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(54) **ROVING STOP DEVICE FOR A CORE YARN SPINNING MACHINE AND CORE YARN SPINNING MACHINE INCLUDING SAID ROVING STOP DEVICE**

(57) Roving stop device for a core yarn ring-spinning machine, comprising a stop element arranged to be able to act, in an active position, on a pair of roving supply rollers to stop the supply of roving when breakage of a continuous filament occurs, and a mechanism to activate the stop element when said breakage occurs, and it is characterized in that said mechanism comprises; first ac-

tivating means for displacing the stop element towards the active position upon breakage of a first continuous filament intended to be fed to a core yarn, and second activating means for displacing the stop element towards the active position upon breakage of a second continuous filament intended to be fed to said same core yarn.

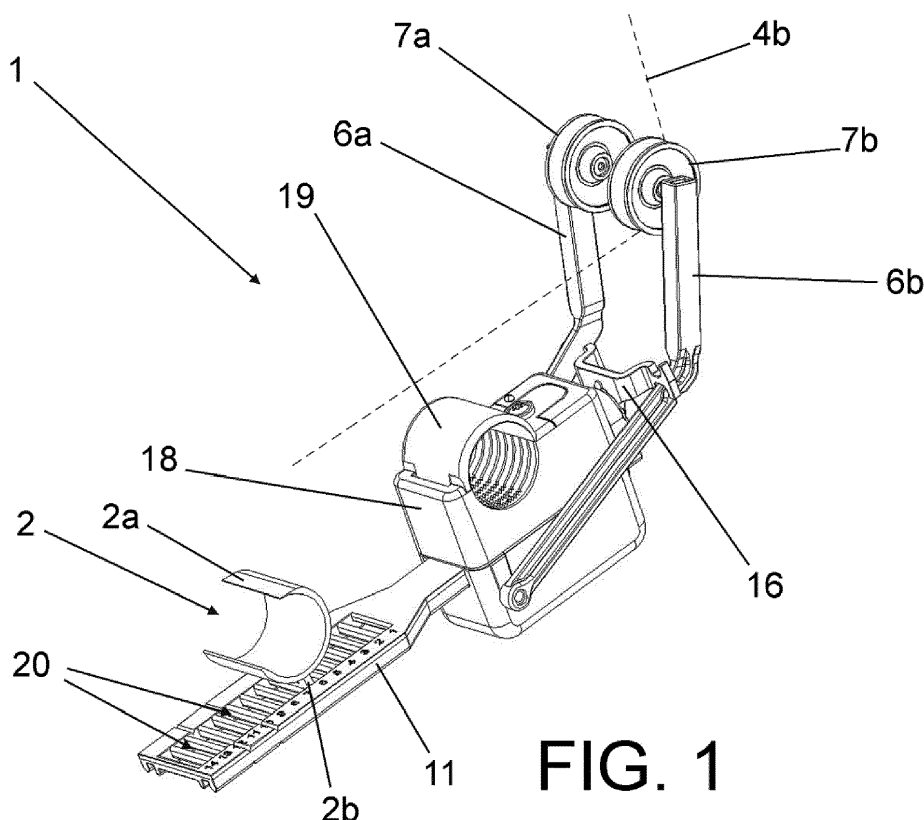


FIG. 1

Description

[0001] The present invention relates to a roving stop device for a core yarn spinning machine and to a core yarn spinning machine including a roving stop device at each spinning position. In particular, the present invention relates to a roving stop device that is suitable to be used for manufacturing a "Duo core" yarn spinning machine.

Background of the invention

[0002] The manufacture of core yarn by means of the continuous spinning process is well known. The manufacture of 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. The supply of the continuous filament to the drafting device of the spinning machine is carried out under tension and at a predetermined tension draft ratio via a filament guide roller acting as a guide for the continuous filament.

[0003] For the manufacture of core yarn it is common to employ a continuous filament of elastomeric material, such as elastane or spandex fibre, as is the case of the Lycra® brand. It is known that this continuous filament breaks 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 filament forming its core.

[0004] In the state of the art, there exists roving stop devices for core yarn spinning machines. Many of these roving stop devices employ an electrical sensor which monitors the passage of the continuous filament, detects the breakage and sends a signal to a device located at the roving supply intake. These electrical devices present the drawback that their maintenance requires the presence of specialised personnel and increases the cost of the spinning process. Besides, the electrical sensors get dirty easily so that continuous cleaning is necessary in order to avoid defective operation of the roving stop device.

[0005] It is known the production of the so-called "Duo Core" yarn that combines two continuous filaments with different elastic properties on a single spindle with the coating of the fibres from a cotton or similar roving. The continuous filaments of the core of the "Duo Core" yarn have different modulus of elasticity, so that those with lower elasticity retain those with greater elasticity, facilitating recovery of the fabric made with this yarn. As a result, "Duo Core" yarn allows the production of fabric with high recovery and high dimensional stability which are highly appreciated by consumers.

[0006] There exists roving stop devices for the production of the highly appreciated "Duo Core" yarn. These devices employ electrical sensors which monitor the passage of the first and second continuous filament, detect the breakage of either one of said continuous filaments

and send a signal to a device located at the roving supply intake. However, in the production of "Duo Core" yarn, the spindle gauge or distance between spindle positions is so narrow that it makes difficult handling and maintenance of the electrical sensors.

[0007] There are known roving stop devices that substantially dispense with electronic means and employs mechanical means to stop the supply of the roving upon breakage of a continuous filament. Nevertheless, these roving stop devices are intended to be used in the production of a core yarn combining a single continuous filament with a roving on a spindle position. In fact, these roving stop devices are incompatible with the production of "Duo core" yarn.

[0008] It is therefore necessary to provide a solution to the state of the art which covers the gaps found therein, by the provision of a roving stop device for the production of "Duo core" yarn which overcomes the above-mentioned shortcomings of the existent roving stop devices.

Description of the invention

[0009] The objective of the present invention is to provide a roving stop device for a core yarn ring-spinning machine, which resolves the indicated drawbacks, having the advantages described below.

[0010] In accordance with this objective, according to a first aspect, the present invention provides a roving stop device for a core yarn ring-spinning machine, comprising a stop element arranged to be able to act, in an active position, on a pair of roving supply rollers to stop the supply of roving when breakage of a continuous filament occurs, and a mechanism to activate the stop element when said breakage occurs, and it is characterized in that said mechanism comprises;

- first activating means for displacing the stop element towards the active position upon breakage of a first continuous filament intended to be fed to a core yarn, and
- second activating means for displacing the stop element towards the active position upon breakage of a second continuous filament intended to be fed to said same core yarn.

[0011] According to a second aspect, the present invention provides a core yarn spinning machine, preferably, a continuous core ring-spinning machine, characterised in that it comprises at each spinning position, the claimed roving stop device to stop the supply of a roving in the event of breakage of either one of said first continuous filament or said second continuous filament.

