drafting frame, and a roving stop device arranged below the drafting frame. For the sake of clarity this figure does not show the raiser to modify the working position of the existing front bottom drafting roller.

Figure 14 is a schematic representation of the embodiment of figure 13 wherein it shows an isometric view of the drafting and spindle assembly at two adjacent spinning positions S1, S2 with passage of one roving at each spinning position. For the sake of clarity top arm bearing the upper drafting rollers of the drafting assembly is not depicted.

Figure 15 is a schematic representation of an embodiment of the claimed system suitable for the production of fancy yarn wherein it shows a side view of the drafting assembly including a drafting kit for manufacturing fancy yarn coupled over the existing drafting frame, and a roving stop device arranged below the drafting frame. For the sake of clarity this figure does not show the raiser to modify the working position of the existing front bottom drafting roller.

Figure 16 is a schematic representation of the embodiment of figure 15 wherein it shows an isometric view of the drafting and spindle assembly at two adjacent spinning positions S1, S2 with passage of a first and second roving at each spinning position. For the sake of clarity top arm bearing the upper drafting rollers of the drafting assembly has not been depicted.

Figure 17 shows an isometric view of the roving stop device of figures 13 to 16.

Figure 18 shows an isometric view of a spindle assembly incorporating an optical sensor for detecting absence or change of movement of the traveller upon breakage of the yarn.

Figure 19 shows in a schematic manner a prior art drafting assembly for manufacturing fancy yarn.

Figure 20 shows in a schematic manner a prior art drafting assembly for manufacturing plain yarn.

Description of preferred embodiments

[0066] Following is a description of the claimed system of the present with reference to drawings of figures 1 to 18. Figures 19 and 20 belong to prior art spinning systems.

[0067] Figures 1 to 6 show perspective and plan views of drafting kits 1A, 1B for using on the claimed spinning system either for manufacturing fancy yarn or for manufacturing plain yarn.

[0068] These drafting kits 1A, 1B include a removable roller apron support 2 with a support arm 3 which is arranged centred on the roller apron support 2 between a pair of first drafting rollers 4 and a pair of second drafting rollers 5. An apron profile 6 is attached to the roller apron support 2 and is dimensioned to be able to extend between two adjacent spinning positions S1, S2 of the ring spinning machine.

[0069] As can be seen on figures 1 to 6, the pair of first removable drafting rollers 4 are coupled on the roller apron support 2 in a forward position whereas the pair of second removable drafting rollers 5 are coupled in a backward position with respect to said first drafting rollers 4. Both said first and second removable drafting rollers 4, 5 are mounted such as to be able to act at each spinning position S1, S2 as middle and back bottom drafting rollers over the existing middle and back bottom rollers 12, 13 of the ring spinning machine (see also figures of figures 8, 9 and 11, 12).

[0070] The rear end 3a of the support arm 3 of the roller apron support 2 of each drafting kit 1A, 1B is configured so as to be able to rotate attached to a bar 8 of the drafting frame 7 of the ring spinning machine. In particular, this rear end 3a is configured such that it can be laterally displaced on the bar 8 of the drafting frame 7. In this manner, the drafting kits 1A, 1B may be easily positioned to match with the middle and back upper drafting rollers 32, 33 of a top arm of the existing drafting frame 7 of the ring spinning machine.

[0071] As previously described, the claimed system has the particularity that the drafting frame 7 of the drafting assembly is modified such that the working position of the existing front bottom drafting rollers 14, or the working position of the existing middle and back bottom drafting rollers 12, 13, is configured for said first and second removable drafting rollers 4, 5 of the drafting kits 1A, 1B to be able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers 12, 13.

[0072] For a preferred embodiment of the claimed system, the drafting assembly includes a raiser 9 configured to be able to raise the working position of an existing front bottom drafting roller 14 for said existing front bottom drafting roller 14 to be able to receive at least a roving coming from said first and/or second removable drafting rollers 4, 5 mounted on the roller support apron 2 of the drafting kits 1A, 1B. Alternatively, according to another embodiment, the working position of the existing middle and back bottom drafting rollers 12, 13 may be modified to a lower position whereas the working position of the existing front bottom drafting roller 14 is not modified.

[0073] Figures 1 to 4 represent a drafting kit 1A for using on an embodiment of the spinning system suitable for manufacturing fancy yarn (i.e., a yarn that combines different bundles of fibres in each single spinning position S1, S2). This drafting kit 1A includes a roller apron support 2 with a first drafting apron 10a configured for drafting a first roving when wrapped around a first drafting roller 4 and the apron profile 6, and a second drafting apron

10b configured for drafting a second roving when wrapped around a second drafting roller 5 and the same apron profile 6, adjacent the first drafting apron 10a. Those first and second drafting aprons 10a, 10b are controlled for the start and the stop thereof during spinning by controlling the operation of the existing middle and back bottom drafting rollers 12, 13 of the drafting frame 7 so that feeding of roving is interrupted alternately to combine sections of different types of fibres in a single yarn.

[0074] According to a method of production of fancy yarn which preferably employs pneumatic devices 35 for compacting fibres coming at the outlet of the drafting aprons 10a, 10b, the claimed system includes, at each spinning position S1, S2;

- an apron guiding component 19 removably attached to the roller apron support 2 of the drafting kit 1A so that it remains located between the first and second removable drafting rollers 4, 5 to guide the driving of one of those second drafting aprons 10b,
- a first fibre condenser component 20 removably attached to the roller apron support 2 of the drafting kit 1A so that it remains located between the first and second drafting rollers 4, 5 to receive a first roving,
- two second fibre condenser components 21 removably attached to the roller apron support 2 of the drafting kit 1A so that they remain located behind the second drafting rollers 5 to help joining fibres of first and second rovings when entering the drafting assembly, and
- an apron tension component 23 removable attached to the roller apron support 2 of the drafting kit 1A.

[0075] As per the apron guiding component 19 and the first and second fibre condenser components 20, 21, these components may be attached to the roller apron support 2 by means of bars 22 which are secured to the support arm 3 wherein the first and second drafting rollers 4, 5 are attached.

[0076] As stated, the claimed system has the advantage that most of the components needed for the production of fancy yarn are removably attached to a roller apron support 2 of the drafting kit 1A, which in turn is also pivotally attached to the drafting frame 7 of the ring spinning machine. In this manner, handling drafting components is easier and maintenance works consume much less time.

[0077] Figures 3 and 4 show upper and lower perspective views of a roller apron support 2 of the drafting kit 1A comprising an apron profile 6 whose body defines fittings 24 for receiving and guiding the first and second drafting aprons 10a, 10b (which have not been represented on these figures 3, 4). It can be observed that the first and second removable drafting rollers 4, 5 are provided with first roller portions 4a, 5a of greater radius including recesses 25 for receiving and guiding in an optimum manner the first and second drafting aprons 10a, 10b of the drafting kit 1A for manufacturing fancy yarn.

[0078] Figures 5 and 6 show a drafting kit 1B suitable for producing a yarn different from fancy yarn, or a plain yarn, according to a method of production that includes pre-drafting and main drafting of at least a bundle of fibres at each spinning position S1, S2. This embodiment includes a single drafting apron 18 configured for main drafting a roving when wrapped around a first drafting roller 4 and the apron profile 6. At each spinning position S1, S2, the single drafting apron 18 is controlled for the start and the stop by controlling the operation of the existing middle 13 bottom roller of the drafting frame 7 of the ring spinning machine.

[0079] As it is shown in figures 5, 6 and in figures 10 to 12, preferably, the roller apron support 2 of the drafting kit 1B includes an extendable support arm 3 for varying the distance between the first and second removable drafting rollers 4, 5 which are arranged over the existing middle and back drafting rollers of the drafting frame 7. In this manner, the claimed drafting kit 1B adapts to the production of different types of plain yarns which require the distance between middle and back drafting rollers 12, 13, to be modified depending on the kind of fibres used to manufacture those plain yarns.

[0080] As stated in the description, conventional drafting frames does need the provision of an important number of attachments to support drafting aprons, fibre condensers and guiding components in between the reduced space left by the existing drafting rollers of the drafting frame. The claimed system has the advantage that drafting kits 1A, 1B drastically improve handling of components necessary for drafting roving either for the production of fancy yarn or plain yarn in a ring spinning machine. In particular, the drafting kits 1A, 1B help reducing the time used to replace drafting aprons during maintenance operations. To this end, the roller apron support 2 is rotated to an upper position to facilitate changing the drafting aprons 10a, 10b, 18 while the existing bottom drafting rollers, 12, 13 keep running (see, figures 7, 9, 10, 12).

[0081] Depending of the type of yarn to be produced with the claimed system, either the drafting kit 1A or the drafting kit 1B is coupled to the drafting frame 7 at spinning positions S1, S2 and roving is fed to the drafting aprons 10a, 10b or 18. Operation of the drafting aprons 10a, 10b, 18 is controlled by the middle and back existing bottom rollers 12, 13 acting on drafting aprons 10a, 10b, 18. These drafting aprons 10a, 10b, 18 may be easily replaced in case of failure without the need for the existing bottom rollers 12, 13 to stop running.

[0082] The claimed system allows to monitor the breakage of either fancy yarn or plain yarn by means of roving stop devices 15 arranged below the drafting assembly, at each spinning position S1, S2. Each roving stop device 15 includes means for stopping the movement of the first and second removable drafting rollers 4, 5 upon breakage of the yarn intended to be fed to the corresponding spindle assembly 26.

[0083] According to a preferred embodiment, said means for stopping the movement of the first and second removable drafting rollers 4, 5 include;

- a first detent element 16 arranged to be able to act, in an active position, on the first removable drafting roller 4 to stop the supply of roving,
- a second detent element 17 arranged to be able to act, in an active position, on the second removable drafting roller 5 to stop the supply of roving and,
- a means for activating the displacement of said first and second detent elements 16, 17 to its active positions upon breakage of the yarn intended to be fed to the corresponding spindle assembly 26.

[0084] As can be seen on figure 17, the first and second detent elements 16, 17 are configured as a wedge arranged to be inserted, in its active position, between an existing middle or back bottom drafting roller 12, 13 and its corresponding first or second drafting roller 4, 5, to stop the supply of roving upon breakage of the yarn. Both wedges are articulately attached to a slide 27 which is arranged to cooperate with a trigger (not shown) responsible for activating the displacement of said slide 27 upon breakage of the yarn.

[0085] Upon the trigger activates the movement of the slide 27, the first and second detent elements 16, 17 rotate to its active position in which these detent elements 16, 17 become inserted between the existing middle and back bottom drafting rollers 12, 13 and its corresponding first and second removable drafting rollers 4, 5 of the corresponding drafting kit 1A, 1B.

[0086] Both detent elements 16, 17 are configured as a wedge to be inserted to raise the first or second removable drafting rollers 4, 5 so that said first and second removable drafting rollers 4, 5 can loss transmission of movement from the driver rollers to detent the supply of roving (the existing middle and back bottom drafting rollers 12, 13 operate as drive rollers).

[0087] To activate the trigger responsible for activating the slide 27 and its corresponding wedges, the roving stop device 15 comprise means for detecting a signal coming from an optical sensor 28 arranged close to the spindle assembly 26 so as to detect movement of a traveller 29 and to output a signal of absence or change of movement of the traveller 29 upon breakage of a yarn.

[0088] It is know that once drafted, the roving or yarn passes down to the spindle assembly 26, where it is threaded through a small ring called the traveller 29. The traveller 29 moves along a ring 30 arranged coaxially a spindle 31. From here the yarn is attached to the existing yarn on the spindle 31. The traveller 29 and the spindle 31 share the same axis but rotate at different speeds. The spindle 31 is driven and the traveller 29 drags behind thus distributing the rotation between winding up on the spindle 31 and twist into the yarn.

[0089] The cited optical sensor 28 controls continuously the status and RPM of each spinning position, and the data collected from the optical sensor 28 is delivered to a monitoring software that sends an activating signal to the roving stop device 15. The optical sensor 28 has the advantage that provides superfast detection and communication because it allows to detect the breakages of yarn in less than 1 second so as to activate the roving stop device 15 instantaneously.

