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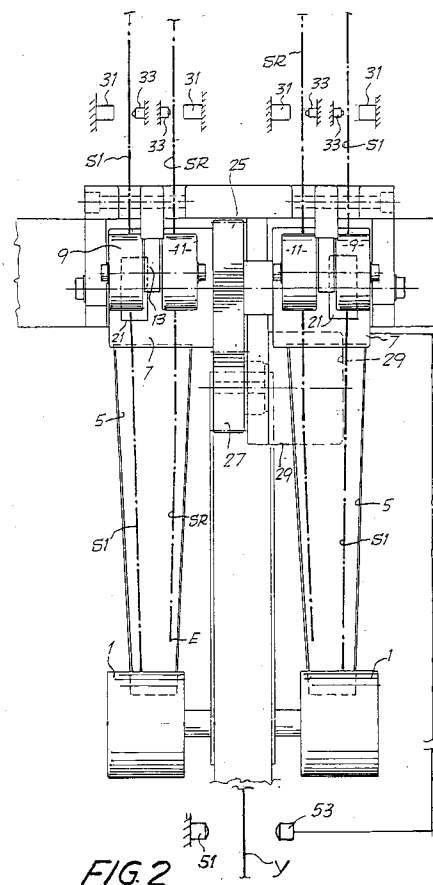
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**BE DE ES FR GB IT**(71) Applicant: **GUALCHIERANI SYSTEM s.a.s. di  
Sergio Gualchierani & C.  
Viale della Repubblica 141  
I-50047 Prato Firenze(IT)**(72) Inventor: **Gualchierani, Paolo****Via Giorgio La Pira n.4  
I-50047 Prato, Firenze(IT)**(74) Representative: **Mannucci, Gianfranco,  
Dott.-Ing. et al  
Ufficio Tecnico Ing. A. Mannucci Via della  
Scala 4  
I-50123 Firenze(IT)**(54) **Device for the automatic tying of roving in a continuous spinning machine.**

(57) A device is described for the automatic tying of roving in a continuous spinning machine, comprising: detection means (31, 33) for detecting an interruption in the feed of roving (S1) that is being processed, and means (7, 9, 11) for engaging and advancing, in time, reserve roving (SR) when said detection means (31, 33) detect an interruption in the feed of the roving (S1) that is being processed.

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The invention relates to a device for use on continuous spinning machines, in particular ring spinning machines and equivalents.

These spinning machines have a plurality of spinning units arranged along two fronts and fed with a roving coming from a bobbin suspended from a creel lying above the spinning units and extending the length of the machine. The roving undergoes drawing and twisting to produce a yarn that is wound onto a tube fitted on a spindle belonging to the corresponding spinning unit. When the roving of one bobbin is exhausted, it must be replaced by the roving of a supply bobbin. At present, spinning machines have creels from which supply bobbins can be suspended so as to get the roving of the supply bobbin ready in position beforehand to be manually joined to the tail end of the roving that is about to run out. The operation of tying new roving to the exhausted roving is an operation which at present is performed manually, after the spinning unit has been stopped by the signal from a special sensor that detects the exhaustion of the roving that is currently being processed. The spinning unit can also be interrupted if roving that is being fed breaks.

In each case, the person employed to supervise the spinning installation has to intervene in time to join the exhausted or broken roving to the supply roving in order to be able to start the corresponding spinning unit up again as soon as possible, so avoiding spinning unit stoppage time. Manually tying the roving has, however, not only disadvantages stemming from the temporary stoppage of the spinning unit and from the need to employ many fast workers to carry out the tying operations in time; but also, tying the roving manually also means flaws in the yarn and hence rather high rejection levels, due to the fact that the operator intervenes on a rather long section of the roving and the yarn subsequently produced has an irregularity at that point that often cannot be tolerated and must therefore be removed before said yarn is processed any further.

The object of the present invention is a device and a method for the automatic tying of roving in a continuous spinning machine, which solve the disadvantages of the manual method used at present.

Basically, the device according to the invention comprises detection means for detecting an interruption in the feed of roving that is being processed and means for engaging and advancing, in time, reserve roving when the detection means detect an interruption in the feed of the roving that is being processed. When the detection means detect an interruption in the roving that is currently being processed (due to the roving's being exhausted or breaking), means are activated that engage, that is hold, the end of the reserve roving

and pull it out in time to a sufficient length to insert the reserve roving into the cylinder system of the spinning machine; since the spinning operation is not interrupted, the rotation of the cylinders of the cylinder system of the corresponding spinning unit finishes pulling the exhausted or interrupted roving and simultaneously begins pulling and feeding the new roving to the drawing and twisting unit. In the drawing and twisting area the end of the exhausted or interrupted roving and the head end of the reserve roving are joined by the same movement imparted to the fibres by the drawing roller system. With the device according to the invention, therefore, there is no need for any interruption in the processing by the spinning unit, since the device itself provides for the automatic tying of the new roving; this not only reduces manufacturing costs because spinning unit stoppages are eliminated and supervising staff may be reduced, but also enables the quality of the yarn to be increased because the roving is not handled by the operator, and the area of the join between the exhausted roving and the reserve roving is reduced to a very short length of the yarn, which has a rather modest flaw.