[0012] The present invention has the advantage that provides a roving stop device that can be used in the production of "Duo Core" yarn. The claimed roving stop device dispense with electronic means and employs mechanical means to stop the supply of the roving upon breakage of either a first continuous filament or a second

continuous filament. The claimed roving stop device includes a mechanism with a first and second means to independently activate the displacement of a same roving stop element.

[0013] As prior mentioned, the electrical devices present the drawback that they get dirty easily and their maintenance requires the presence of specialised personnel and increases the cost of the spinning process. The present invention overcomes this drawback by providing a mechanical based roving stop device that dispense with electronical sensors to stop the supply of roving.

[0014] Indeed, the roving stop device of the present invention has the advantage that the element that stop the supply of roving can be activate by means of a mechanism upon breakage of either one of a first continuous filament or a second continuous filament intended to be feed to a core yarn. If only one continuous filament is to be combined with the roving in the yarn, one of the first or second activating means of the mechanism is kept inactive. But, if two continuous filaments are to be combined with the roving in the yarn, then both separate activating means are kept active.

[0015] In accordance with a preferred embodiment, the first activating means comprise a first filament guide roller attached to a first activating lever, said first roller being susceptible of acting as a guide for the first continuous filament, and said second activating means comprise a second filament guide roller attached to a second activating lever, said second roller being susceptible of acting as a guide for the second continuous filament. The activation of the stop element takes place when the tension of either one of said first or second continuous filaments on the first or second roller ceases.

[0016] Advantageously, the claimed roving stop device comprises means for inactivating either one or both of the first activating means or second activating means, and according to the above mentioned preferred embodiment, the inactivating means comprise a holding element arranged to fasten either one or both of said first activating lever or said second activating lever in order to keep either one or both of said first or second activating levers inactive (i.e. so as not to fall upon breakage of the filament).

[0017] Thanks to this feature, the user can adapt the operation of the same roving stop device to the type of yarn that is to be manufactured in each spindle position.

[0018] For one embodiment, the stop element comprises a wedge arranged to be inserted, in its active position, between a pair of roving supply rollers to stop the supply of roving when breakage of either one of said first or second continuous filament occurs.

[0019] This embodiment has the advantage that the supply of roving is stopped when a free end of the roving is grasped between the roving supply rollers due to the effect of the wedge. In fact, the free end of the roving is arranged within a condenser element which captures the roving and automatically directs it to the drafting rollers

when the supply is resumed. Therefore, it is not necessary to manipulate the roving but merely to release the mechanism that activates the stop element, or the wedge, to recommence the spinning process.

[0020] Preferably, the roving stop device includes a mechanism that comprises a trigger for activating the movement of the stop element to its active position upon breakage of either one of said first or second continuous filaments, and said first and second activating levers are arranged to be able to cooperate with said trigger associated to said stop element.

[0021] For a particular implementation of the device, the mechanism comprises a first and second cam activating elements provided at one of the extremities of each of said first and second activating levers, said first and second cam activating elements being able to act on the trigger to move said stop element to its active position.

[0022] These cam activating elements may act on the trigger independently to activate the movement of the stop element to its active position.

[0023] Advantageously, the first and second activating levers are rotatably mounted along a same axis "Y" and, preferably, the first and second filament guide rollers are arranged faced to each other at the respective extremities of the first and second activating levers.

[0024] This configuration allows the roving stop device to be placed in a narrow distance to simultaneously control the supply of two continuous filaments at each spinning position.

[0025] For one embodiment, the stop element, for example, a wedge, is articulately mounted on a supporting slide and said supporting slide is arranged to cooperate with the first and second activating means of the mechanism. Preferably, said wedge includes a body with a curved surface configured to surround a portion of the lower roving supply roller, and a stem to articulately join said body to the wedge supporting slide.

[0026] The upper feed roller is a roller assembled on the pressure arm of the spinning machine. This roller is pressuredly held against the lower roller, which is the drive roller. On inserting the wedge or stop element between the two rollers, the upper roller is elevated and ceases to make contact with the lower roller, and the roving is grasped.

[0027] In accordance with an embodiment, the supporting slide comprises a plurality of grooves to attach the stem of the wedge in a plurality of positions, each of said grooves determining a predetermined position of the stop element in accordance with the distance separating the bar holding the pressure arm from the feed rollers.

[0028] Advantageously, said supporting slide is provided with trigger retaining means and is susceptible to accumulate potential energy derived from the compression force applied to a spring. This potential energy may be transmitted as movement to the stop element on cessation of the tension of either one of said first and second continuous filaments on the first or second roller.

[0029] According to one embodiment, the trigger re-

taining means of the supporting slide comprise a notch for the trigger and a spring arranged to be compressed by manually displacing the supporting slide until the trigger becomes locked in the aforementioned notch.

[0030] Preferably, the roving stop device comprises a housing provided with detecting means for detecting the displacement of the stop element to the active position when the tension of either one of the first or the second continuous filament ceases, and a lamp provided to generate a light signal when said detecting means detect the displacement of the stop element to the active position.

[0031] For example, a sensor may cooperate with a magnet installed on the supporting slide. When the slide is displaced in order to activate the stop element, the magnet activates the sensor and the lamp (LED) is illuminated.

[0032] Advantageously, the roving stop device comprises a clamp to secure the housing to a bar bearing a plurality of pressure arms of a core yarn spinning machine. Each of these pressure arms is configured so as to pressuredly hold the upper roving feed roller against the lower roller.

[0033] In the present invention, "continuous filament" 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.

[0034] "Roving" or "bundle of roving fibres" should be understood to be a bundle of cut cotton, wool, or viscose fibres, or another similar natural or artificial cut fibre, intended for the coating of one or more continuous filaments in the spinning of core yarn.

[0035] "Core yarn" should 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.

[0036] "Duo core" yarn should be understood to be a yarn combining a core of two continuous filaments with a bundle of roving fibres covering the filaments.

Brief description of the figures

[0037] For a better understanding of that which is described herein, a set of drawings is attached which, schematically and by way of a non-limiting example only, represent a practical case of embodiment.

[0038] In said drawings:

Figure 1 is a perspective view of an embodiment of the roving stop device.

Figure 2 is a rear view of the roving stop device of figure 1.

Figure 3a is a schematic representation of a longitudinal section of the drafting device of a core yarn spinning machine showing the mechanism of the roving stop device of figure 1 which activates the displacement of the stop element. This representation shows the supply of one of the continuous fila-

ments via the corresponding filament guide roller which acts as a guide for said filament at the extremity of its corresponding activating lever. In this figure 3a, the stop element and the supporting slide are in a non-activate resting position (continuous filament in tension over the guide roller keeping the activating lever in an elevated position).