[0090] Figures 13 to 16 show isometric and side views of the drafting assembly and roving stop device 15 of the claimed system at two adjacent spinning positions S1, S2, with passage of one roving at each spinning position for the production of either plain yarn or fancy yarn. The detent elements 16, 17 of the roving stop device are shown in an active position in one of the spinning positions S1 so that a roving breakage is shown in the main drafting zone close to the drafting aprons of the drafting assembly.

[0091] As previously described, once the first and second detent elements 16, 17 are activated, the supply of roving is stopped and a roving break occurs on the main drafting zone close to the drafting aprons of the drafting assembly. As can be seen in figures 14 and 16, the roving ends "R" are found at an easy accessible and forward position whereby reengagement can be done very easy and with practically inexistent broken stretches of roving to be air suctioned on restarting operation. Therefore, energy consumption of spinning system may be much lower.

[0092] Particularly advantageous is the application of the system to the method of spinning of fancy yarn since this method supplies two adjacent strands of roving at each spinning position. Upon breakage of the yarn intended to be fed to the spinning assembly 26, the claimed system allows both adjacent roving ends "R" to be found in the main drafting zone close to the drafting aprons 10a, 10b of the first and second removable drafting rollers 4, 5 and the upper drafting aprons of the drafting rollers 32, 33 of the top arm (see, figure 16).

[0093] As a matter of fact, the claimed system has the advantage that middle and back bottom drafting aprons 10a, 10b can be wrapped around those first and second removable drafting rollers 4, 5 so that existing middle and back bottom drafting rollers 12, 13 keep clear of aprons for the two detent elements 16, 17 of the roving stop device 15 to act on the first and second removable drafting rollers 4, 5 to stop the supply of roving.

[0094] Figure 19 show a prior art spinning system for spinning fancy yarn wherein drafting aprons 10a' and 10b' are wrapped around the existing middle and back drafting rollers 12, 13 making it difficult for standard roving stop devices to act on the upper back drafting rollers to stop the supply of roving. Thus, special roving stop devices must be used to stop the supply of roving at the entry of the drafting assembly whereby the roving break occurs at the entry of the drafting assembly. As a result, long broken stretches of roving keep held fixed in between the back, middle and front drafting rollers 12, 13, 14 so that air suctioning devices 34 must be used to avoid

these broken stretches to be bundled around the front bottom drafting roller 14 upon restarting operation.

[0095] Figure 20 show a prior art spinning system for spinning plain yarn wherein drafting aprons 18 are wrapped around the existing middle drafting rollers 13. In this case, standard roving stop devices may be used to act on the upper back drafting rollers to stop the supply of roving. Nevertheless, the standard roving stop devices stop the supply in the pre-drafting zone whereby the roving break occurs between back and middle drafting rollers 12, 13. As a result, broken stretches of roving keep held fixed in between the existing middle and front drafting rollers 13, 14 so that fibre air suctioning devices 34 must be used to avoid these broken stretches to be bundled around the front bottom drafting roller 14 upon restarting operation.

[0096] Surprisingly, the claimed system may be used for spinning either plain yarn or fancy yarn without the ring spinning machine operating with air fibre suction devices 34. Moreover, the present invention provides drafting kits 1A, 1B which may be used to easily switch between producing plain yarn to fancy yarn, or vice-versa. Additionally, with the claimed system, drafting aprons 10a, 10b, 18 may be easily replaced in case of failure by pivoting the drafting kits 1A, 1B onto the drafting frame 7 to access to the first and second removable drafting rollers 4, 5. A further advantage of the claimed system is that operation of drafting aprons 10a, 10b, 18 on the first and second drafting rollers 4, 5 is carried out by applying a force torque to the existing bottom rollers 12, 13 lower than in the case of conventional drafting assemblies because these bottom rollers 12, 13 do not bear drafting aprons.

[0097] 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 of drafting assembly 1 wherein the working position of the existing front roller 14 of the drafting frame 7 is modified by means of a raiser 9, it would be possible to provide another embodiment of drafting assembly 1 wherein the working position of the existing middle and back bottom drafting rollers 12, 13 is modified to a lower position while the existing working position of the front bottom roller 14 remains unchanged. The claimed drafting kits 1A, 1B would be suitable for both embodiments. Likewise, although a particular embodiment of roving stope device has been described, other embodiments of roving stop devices would be suitable for stopping the movement of the first and second removable drafting rollers 4, 5 upon breakage of the yarn.

Claims

1. A spinning system for a ring spinning machine, comprising a drafting assembly and a device (15) for stopping the supply of roving to the drafting assembly upon breakage of a yarn intended to be fed to a spindle assembly (26), **characterised in that** said drafting assembly comprises;

   - a first removable drafting roller (4) attached to a drafting frame (7) of the ring spinning machine in a forward position to be able to act at a spinning position (S1, S2) as a middle bottom drafting roller over an existing middle bottom drafting roller (12) of said spinning machine,
   - a second removable drafting roller (5) attached to the said drafting frame (7) in a backward position with respect said first removable drafting roller (4) to be able to act at the said spinning position (S1, S2) as a back bottom drafting roller over an existing back bottom drafting roller (12) of said spinning machine, and
   - the drafting frame (7) of the spinning machine with a working position of the existing front bottom drafting roller (14), or a working position of the existing middle and back bottom drafting rollers (12, 13), configured such that said first and second removable drafting rollers (4, 5) are able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers (12, 13) of the spinning machine, and **characterised in that**;

   the roving stop device comprises means (16, 17, 27, 28) for stopping movement of said first and second removable bottom drafting rollers (4, 5) upon breakage of yarn at the spinning position (S1, S2) of said first and second removable drafting rollers (4, 5).

2. A system according to claim 1, wherein said first and second removable drafting rollers (4, 5) are coupled to a roller apron support (2) removable attached to the drafting frame (7) of the spinning machine.

3. A system according to any of claims 1 to 2, wherein it comprises one drafting apron (18) configured for drafting a pre-drafted roving, said drafting apron (18) being wrapped around said first removable drafting roller (4) acting as a middle bottom drafting roller over an existing middle bottom drafting roller (13) of said spinning machine.

4. A system according to any of claims 1 to 2, wherein it comprises;

   - a first drafting apron (10a) wrapped around the first removable drafting roller (4) acting as a middle bottom drafting roller, said first drafting apron (10a) being configured for drafting a first roving, and
   - a second drafting apron (10b) wrapped adjacent to the first drafting apron (10a) around said

second drafting roller (5) acting as a back bottom drafting roller, said second drafting apron (10b) being configured for drafting a second roving at the same spinning position (S1, S2).

5. A system according to claim 2, wherein said removable roller apron support (2) comprises a support arm (3) where said first and second removable drafting rollers (4, 5) are attached, and wherein a rear end (3a) of said support arm (3) is pivotally attached to the drafting frame (7) of the spinning machine.

6. A system according to claim 5, wherein said support arm (3) is extendable for varying the distance between said first removable drafting roller (4) and said second removable drafting roller (5) both attached to the support arm (3) of the roller apron support (2).

7. A system according to claim 2 when dependent of claim 3 or 4, wherein said removable roller apron support (2) comprises an apron profile (6), the body of said apron profile (6) defining a fitting (24) for receiving at least one drafting apron (10a, 10b, 18) at a spinning position S1, S2.

8. A system according to claim 1, when dependent of claim 4, wherein said first removable drafting roller (4) comprises a first roller portion (4a) with a recess (25) for receiving said first drafting apron (10a) for drafting said first roving, and wherein said second removable drafting roller (5) also comprises a first roller portion (5a) with a recess (25) for receiving said second drafting apron (10b) for drafting said second roving at the same spinning position (S1, S2).

9. A system according to claim 1, comprising a drafting frame (7) wherein the working position of the existing front bottom drafting rollers (14) is configured for said first and second removable drafting rollers (4, 5) to be able to operate as middle and back bottom drafting rollers over the existing middle and back bottom drafting rollers (12, 13) by means of a raiser (9) arranged to raise the working position of the existing front bottom drafting roller (14) for said existing front bottom drafting roller (14) to be able to receive a roving coming from said first and/or second drafting rollers (4, 5).

10. A system according to claim 1, wherein said means for stopping the movement of said first and second removable drafting rollers (4, 5) comprise;

- a first detent element (17) arranged to be able to act, in an active position, on the first removable drafting roller (4) to stop the supply of roving,
- a second detent element (16) arranged to be able to act, in an active position, on the second removable drafting roller (5) to stop the supply of roving and,
- means (27, 28) for activating the displacement of said first and second detent elements (16, 17) to its active positions upon breakage of the yarn intended to be fed to a spindle assembly (26) at the spinning position (S1, S2) of said first and second removable drafting rollers (4, 5).

11. A system according to claim 10, wherein said means for activating the displacement of said first and second detent elements (16, 17) to its active positions comprise process and control means for detecting a signal coming from an optical sensor (28) arranged to detect the absence or change of movement of a traveller (29) along a ring (30) upon breakage of yarn intended to be fed to a spindle (31) at a spinning position (S1, S2).

12. A system according to claim 10, wherein said means for activating the displacement of said first and second detent elements (16, 17) comprise a slide (27) arranged to cooperate with a trigger activating the displacement of said slide (27) upon breakage of the yarn.

13. A system according to any of claims 10, 11 or 12, wherein said first and detent elements (16, 17) are configured as a wedge arranged to be inserted, in its active position, between an existing middle or back bottom drafting roller (12, 13) and its corresponding first or second removable drafting rollers (4, 5) to stop the supply of roving upon breakage of yarn.

14. A system according to claim 2, wherein said drafting assembly is suitable for working two adjacent spinning positions (S1, S2) with a single removable roller apron support (2), and wherein said drafting assembly comprises;

- a pair of first drafting rollers (4) for a pair of adjacent spinning positions S1, S2 of said ring spinning machine, said pair of first drafting rollers (4) being coupled to said roller apron support (2) in a forward position to be able to act on each spinning position (S1, S2) as middle bottom drafting rollers over existing middle bottom rollers (13) of said ring spinning machine, and
- a pair of second drafting rollers (5) for said pair of adjacent spinning positions (S1, S2) of said ring spinning machine, said pair of second drafting rollers (5) being coupled to said same roller apron support (2) in a backward position with respect the pair of first drafting rollers (4) to be able to act on each spinning position (S1, S2) as back bottom drafting rollers over existing

back bottom rollers (12) of said ring spinning machine,

- wherein said apron profile (6) is dimensioned to extend between said adjacent spinning positions (S1, S2), for at least one drafting apron (10a, 10b, 18) to be wrapped around one of said first drafting rollers (4) and/or one of said second drafting rollers (5) on each of said adjacent spinning positions (S1, S2).

15. A system according to any of claims 3 or 4, when dependent of claim 2, wherein it comprises a first fibre condenser (20) component removably attached to the roller apron support (2) so that it remains located between one of said first drafting roller (4) and one of said second drafting roller (5) for receiving a first roving in a spinning position (S1, S2).

16. A system according to claim 4, when dependent of claim 2, wherein it comprises an apron guiding component (19) removably attached to the roller apron support (2) so that it remains located between one of said first drafting rollers (4) and one of said second drafting rollers (5) for guiding one of said second drafting aprons (10b) in a spinning position S1, S2.

17. A system according to any of claims 3 or 4, when dependent of claim 2, wherein it comprises at least one second fibre condenser component (21) removably attached to the roller apron support (2) so that it remains located behind one of said second drafting rollers (4, 5) in a spinning position (S1, S2).

18. A method of spinning plain yarn with the claimed system according to claim 3, comprising the steps of;

a) drafting a pre-drafted roving by means of one drafting apron (18) wrapped around the first removable drafting roller (4) of the drafting assembly,

b) simultaneously stopping, by means of said roving stop device (15), the movement of the first and second removable drafting rollers (4, 5) upon breakage of the plain yarn intended to be fed to a spindle assembly (26) at the spinning position (S1, S2) of said first drafting roller (4), and

c) resuming movement of said first and second removable drafting rollers (4, 5) upon reengagement of the plain yarn, wherein said step c) is carried out without air suctioning broken stretches of roving.