When the spinning machine is equipped with devices according to the present invention, the operator is no longer required to intervene in time to tie the reserve rovings on where the roving that is being processed has run out, but may limit himself to replacing the exhausted bobbins with other full supply bobbins at his convenience, while each spinning unit processes the reserve roving.

Advantageous embodiments of the device according to the invention are indicated in the appended claims. In particular, the means for engaging and advancing, in time, the reserve roving may comprise a shaped part that has two alternative seats for the passage of the roving that is being processed, and a surface able to interact with pressure means for grasping and pulling the reserve roving. This shaped part may be made in a substantially cylindrical shape with two flats or seats, offset axially and angularly. The two flats form the seats for the passage of the roving that is being processed and for the reserve roving. The roving that is currently being processed runs through one of the two seats or flats, while the supply roving is held between the cylindrical surface of the part and a pressure means, for example a wheel, or other pressure means such as for example an elastic plate. When the roving being processed runs out or (what happens very rarely) breaks, the interruption in it is detected by the detection means and the cylindrical part is rotated by an angle equal to the angular offset between the two flats. In this rotational motion the reserve roving is pulled, since it is pinched between the cylindrical surface of the part

and the pressure means, while the tail end of the interrupted or exhausted roving can continue to be pulled by the cylinder system of the spinning unit. When the cylindrical part has finished rotating, the reserve roving is free to run through the second of the two offset flats or seats provided in the cylindrical part. Meanwhile, the advancing of the reserve roving caused by the rotation of the cylindrical part has brought the end of said roving into the throat formed by the cylinders of the cylinder system of the spinning unit, so that the new roving begins to be pulled by said cylinder system towards the roller system, where it joins itself to the rearmost end of the exhausted roving.

In practice, and particularly in the cotton sector, one motor means (for example a stepping motor) may be provided for each spinning unit, for in this case a single length of roving is wound onto each bobbin and fed to a corresponding spinning unit. By arranging one working bobbin and one supply bobbin above the spinning unit, the motor means associated with the device according to the invention enables the exhausted or broken roving that is being processed to be replaced by a supply roving. In the wool sector, on the other hand, two lengths of roving are wound onto each bobbin and then fed to two spinning units adjacent to each other on the same front of the spinning machine. In this case it is possible for a motor means to be provided for each pair of spinning units. This means that when one of the two rovings being fed in runs out or breaks, the device according to the invention replaces both the rovings that are being processed with the two corresponding supply rovings, the two rovings that are being processed coming from one bobbin and the two supply rovings coming from the second bobbin. To limit the overall cost of the installation and to reduce or altogether eliminate the motor means associated with each spinning unit (in the cotton sector) or with each pair of spinning units (in the wool sector) a connection may be provided between one or more automatic roving tying devices and a drive shaft of the spinning machine, with a friction clutch or equivalent being interposed which is activated by a command generated by the signal coming from the means for detecting the breaking or exhaustion of roving. In this case a direct and independent connection may be provided between each device and the spinning machine's shaft, with a corresponding clutch controlled by the corresponding detection means. A great simplification of the installation is achieved, however, by providing a single clutch that simultaneously activates all the automatic tying devices belonging to one front of spinning units in the machine, or at least to one sector of the front, comprising a plurality of spindles. In this case the roving that is being processed

is replaced with supply roving on all the spinning units of one sector or of an entire front of the spinning machine when just one of the rovings that are being processed runs out or breaks.

The invention also relates to a method for the automatic tying of the roving in a continuous spinning machine as claimed in the appended claims.

A better understanding of the invention will be provided by following the description and the attached drawing, which shows a practical non-limiting embodiment of said invention. In the drawing:

Fig. 1 shows a side elevation of a device according to the invention, associated with a spinning unit;

Fig. 2 shows a front view along II-II of Fig. 1; and

Figs 3, 4 and 5 show the cylindrical part which pulls the reserve roving, in a front view and in two cross-sections through IV-IV and V-V of Fig. 3 respectively.

1 and 3 indicate the cylinders of the cylinder system of the spinning units of a continuous ring spinning machine or equivalent. The cylinders 1 and 3 of the cylinder system form a throat into which a roving S1 is passed from a bobbin (not shown) suspended from the creel of the spinning machine. In the free section directly downstream of the cylinder system 1, 3 the roving S1 is guided in a corresponding channel 5 slightly tapering towards the cylinder system 1, 3. Arranged upstream of the channel 5 is a shaped cylindrical part 7, described in greater detail later, which interacts with two wheels 9 and 11 carried by an arm 13 articulated at 15 to the structure 17 of the frame over the spinning machine. The wheels 9 and 11 turn idly on an axle 19 and can be moved from the position shown in solid lines in Fig. 1 and in Fig. 2 to the position in broken lines in Fig. 1 where it is indicated by 11X, for manual positioning of the roving.