Figure 3b is a schematic representation of a longitudinal section of the drafting device of a core yarn spinning machine showing the mechanism of the roving stop device of figure 1 which activates the displacement of the stop element. This representation shows the supply of one of the continuous filaments via the corresponding filament guide roller which acts as a guide for said filament at the extremity of its corresponding activating lever. In this figure 3b, the stop element and the supporting slide are in an activate position upon breakage of the continuous filament.

Figure 4 is a schematic representation of several spindle positions of a "Duo core" yarn ring spinning machine, each spindle position incorporating a roving stop device attached to the arm-bearing bar. This representation shows the supply of two continuous filaments via the first and second filament guide rollers of each roving stop device.

Figure 5 is a longitudinal section of the roving stop device of figure 1 that schematically shows the mode of operation of the device when breakage of the continuous filament occurs.

Figure 6 is a schematic partial cross section of the roving stop device of figure 1 showing a portion of the first and second activating levers rotatably mounted along a same axis "Y", and the first and second cam activating elements provided at the extremities of said first and second activating levers.

Description of a preferred embodiment

[0039] A preferred embodiment of the present invention is described below, making reference to figures 1 to 6.

[0040] As shown in the appended Figures, the present invention relates to a roving stop device 1 comprising a stop element 2 arranged to be able to act, in an active position, on a pair of roving supply rollers 3 to stop the supply of roving 5 when breakage of a continuous filament 4a, 4b occurs. The described roving stop device 1 is applied to the manufacture of core yarn by means of a continuous ring spinning machine (not represented) and, in particular, to the manufacture of "Duo Core" yarn, i.e., a yarn that combines two continuous filaments 4a, 4b and a bundle of roving 5 fibres intended to cover the said continuous filaments 4a, 4b.

[0041] The claimed roving stop device 1 comprises a mechanism to activate the stop element 2 when breakage of either one of a first continuous filament 4a or second continuous filament 4b occurs. This mechanism

comprises a first and second means to independently active the displacement of the same roving stop element 2.

[0042] For the illustrated embodiment, the first activating means comprises a first activating lever 6a and a second activating lever 6b. The free ends of both activating levers 6a, 6b are each provided with a first filament guide roller 7a and a second filament guide roller 7b, respectively. These filament guide rollers 7a, 7b act as a guide for the two continuous filaments 4a, 4b intended to be supplied to the drafting train that manufacture the core yarn 8 (see figure 4).

[0043] For the same illustrated embodiment, the opposite extremities of both activating levers 6a, 6b are rotatably mounted along a same axis "Y" and are arranged to independently cooperate with a trigger 9 via first and second cam elements 10a, 10b (see, figure 6).

[0044] As may be seen in figures 3a, 3b and figure 5, the stop element 2 is articulately mounted on a supporting slide 11 provided with a notch 12 for the trigger 9 and with a spring 13 arranged to be compressed by manually displacing the supporting slide 11 until the trigger 9 becomes locked in the aforementioned notch 12 (see, figure 3a).

[0045] When the tension of either one of said first and second continuous filaments 4a, 4b on the first or second filament guide rollers 7a, 7b ceases, either one of the first or second activating levers 6a, 6b descend to a lower position and make the trigger 9 to be released from the interior of the notch 12 via either one of the first or second activating cam elements 10a, 10b. The potential energy accumulated by the supporting slide 11 from the compression force applied to the spring 13 is transmitted as movement to the supporting slide 11 and the stop element 2 on releasing the trigger 9 from the interior of the notch 12. In its active position, the stop element 2 acts on the roving supply rollers 3 to stop the supply of roving 5 (see, figures 3b and 5).

[0046] Figure 3a shows the roving stop device 1 with the supporting slide 11 in a forward position and the stop element 2 in a non-working position to enable the supply of roving 5. As may be seen in this figure 3a, the tension of one of said continuous filaments 4a on the first filament guide roller 7a maintains the first activating lever 6a in an elevated position, enabling the supporting slide 11 to remain locked in a forward position, accumulating elastic potential energy derived from the compression force applied to the spring 13. As has been mentioned above, the potential energy accumulated by the spring 13 activates the recoil of the supporting slide 11 when the trigger 9 is freed due to the occurrence of a breakage of one of said continuous filaments 4a, 4b (see, figure 3b).

[0047] In the embodiment described, the stop element 2 presents a body 2a with a curved surface configured in order to surround a portion of the curved surface of the lower roving supply roller 3, and a stem 2b articulately attached to the supporting slide 11. In its active position (see figure 3b), a portion of the body 2a with a curved

surface is inserted between the lower and upper roving supply rollers 3. In this position, the upper roller is elevated and ceases to make contact with the lower roller, interrupting the supply of roving 5 which, being grasped, is separated or cut prior to entering the drafting rollers 14.

[0048] As may be seen in figure 3b, the free extremity of the roving 5 is captured within a condenser element 15, precisely at the intake of the drafting rollers 14. This extremity may be fed automatically in order to continue with the spinning process once the broken filament 4a or 4b has been repaired. To achieve this, the supporting slide 11 must be manually moved so that the stop element 2 frees the roving supply rollers 3.

[0049] As stated in the description of the invention, preferably, the roving stop device 1 comprises means for inactivating either one or both of the first activating lever 6a and second activating lever 6b, and according to the illustrated embodiment, said inactivating means comprise a holding element 16 arranged to fasten either one or both of said first activating lever 6a and said second activating lever 6a in order to keep either one or both of said first or second activating levers 6a, 6b inactive so as not to cause the displacement of the stop element 2. Thanks to this feature, the user can adapt the operation of the same roving stop device 1 to the type of yarn to be manufactured in each spindle position.

[0050] Figure 4 shows a schematic representation of several spindle positions of a "Duo core" yarn ring spinning machine. Each spindle position incorporates a roving stop device 1 attached to an arm-bearing bar 17. This representation shows the supply of two continuous filaments 4a, 4b via its corresponding first and second filament guide rollers 7a, 7b. In this figure 4, each roving stop device 1 includes a holding element 16 arranged to not fasten neither the first activating lever 6a nor the second activating lever 6b so as to keep both activating levers 6a, 6b active. As can be observed, the first and second filament rollers 7a, 7b are arranged on the extremities of the activating levers 6a, 6b faced to each other so that the supply of both continuous filaments 4a, 4b takes place via the said guide rollers 7a, 7b in a narrow distance.

[0051] Figures 1 and 2 show a perspective and rear view of an embodiment of the roving stop device 1 wherein the mentioned holding element 16 is arranged to fasten only one of the activating levers 6a to keep said activating lever 6a inactive while the other activating lever 6b is kept in position by the tension of the continuous filament 4a on its corresponding filament guide roller 7a. Thus, in these figures 1 and 2 the roving stop device 1 is adapted to manufacture a core yarn combining only one continuous filament 4a and a bundle of roving 5 in the yarn. To adapt the same stop roving device 1 to the manufacture of "Duo Core" yarn 8, each of the activating levers 6a, 6b is arranged to not being fasten by the holding element 16 as it is shown in figure 4.