19. A method of spinning fancy yarn with the claimed system according to claim 4, comprising the steps of;

a) drafting a first roving by means of the first drafting apron (10a) wrapped around the first removable drafting roller (4) of the drafting assembly,

b) drafting a second roving by means of the second drafting apron (10b) wrapped around the second removable drafting roller (5) of the drafting assembly, and

c) simultaneously stopping, by means of said roving stop device (15), the movement of said first and second removable drafting rollers (4, 5) upon breakage of the fancy yarn intended to be fed to a spindle assembly (26) at the spinning position (S1, S2) of said first and second drafting rollers (4, 5),

d) resuming movement of said first and second removable drafting rollers (4, 5) upon reengagement of the fancy yarn, wherein said step d) is carried out without air suctioning broken stretches of roving.

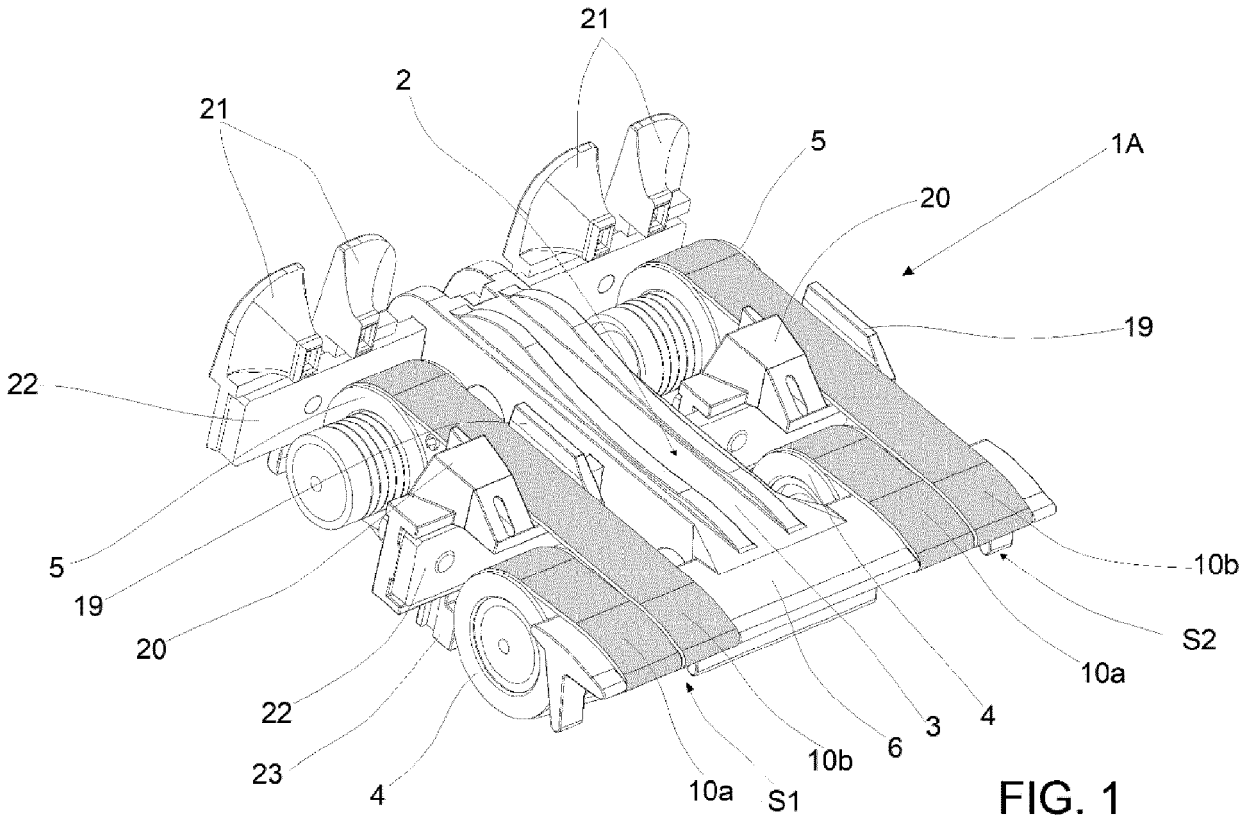

FIG. 1

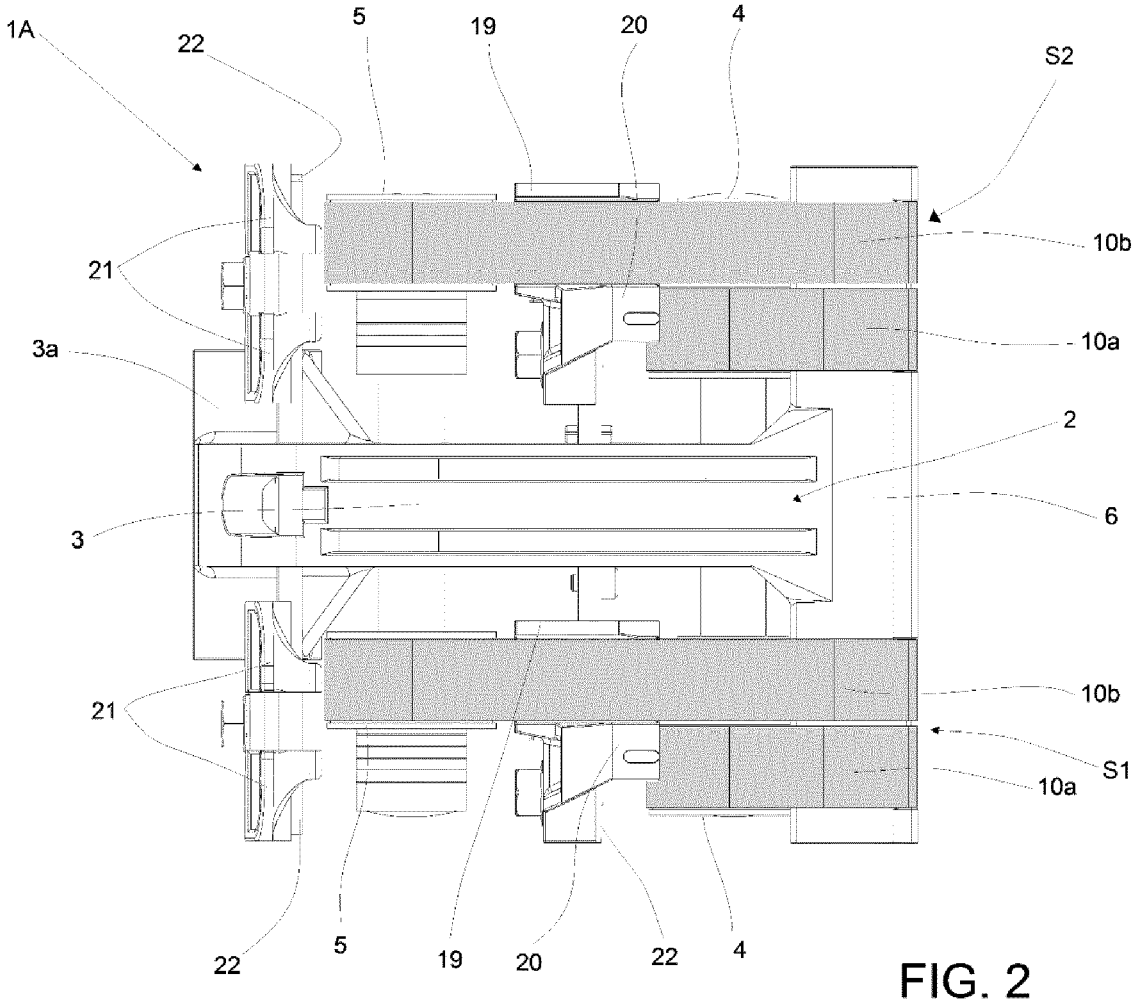

FIG. 2