[0052] In the embodiment described, the stop roving device 1 comprises a housing 18 provided with a clamp 19 to secure the device to a bar 17 of the spinning ma-

chine. The distance separating the bar 17 bearing the arms from the supply rollers 3 may vary, depending on the type of machine. For this reason, the supporting slide 11 supporting the stop element 2 features a plurality of grooves 20 to attach the stem 2b of the stop element 2 in a plurality of positions in accordance with the distance chosen.

[0053] Each roving stop device 1 comprises a sensor (not represented) to detect the displacement of the supporting slide 11 when the tension of either one of the first or the second continuous filaments 4a, 4b ceases, and a lamp (not represented) provided to generate a light signal when said sensor detects the displacement of the stop element 2 to the active position. For example, the sensor may cooperate with a magnet installed on the supporting slide 11. When the supporting slide is displaced in order to activate the stop element 2, the magnet activates the sensor and the lamp (LED) is illuminated to warn the user of the machine. This sensor may also send a signal to collective warning lights (not portrayed) located at both extremities of the spinning machine.

[0054] As has been mentioned in the description of the invention, the roving stop device 1 claimed enables stopping the supply of roving 5 when breakage of either one or two continuous filaments 4a, 4b occurs, by strictly mechanical means. In this way, and in contrast to the state of the art, the roving stop device 3 may dispense with electric sensors to detect the breakage of two continuous filaments 4a, 4b during manufacture of "Duo Core" yarn.

[0055] While the foregoing description and representation has been with reference to particular embodiments of the present invention, it will be evident that a person skilled in the art will be able to introduce multiple variations or modifications, or replace the details mentioned herein by other technically equivalent details without departing from the scope of protection defined by the appended claims. For example, although reference has been made in the present specification to a roving stop device 1 wherein the stop element 2 is configured in the shape of a wedge, the same stop element 2 may be configured to act on the roving supply rollers in a different way.

Claims

1. Roving stop device (1) for a core yarn ring-spinning machine, comprising a stop element (2) arranged to be able to act, in an active position, on a pair of roving supply rollers (3) to stop the supply of roving (5) when breakage of a continuous filament (4a, 4b) occurs, and a mechanism to activate the stop element (2) when said breakage occurs, **characterized in that** said mechanism comprises first activating means (6a, 7a, 10a) for displacing said stop element (2) towards the active position upon breakage of a first continuous filament (4a) intended to be fed to a core yarn (8), and second activating means (6b, 7b, 10b)

for displacing said stop element (2) towards the active position upon breakage of a second continuous filament (4b) intended to be fed to said same core yarn (8).

2. Roving stop device (1) according to claim 1, wherein said first activating means comprise a first filament guide roller (7a) attached to a first activating lever (6a), said first filament guide roller (7a) being susceptible of acting as a guide for the first continuous filament (4a), and wherein said second activating means comprise a second filament guide roller (7b) attached to a second activating lever (6b), said second filament guide roller (7b) being susceptible of acting as a guide for the second continuous filament (4b), the activation of said stop element (2) taking place when the tension of either one of said first or second continuous filaments (4a, 4b) on the first or second filament guide rollers (7a, 7b) ceases.
3. Roving stop device (1) according to claim 2, wherein said mechanism comprises a trigger (9) for activating the movement of said stop element (2) to its active position upon breakage of either one of said first or second continuous filaments (4a, 4b), and wherein said first and second activating levers (6a, 6b) are arranged to be able to cooperate with said trigger (9) associated to said stop element (2).
4. Roving stop device (1) according to claim any of claims 2 to 3, wherein said first and second activating levers (6a, 6b) are rotatably mounted along a same axis "Y".
5. Roving stop device (1) according to claim 4, wherein said first and second filament guide rollers (7a, 7b) are arranged faced to each other at the respective extremities of said first and second activating levers (6a, 6b).
6. Roving stop device (1) according to any of claims 1 to 5, wherein said stop element (2) is articulately mounted on a supporting slide (11) and said supporting slide (11) is arranged to cooperate with said first and second activating means.
7. Roving stop device (1) according to any of claims 2 to 6, wherein said mechanism comprises a first and second cam activating elements (10a, 10b) provided at one of the extremities of each of said first and second activating levers (6a, 6b), said first and second cam activating elements (10a, 10b) being able to act on a trigger (9) to move said stop element (2) to its active position.
8. Roving stop device (1) according to claims 3 and 5, wherein said supporting slide (11) is provided with trigger retaining means (12).

9. Roving stop device (1) according to any of claims 5 to 7, wherein said supporting slide (11) is susceptible to accumulate potential energy derived from the compression force applied to a spring (13) and susceptible to transmit, in an active position, the potential energy as movement to the stop element (2) on cessation of the tension of either one of said first and second continuous filaments (4a, 4b) on the first or second filament guide rollers (7a, 7b). 5 10
10. Roving stop device (1) according to claims 8 and 9, wherein said trigger retaining means comprise a notch (12) for the trigger (9) and a spring (13) arranged to be compressed by manually displacing the supporting slide (11) until the trigger (9) becomes locked in the aforementioned notch (12). 15
11. Roving stop device (1) according to any of claims 1 to 10, wherein said stop element comprises a wedge (2) arranged to be inserted, in its active position, between a pair of roving supply rollers (3) to stop the supply of roving (5) when breakage of either one of said first or second continuous filaments (4a, 4b) occurs. 20 25
12. Roving stop device (1) according to any of claims 1 to 10, wherein it comprises means (16) for inactivating either one of said first activating means (6a, 7a, 10a) or said second activating means (6b, 7b, 10b). 30
13. Roving stop device (1) according to claims 2 and 12, wherein said means for inactivating either said first activating means or said second activating means, comprise a holding element (16) arranged to fasten either one of said first activating lever (6a) or said second activating lever (6b) in order to keep either one of said first or second activating levers (6a, 6b) inactive so as not to cause the displacement of the stop element (2). 35 40
14. Roving stop device (1) according to any of claims 1 to 13, wherein it comprises means for detecting the displacement of the stop element (2) to the active position when the tension of either the first or the second continuous filament (4a, 4b) ceases, and a lamp provided to generate a light signal when said detecting means detect the displacement of the stop element (2) to the active position. 45
15. A continuous core yarn spinning machine, **characterised in that** it comprises, at each spinning position, a roving stop device (1) as claimed in any of claims 1 to 14 to stop the supply of a roving (5) in the event of breakage of either one of a first continuous filament (4a) or second continuous filament (4b). 50 55

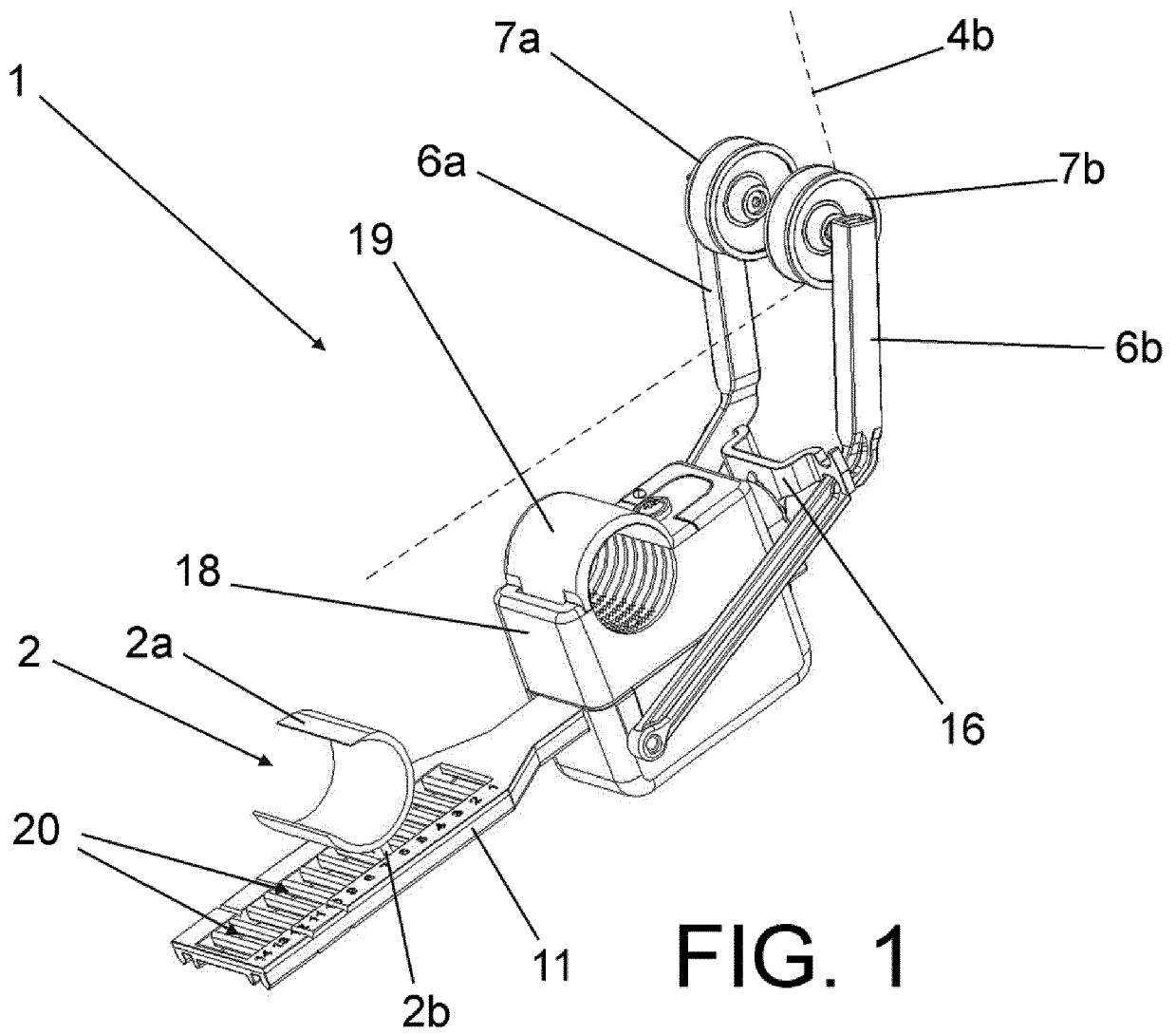


FIG. 1

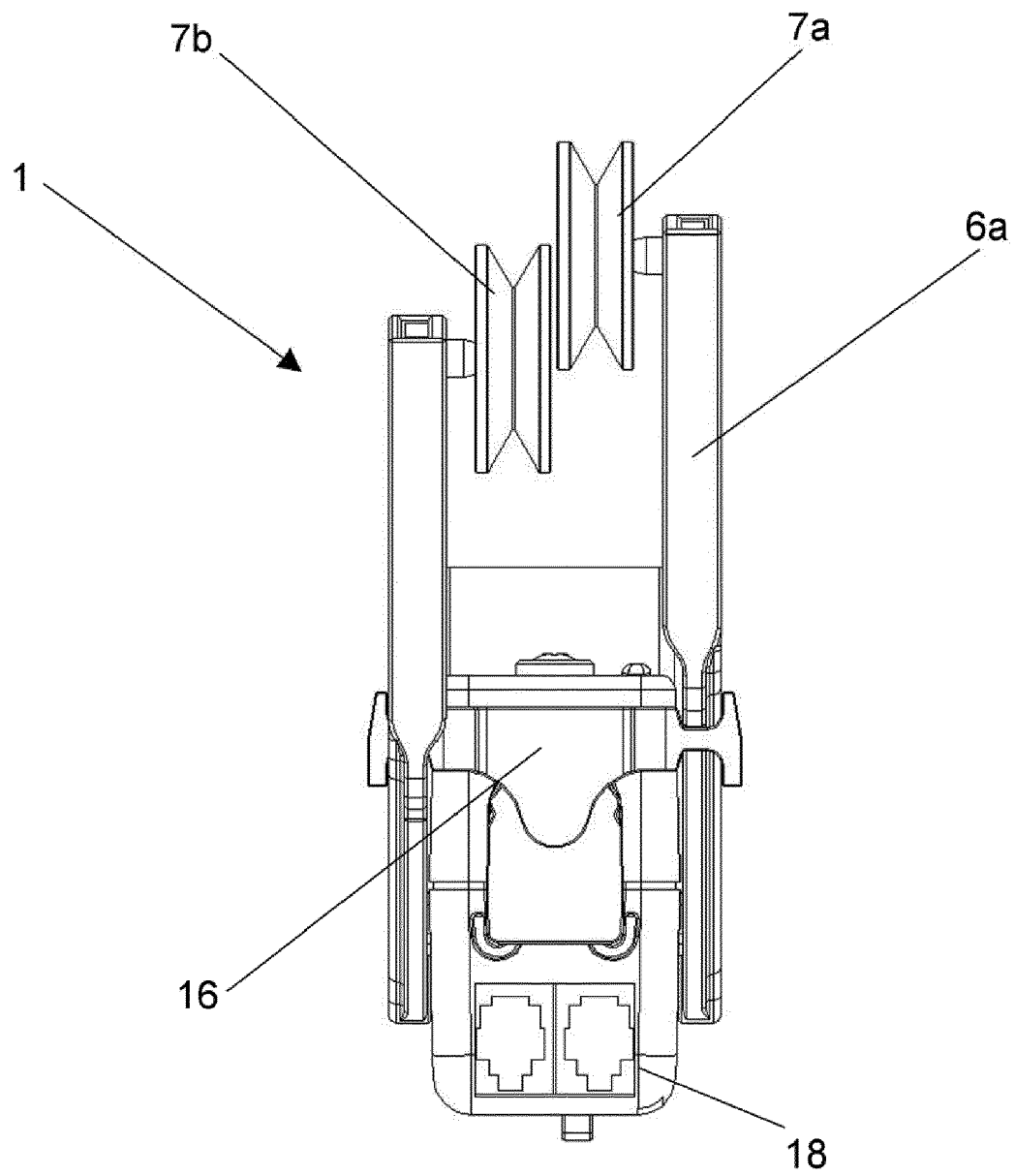


FIG. 2

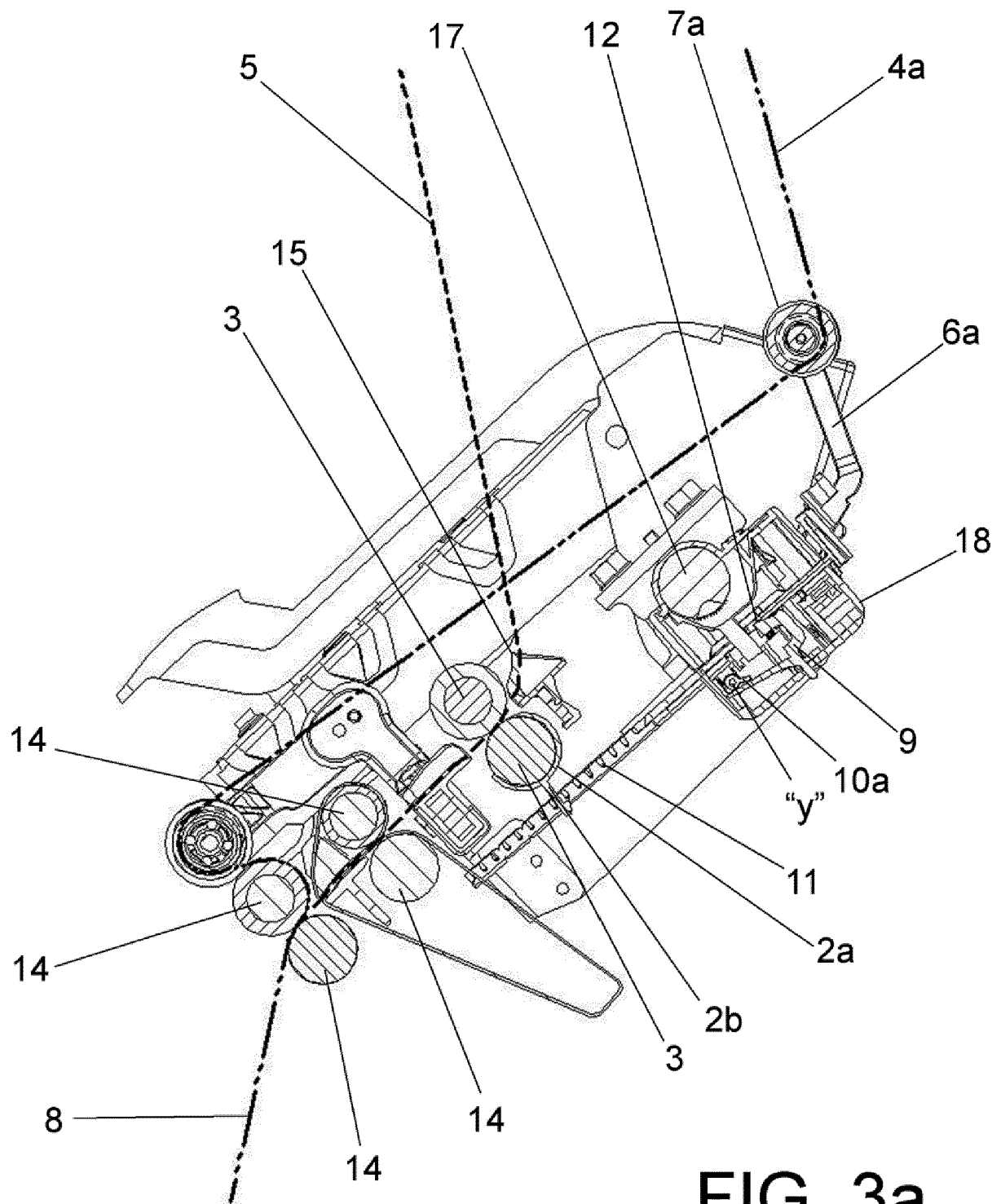


FIG. 3a

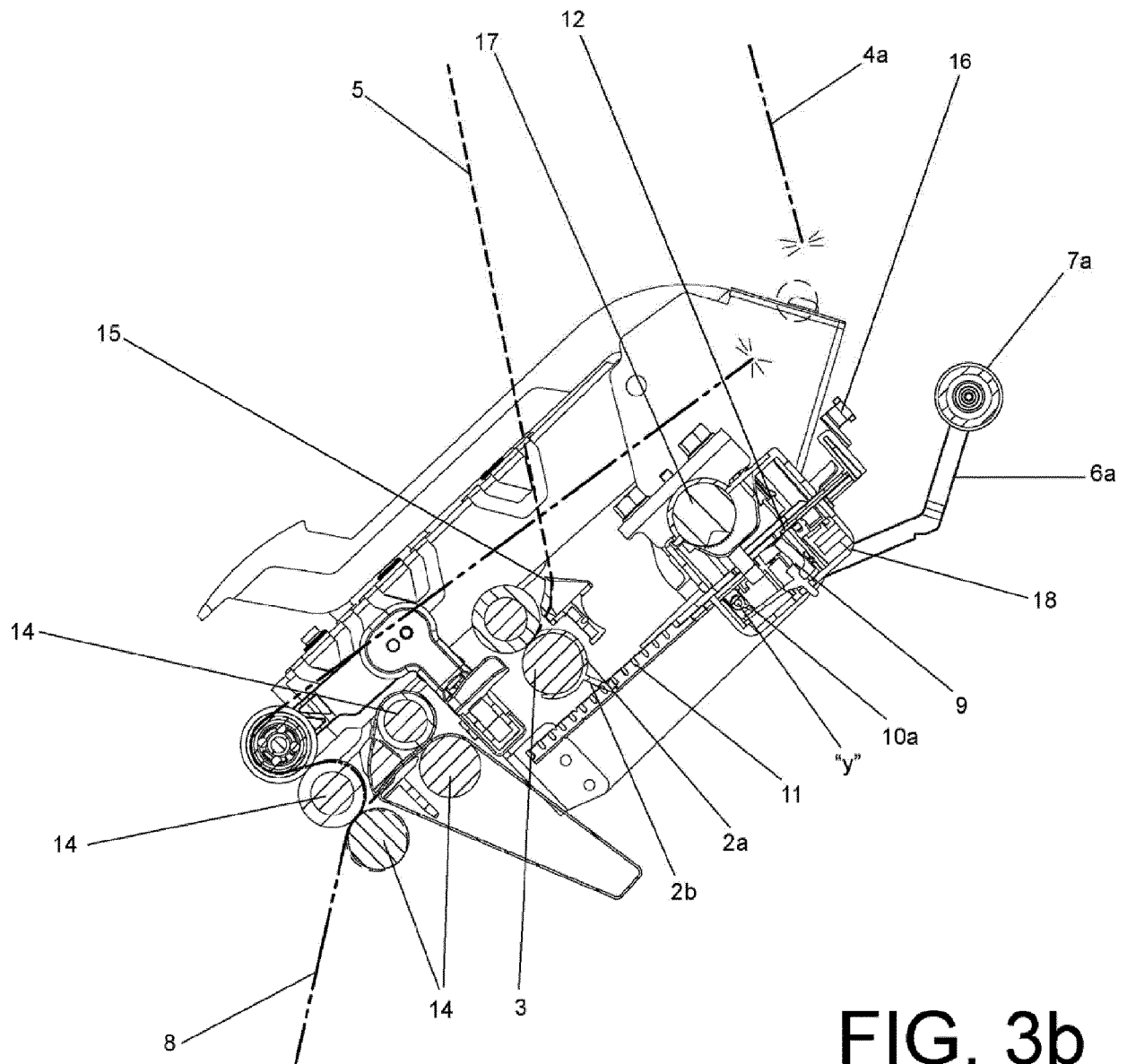


FIG. 3b

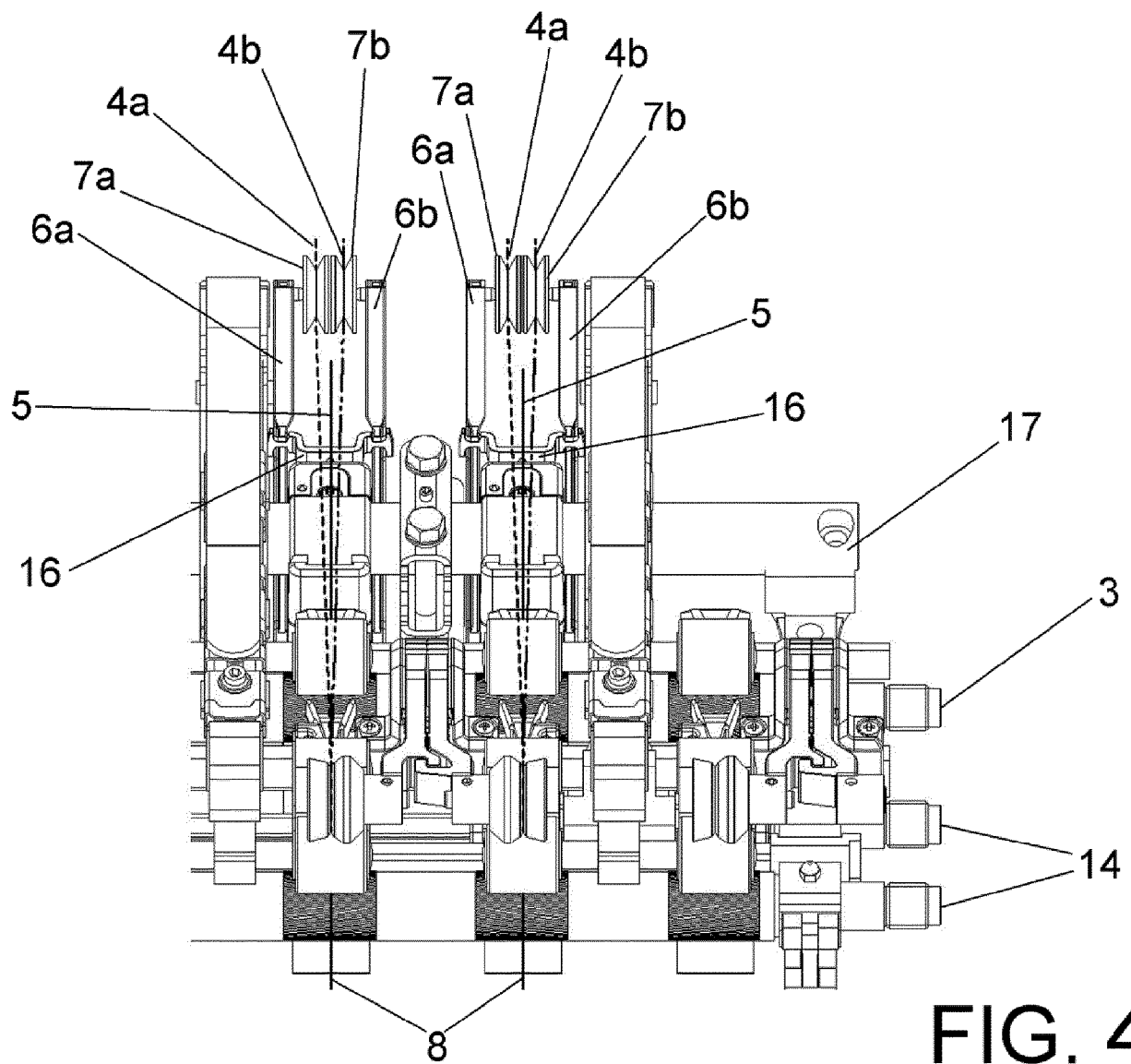
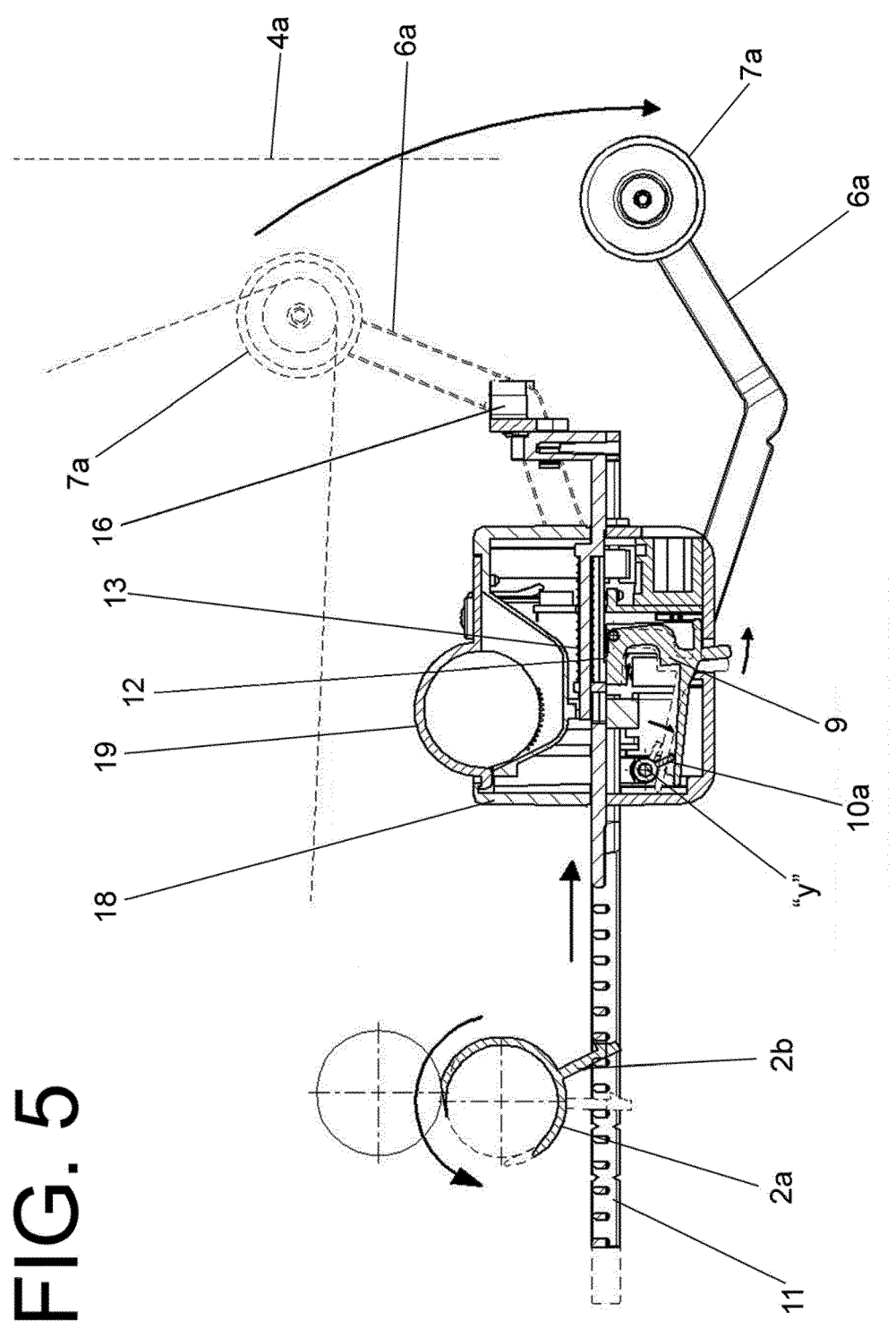