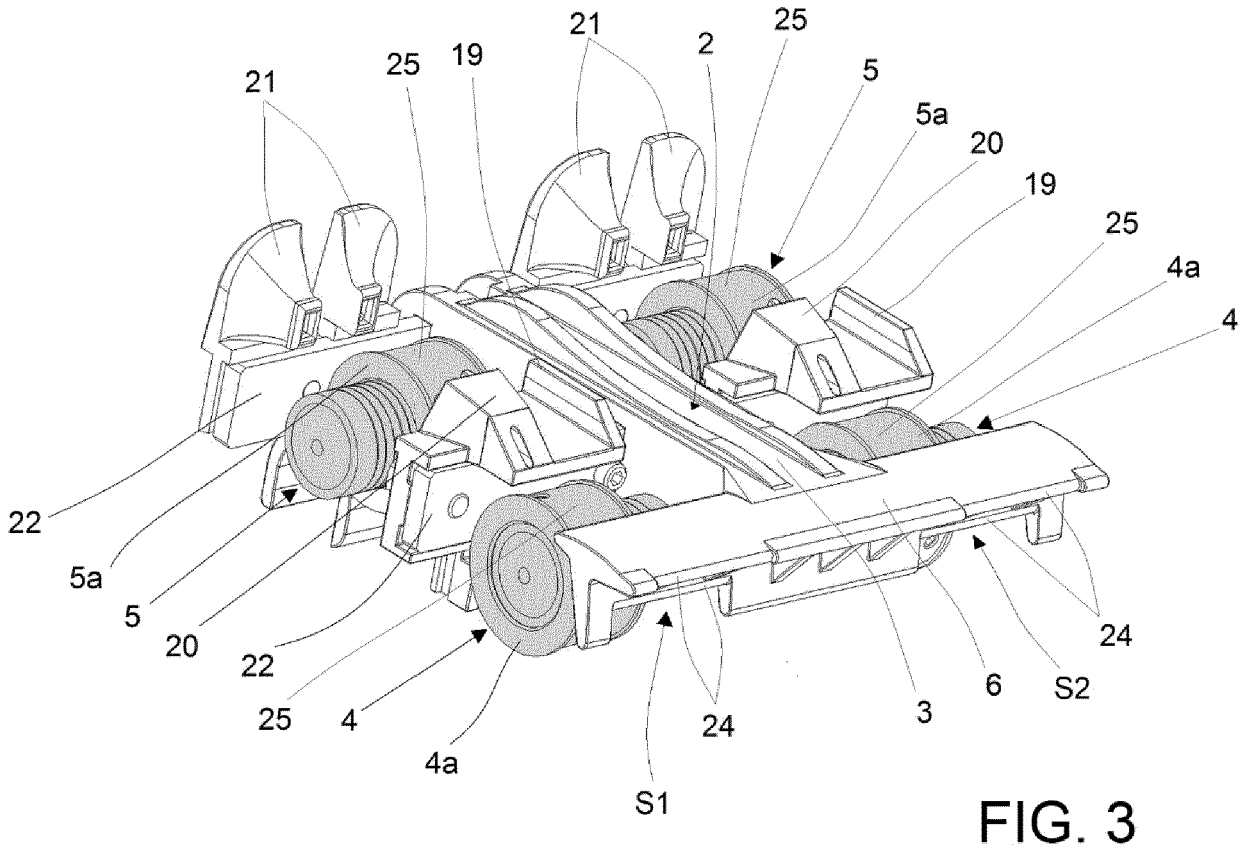

FIG. 3

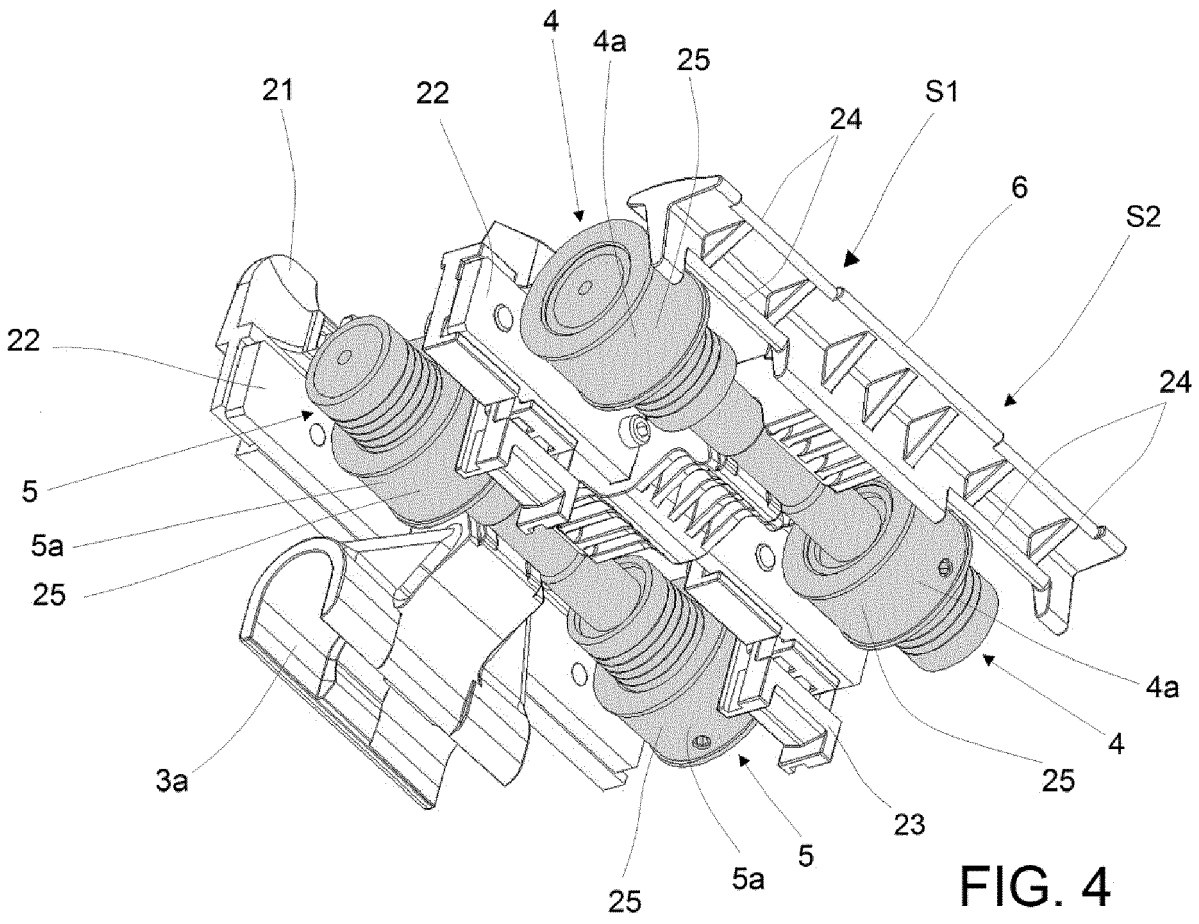

FIG. 4

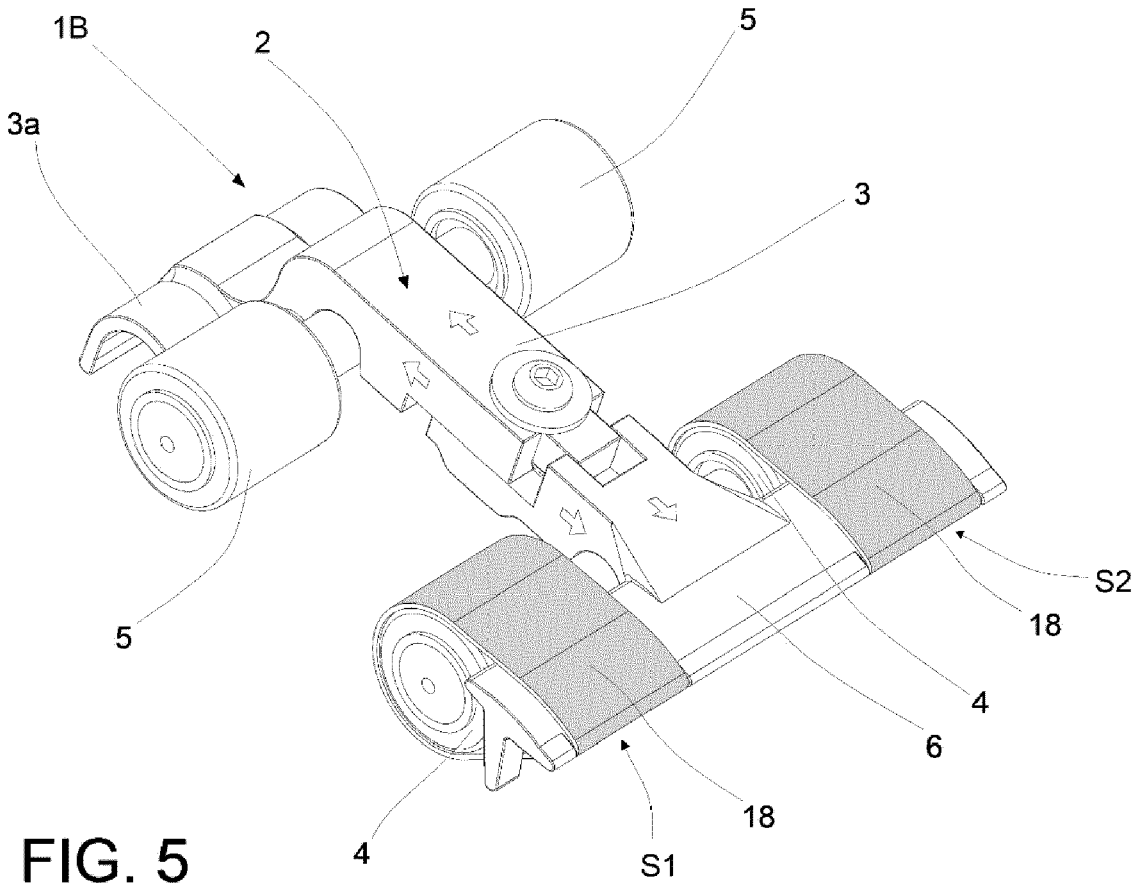

FIG. 5

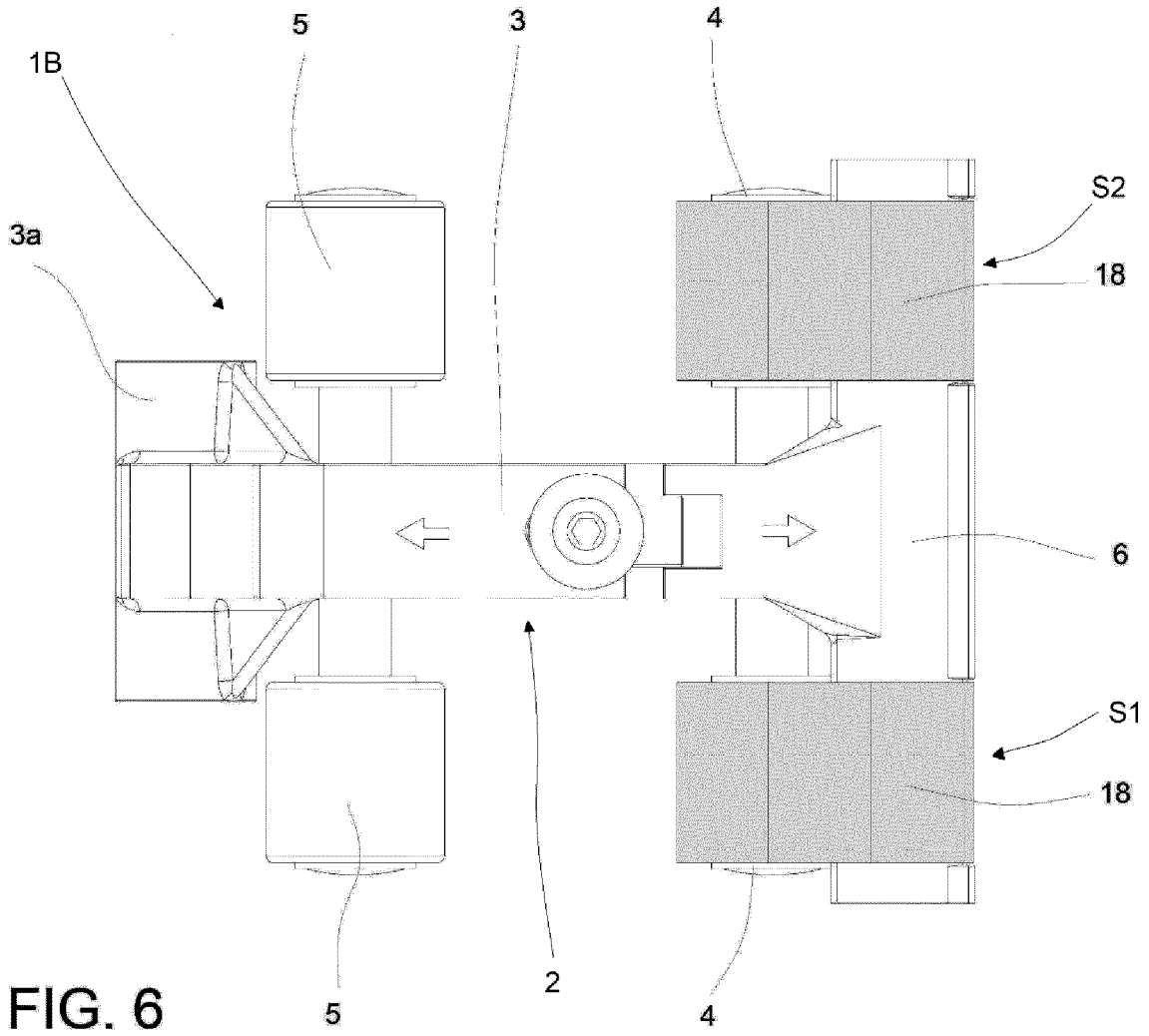

FIG. 6

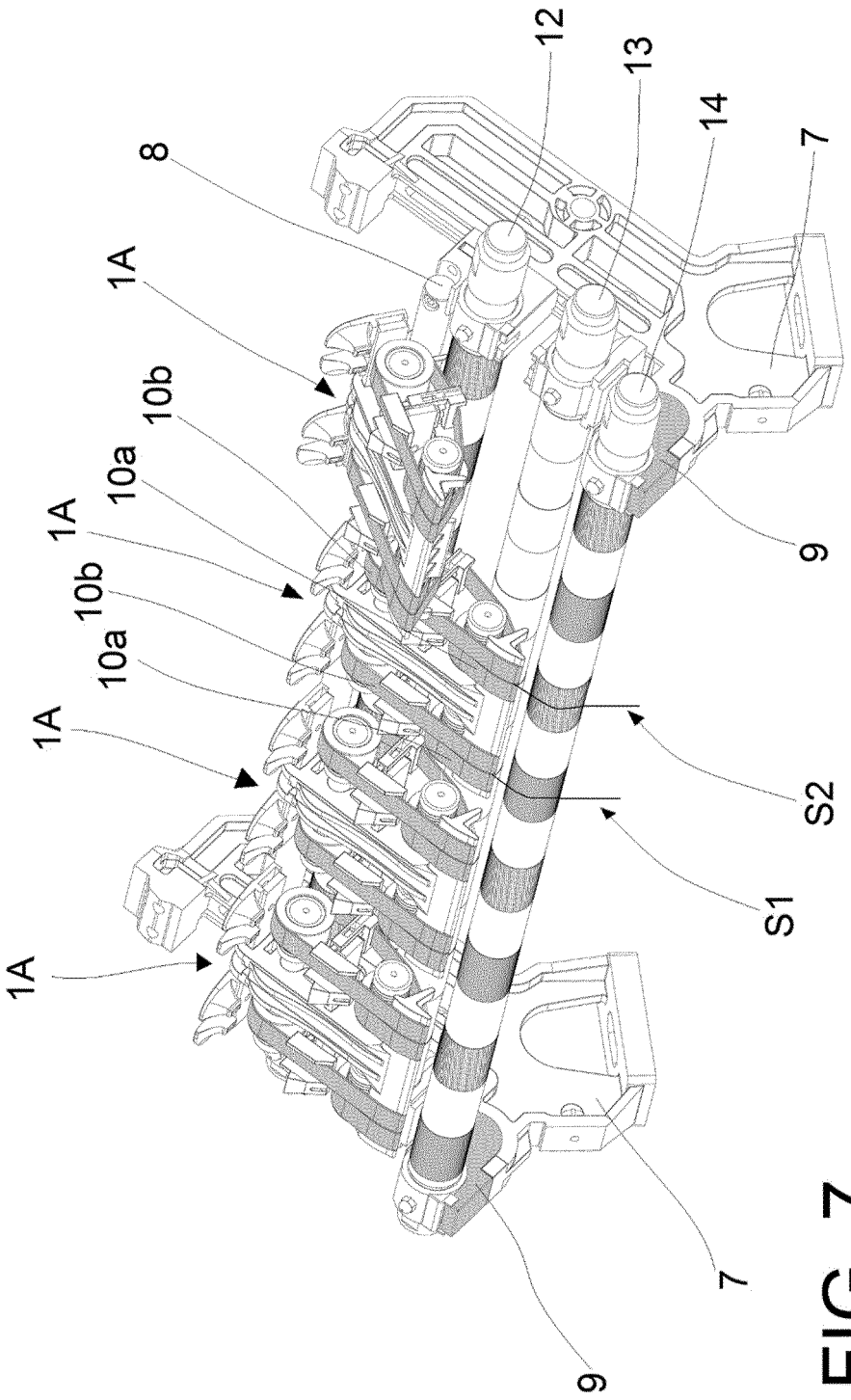

FIG. 7

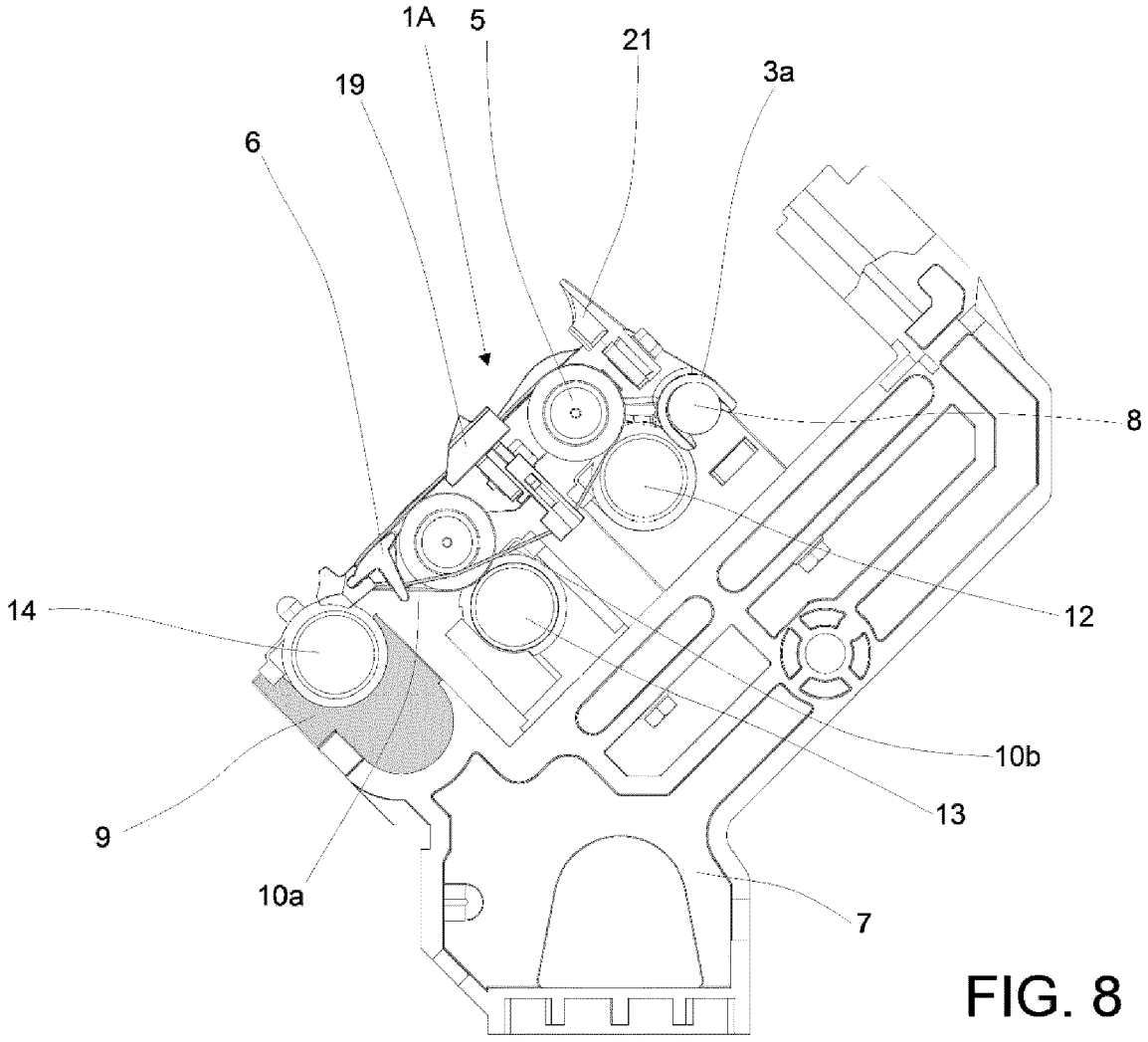

FIG. 8

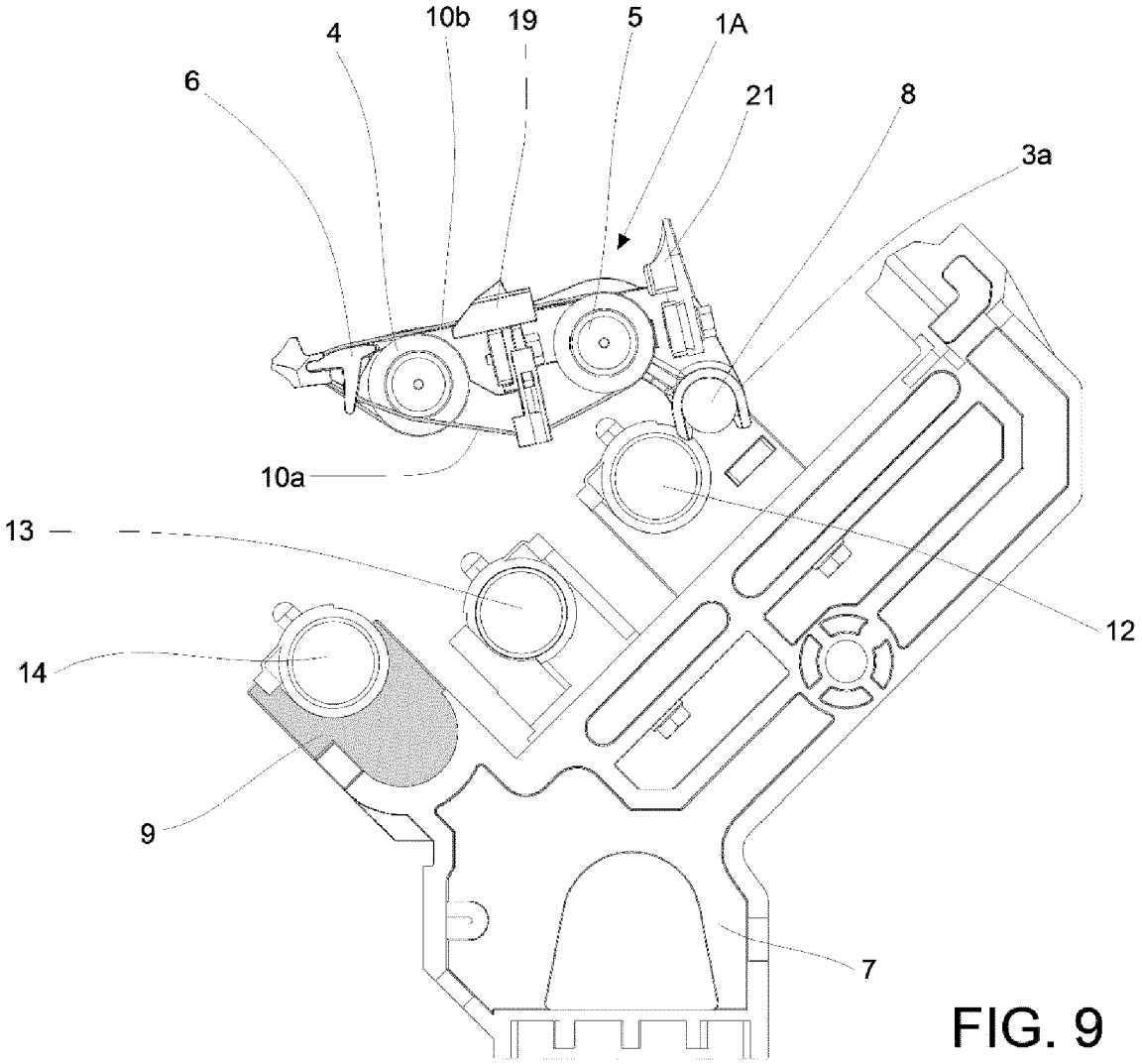

FIG. 9