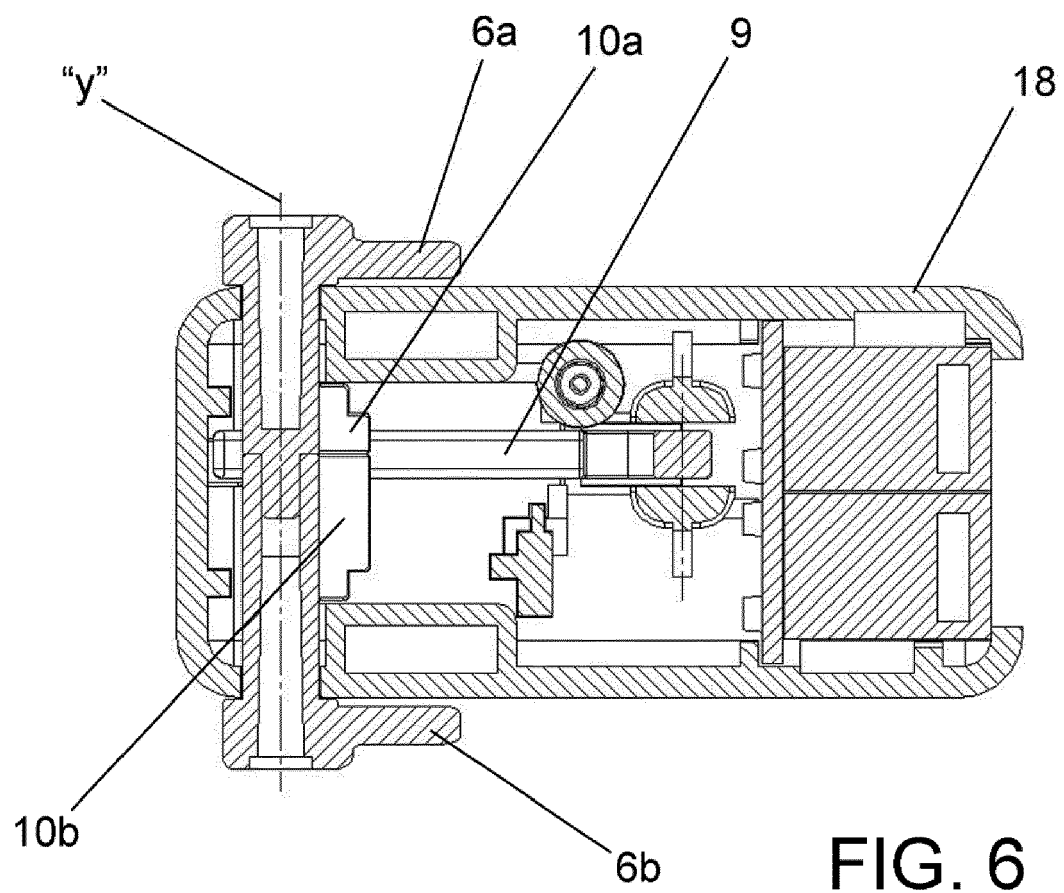


FIG. 5







EUROPEAN SEARCH REPORT

Application Number
EP 17 38 2771

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 107 099 899 A (JIANGSU LEHUA AUTOMATION TECH CO LTD) 29 August 2017 (2017-08-29)	1-11,15	INV. D01H13/18
Y	* paragraph [0040] * * paragraph [0043] * * paragraph [0045] - paragraph [0048] * * paragraph [0053] - paragraph [0054] * * claims 1,8,14,15 * * figures 1-12 *	14	
Y	----- EP 3 231 905 A1 (PINTER CAIPO S A U [ES]) 18 October 2017 (2017-10-18) * abstract * * paragraph [0022] - paragraph [0023] * * figures 1-6 * -----	14	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			D01H D02G
Place of search		Date of completion of the search	Examiner
Munich		18 April 2018	Humbert, Thomas
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