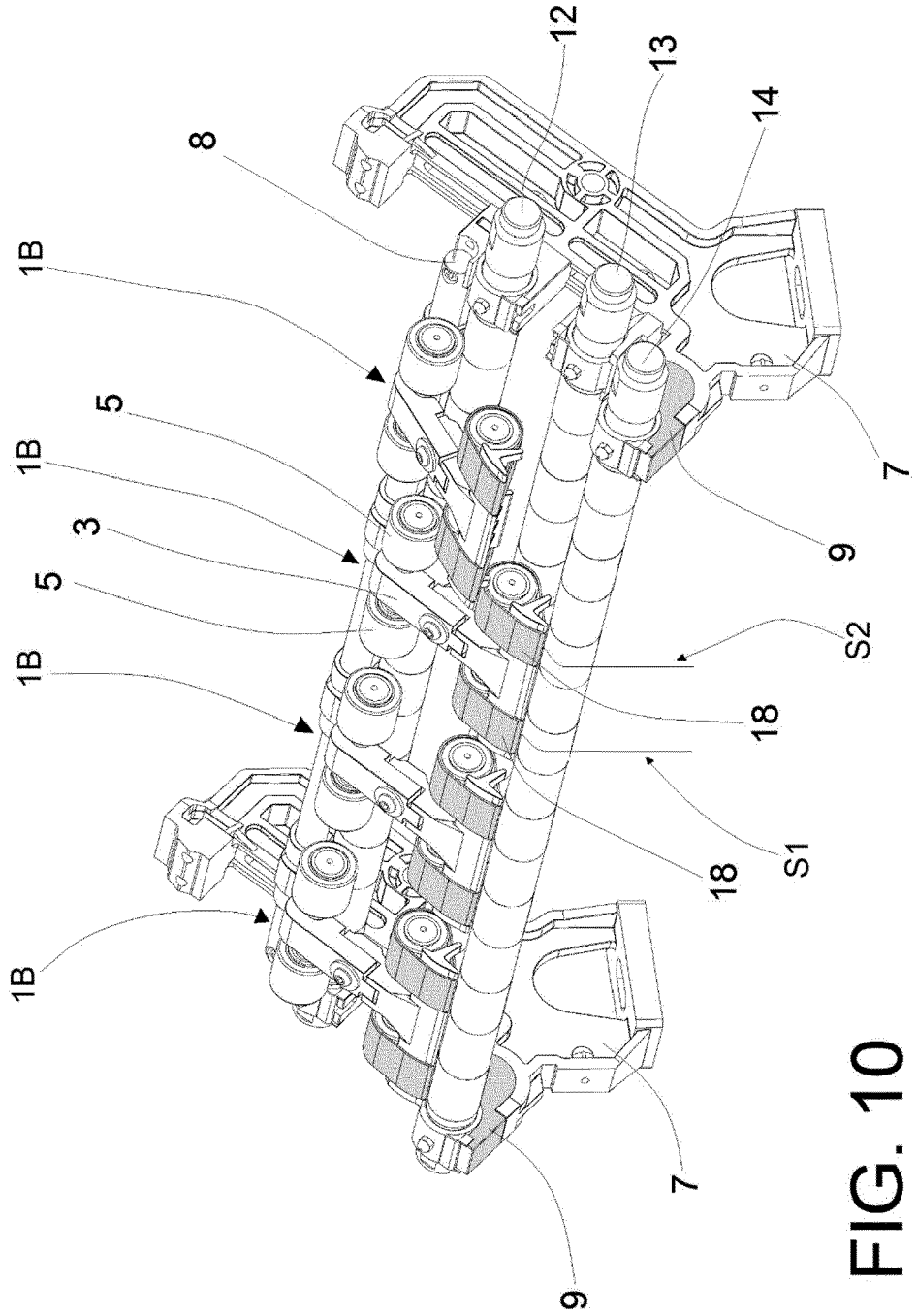

FIG. 10

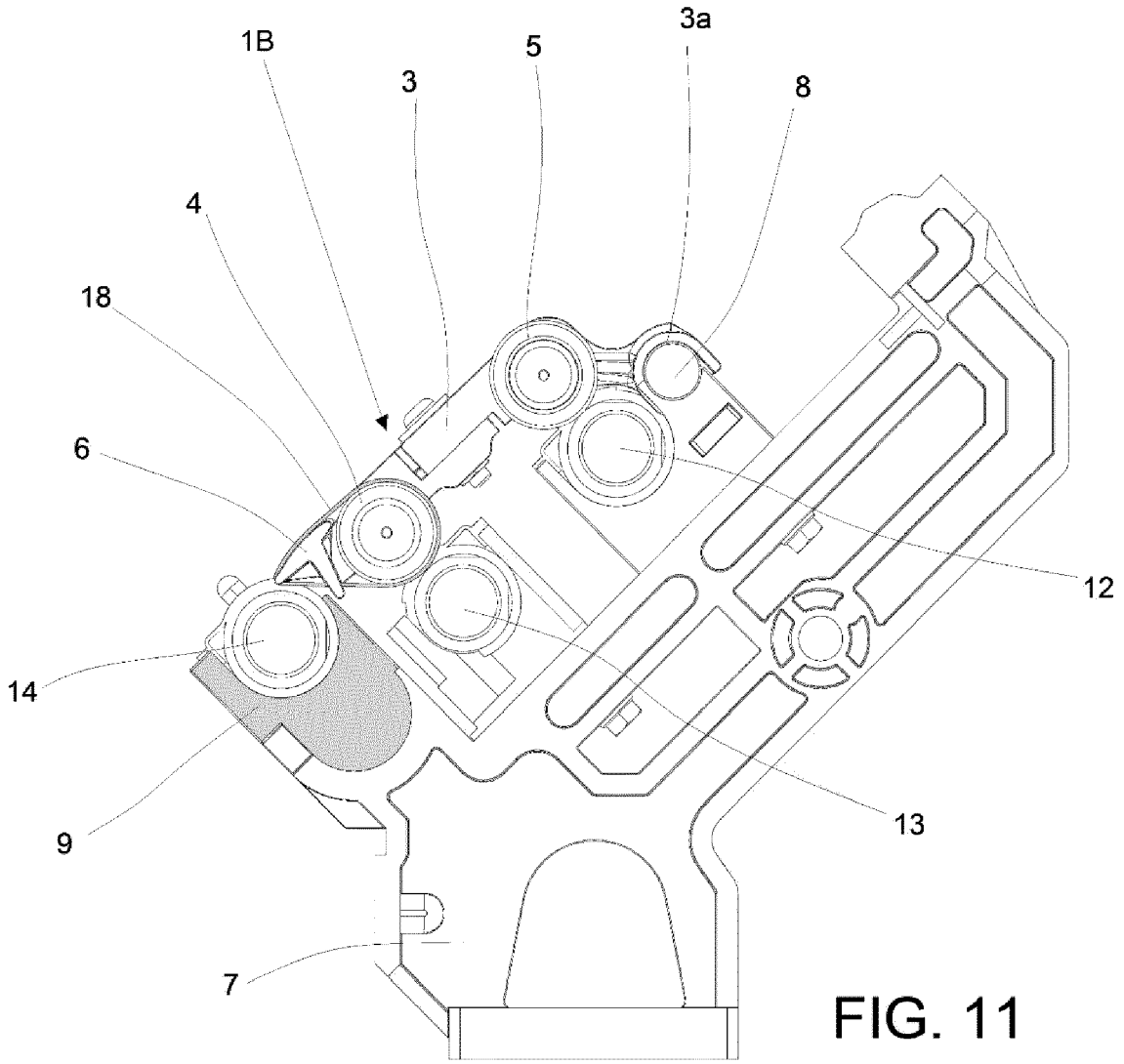

FIG. 11

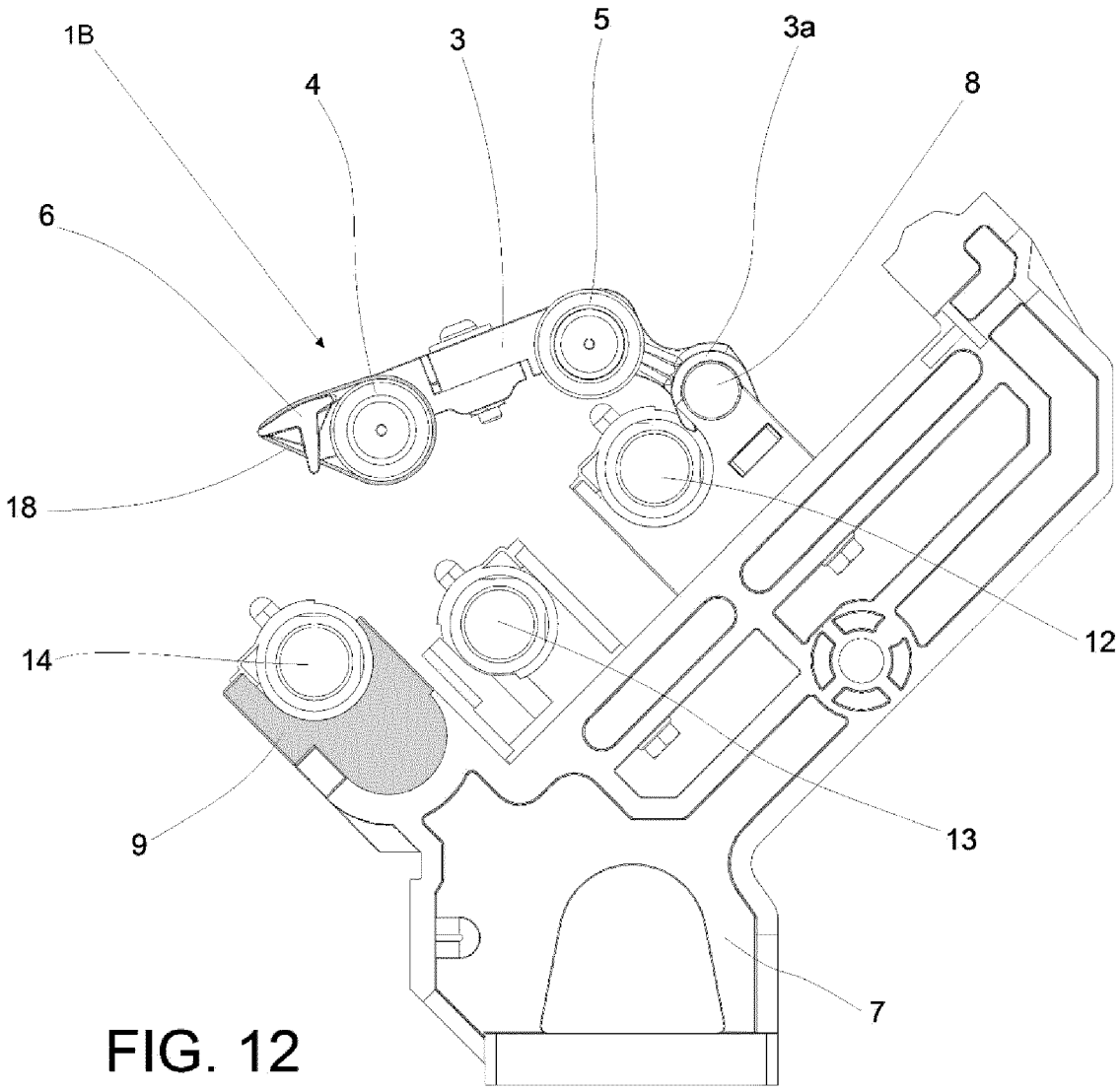

FIG. 12

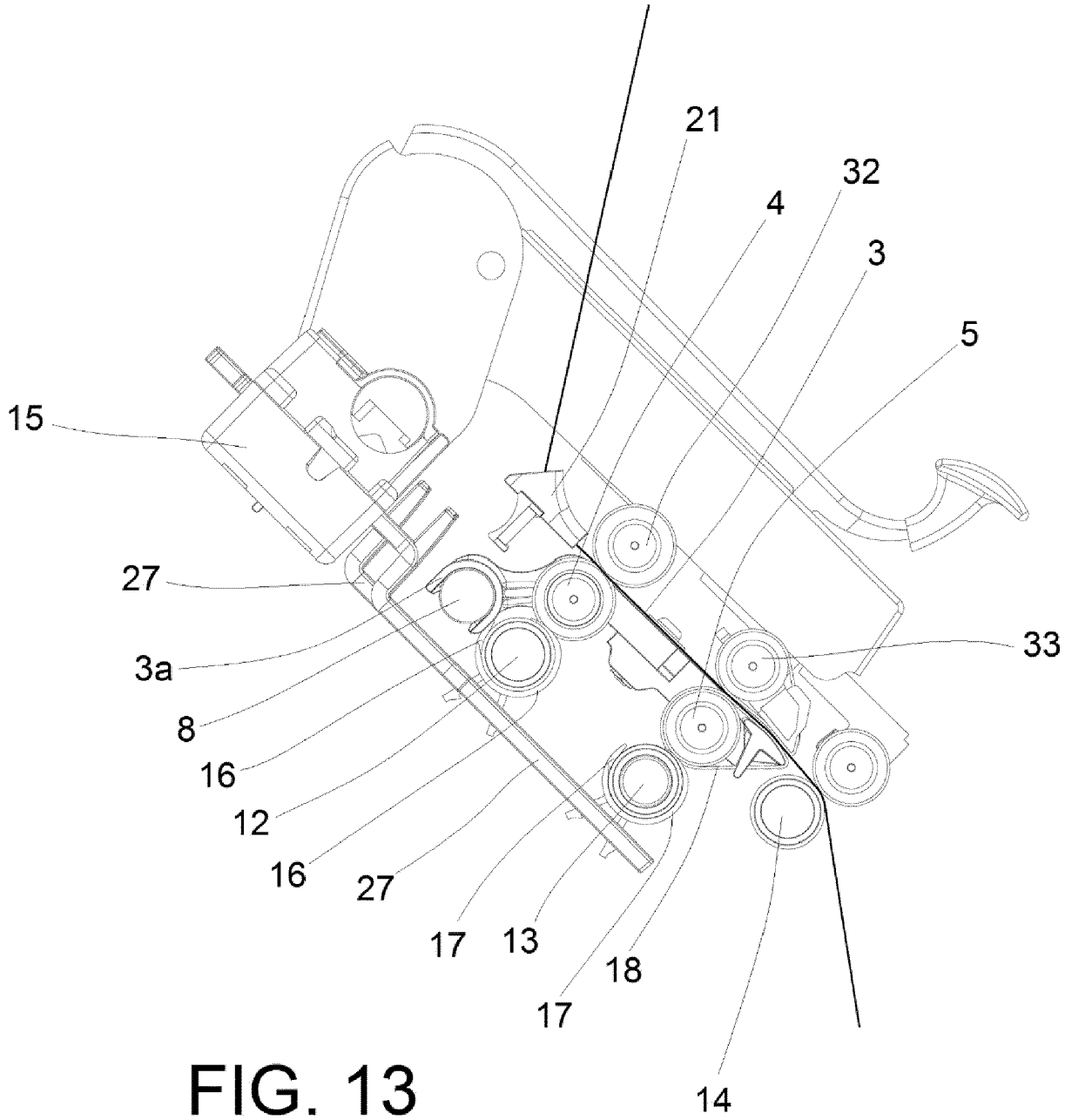

FIG. 13

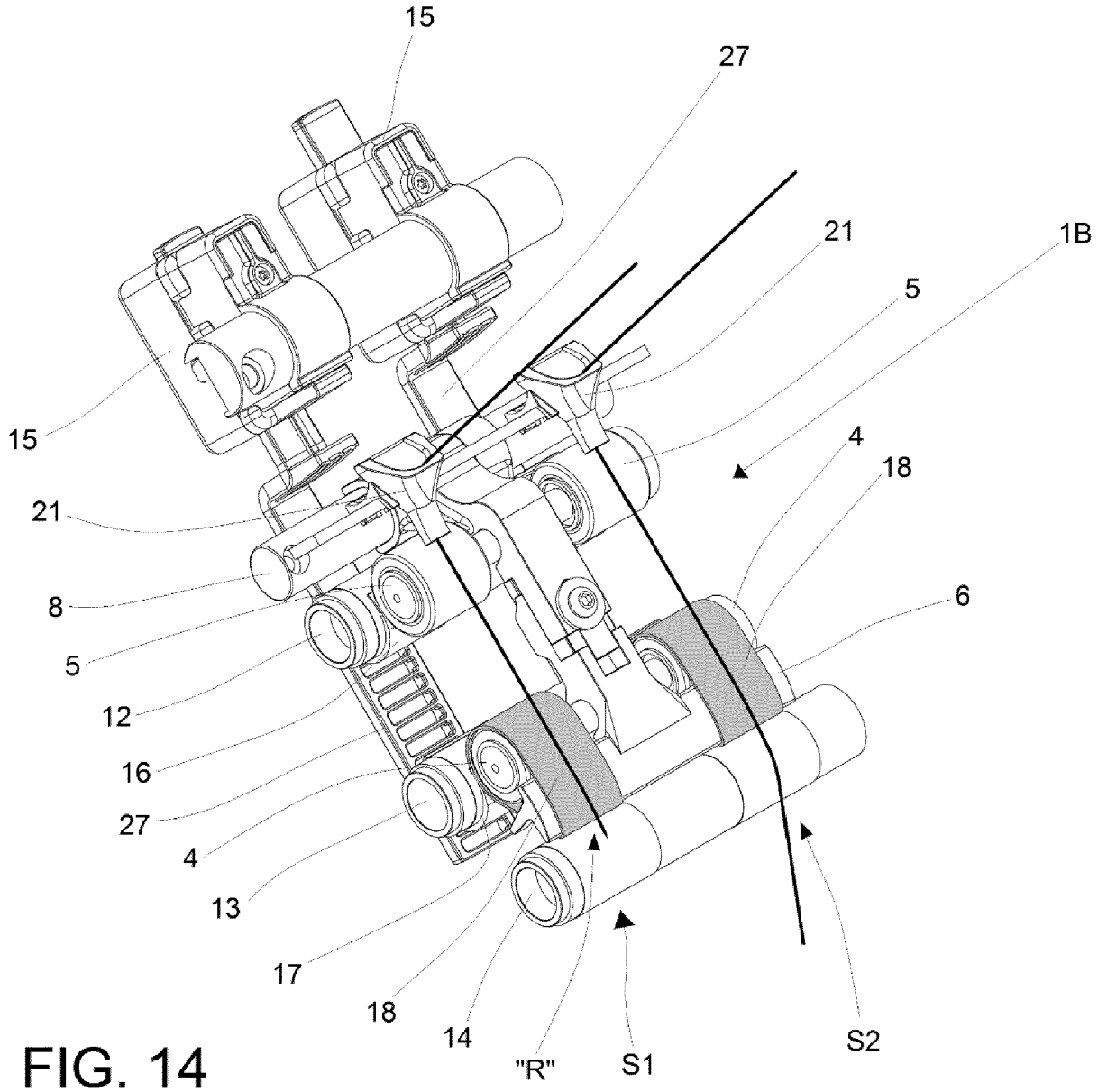

FIG. 14

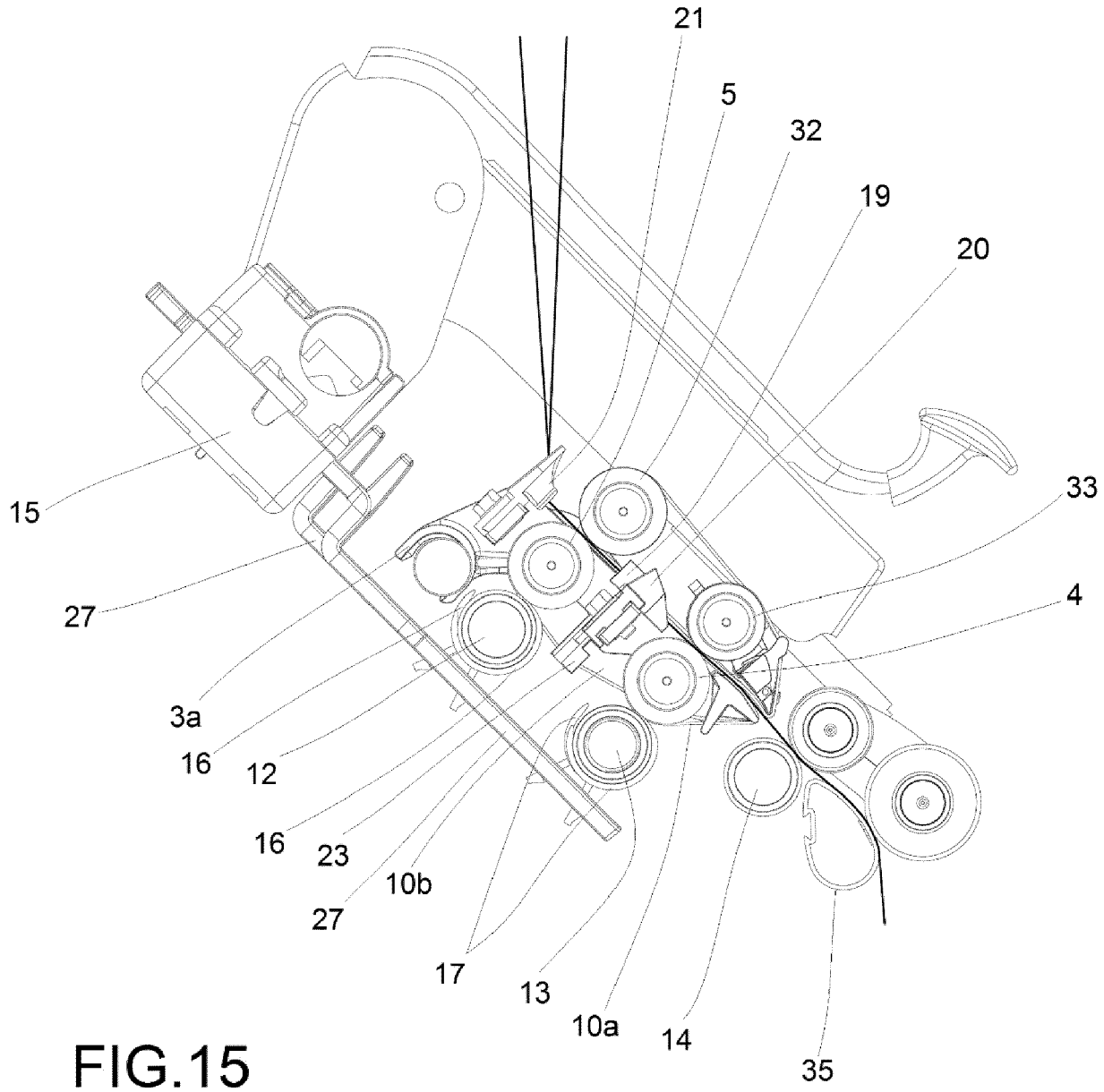

FIG.15

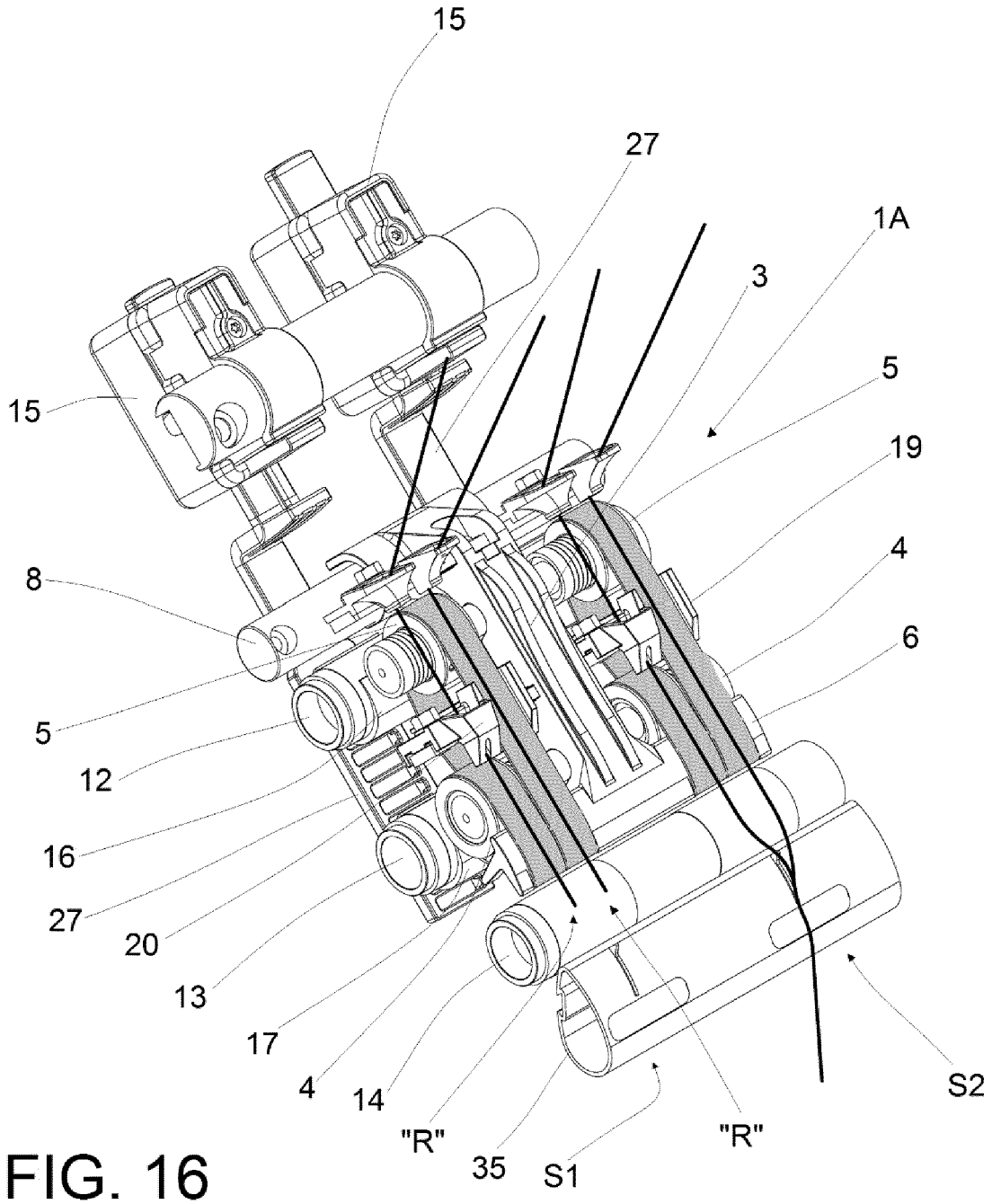

FIG. 16

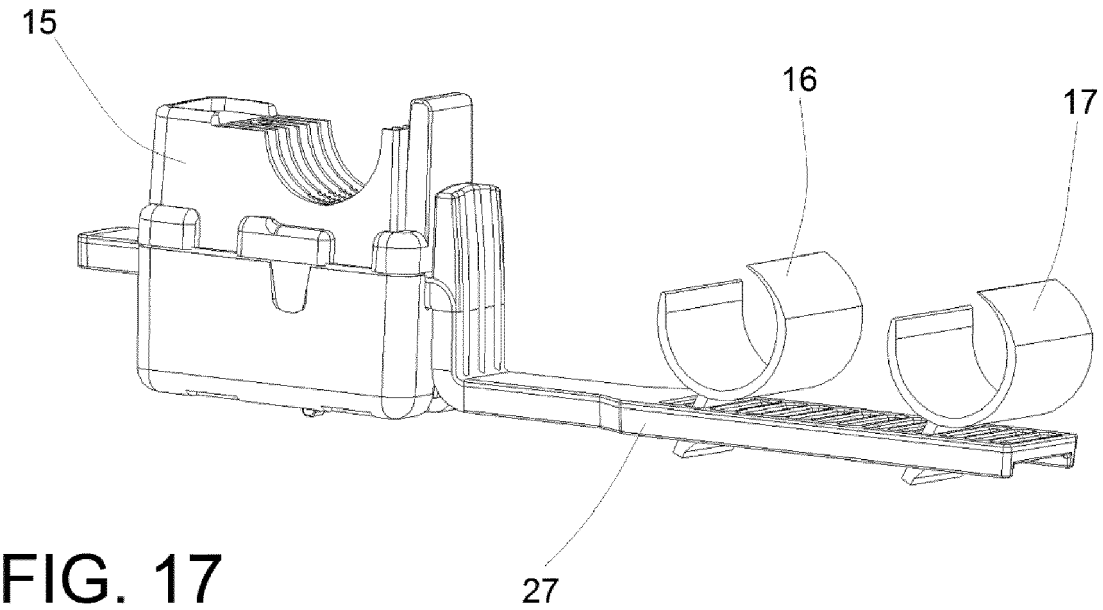

FIG. 17

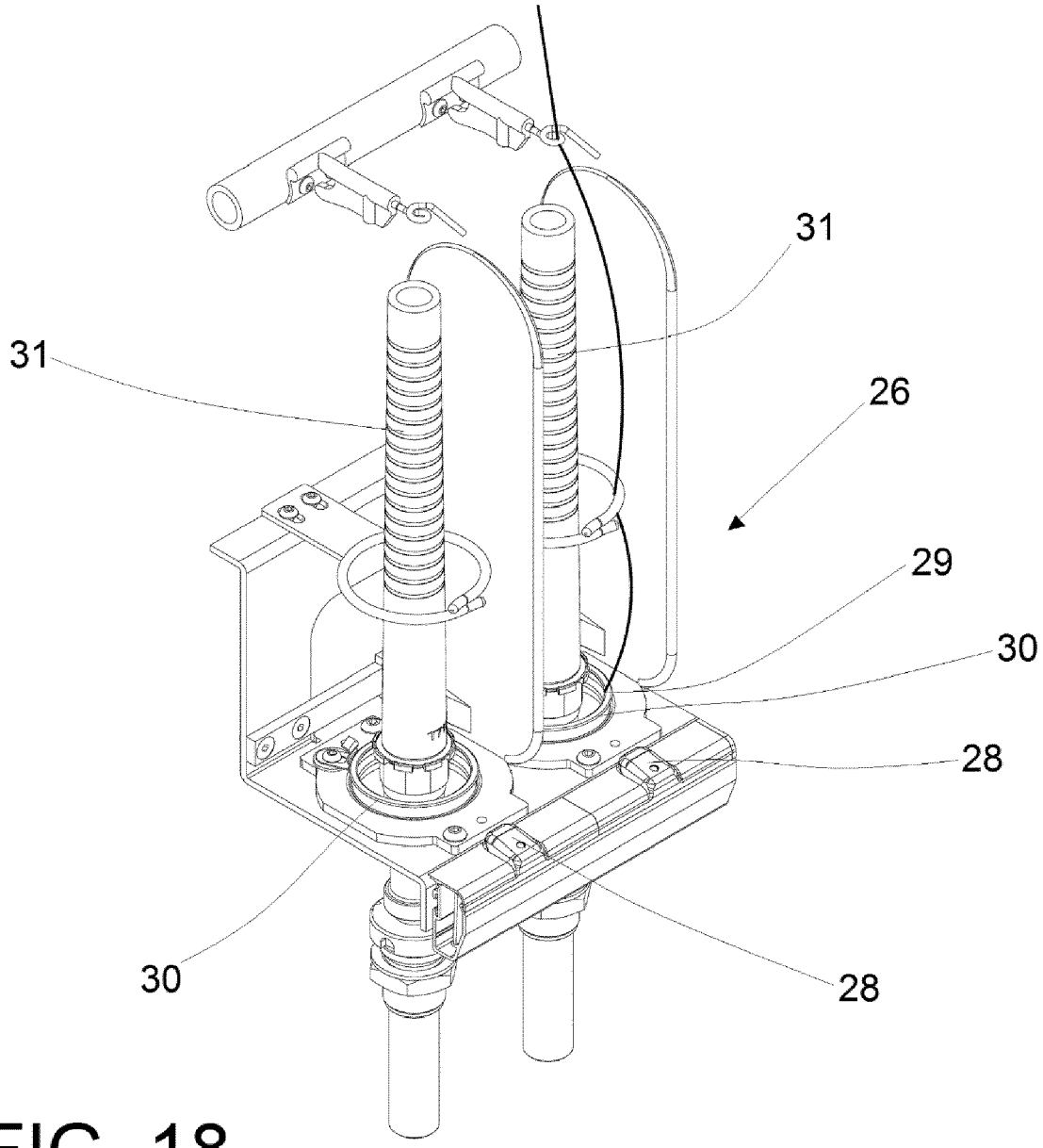

FIG. 18

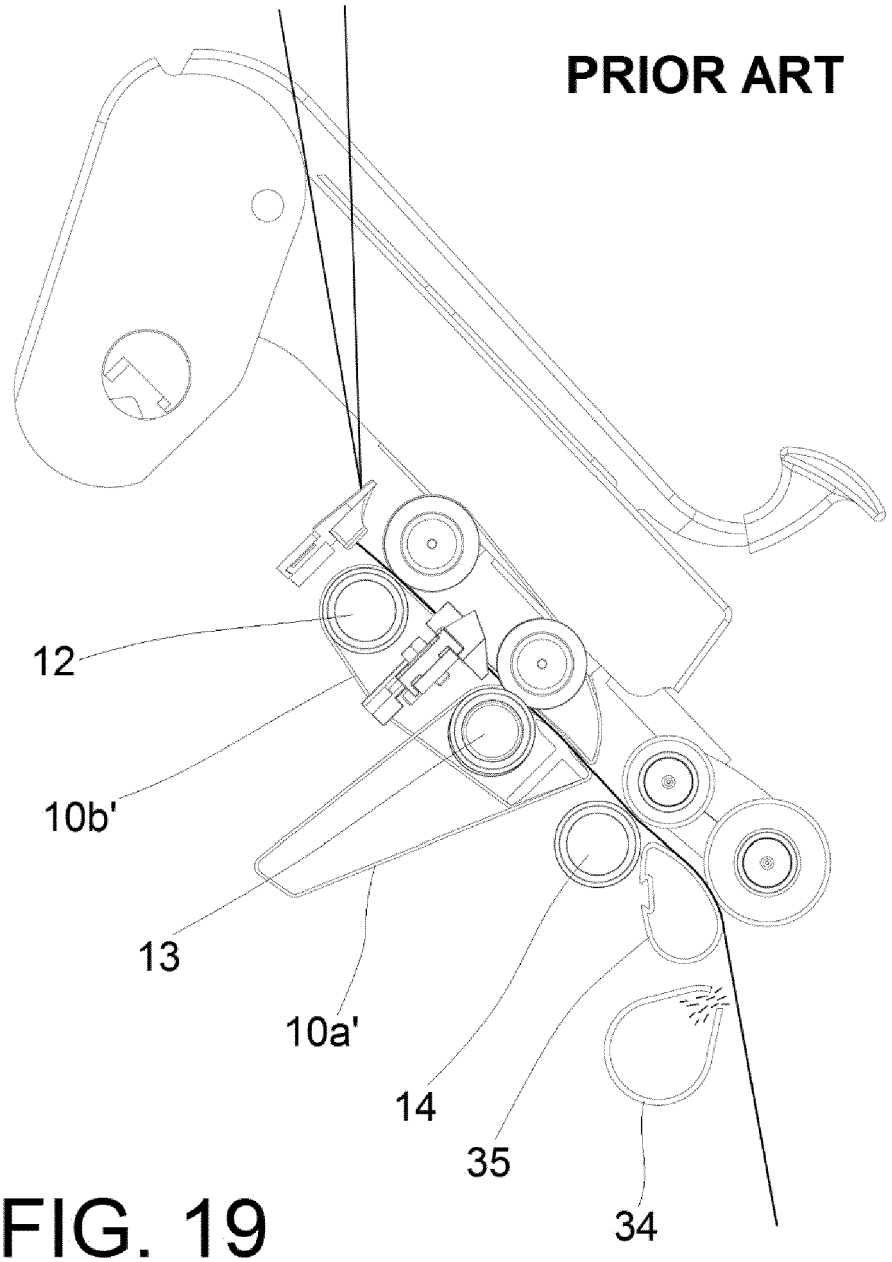

FIG. 19

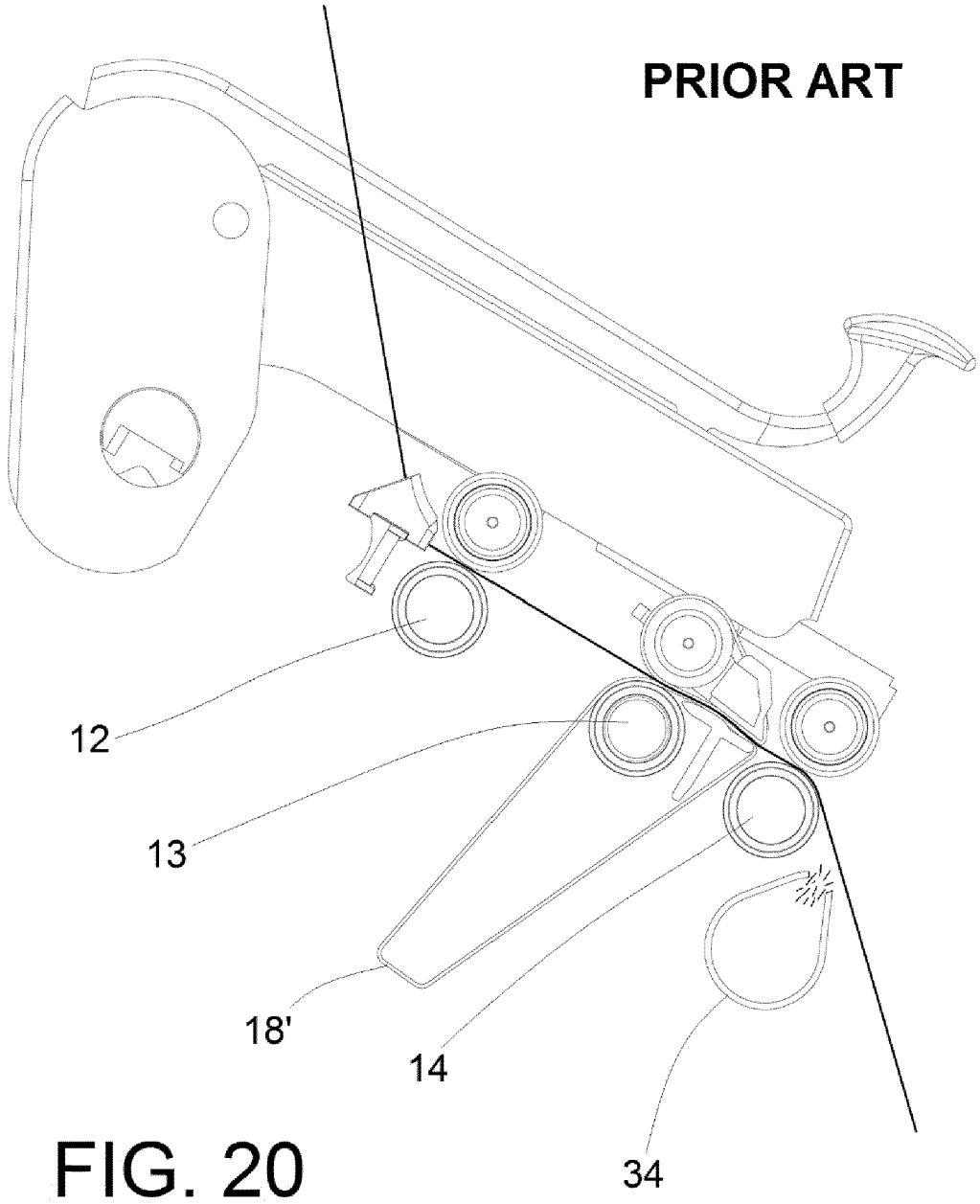

FIG. 20

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 August 2019	Clivio, Eugenio

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