The shaped cylindrical part 7 is supported by an axle 20 attached to the structure 17 of the frame and has two flats 21 and 23 which are offset axially and angularly. More particularly, as can be seen in Fig. 3, the flats 21 and 23 are displaced to the left and to the right, respectively, of the midplane perpendicular to the axle of the cylindrical part 7. In addition, the flat 21 is angularly offset by 180° from the flat 23 for the purposes indicated below.

The cylindrical part 7 is integral with a toothed wheel 25 that engages with a pinion 27 keyed to the output shaft of a motor 29.

The device works as follows. In normal operating conditions the roving S1 is fed through the cylinder system 1, 3 to the drawing and twisting area of the spinning machine and passes under the wheel 9 which bears on the cylindrical surface of the part 7, by passing through the free space left

by the flat 21. The presence of roving S1 upstream of the device is detected by sensor means diagrammatically indicated by 31 and 33, which may consist of an optical system comprising a photodiode and a phototransistor, as indicated diagrammatically in the example of the drawing, or by a microswitch with an arm that maintains contact with the roving S1. When the detection means 31, 33 no longer detect the presence of the roving S1 (because it is broken or, more probably, because it is exhausted), the device according to the invention replaces the roving S1 that is being processed with a reserve roving SR, whose head end was already in position in the channel 5 and is wound on a reserve bobbin (not shown) suspended from the creel of the spinning machine. The tying of the reserve roving SR is performed by means of the motor 29, which is set in rotation by a command caused by the signal generated by the detection means 31, 33. The rotation of the motor 29 is such as to cause the cylindrical part 7 to perform a rotation through about 180°. This rotation means that the flat 21 initially located in the front area moves into the back area by rotating in the direction of the arrow f (Fig. 1). The residual roving S1 is therefore pinched between the wheel 9 and the cylindrical surface C of the cylindrical part 7. Simultaneously the roving SR, which was initially pinched between the cylindrical surface C and the wheel 11, is pulled and thus made to advance by the rotation of the cylinder 7 towards the spinning area, far enough to bring the end E (Fig. 2) of the roving SR into the throat formed by the cylinders 1 and 3 of the cylinder system of the corresponding spinning unit. When the 180° rotation of the part 7 has finished, the reserve roving SR now lies in the free space between the wheel 11 and the flat 23 which, after the rotation in the direction f, will be positioned in the front part of the device. Throughout this operation the corresponding spinning unit has never stopped, so the cylinder system 1, 3 has continued to feed the roving S1 that is about to run out and has begun pulling the reserve roving SR which, when the cylindrical part 7 stops rotating, is free to unwind from the corresponding bobbin and to feed the spinning unit which continues to produce the yarn without interruption. The tail end of the roving S1 and the head end of the roving SR are united in the drawing and twisting area below by the rolling members or other equivalent members, not shown, of a type known per se.

In the illustrative embodiment two connected devices are shown associated with two corresponding spinning units. This is in fact an illustrative embodiment on a wool spinning machine, where two rovings S1 are unwound from the same bobbin and fed to two adjacent spinning units, each of which is equipped with its own automatic roving

tying device. The reserve rovings SR shown in Fig. 2 both come from a supply bobbin. Via the couple 25, 27, the motor 29 controls the rotation of two cylindrical parts 7, so that the exhaustion or breaking of one or other of the two rovings S1 causes the replacement with and tying on of both the rovings SR. Whichever of the two rovings S1 has not run out will be broken following the rotation of the two cylindrical parts 7, as it will remain pinched between the cylindrical part 7 itself and the corresponding wheel 9. In a version for a cotton spinning machine one motor 29 may be provided for each cylindrical part 7 so that the tying of the roving is only performed for that spinning unit where the roving that is being processed S1 has run out or broken.

As mentioned above, the motor 29 may be omitted and the cylindrical part 7 may be activated by a friction clutch or the like, drawing its motion directly from a rotating shaft of the spinning machine, with the clutch being controlled by a signal caused by the detection of an interruption to the feed of roving S1 by the detection means 31, 33.

The device of the invention can be used also for automatically stop working of each single working unit in case the yarn being wound onto the tube fitted onto the spindle breaks. To this end, sensor devices are provided between the output of the drawing and twisting area and the spindle. In Fig. 2, 51 denotes a light source, such as a photodiode, and 53 denotes a light detector means, for example a phototransistor. The yarn y travels between sensor means 51, 53 before being wound onto the tube (not shown). If the yarn y breaks, a signal is caused to be generated by sensor means 51, 53. Said signal causes a reverse rotation of motor 29, in order to stop the feeding of the roving. This suddenly interrupts the working of the unit, and thus accumulation of yarn downstream of the drawing and twisting area is avoided.

## Claims

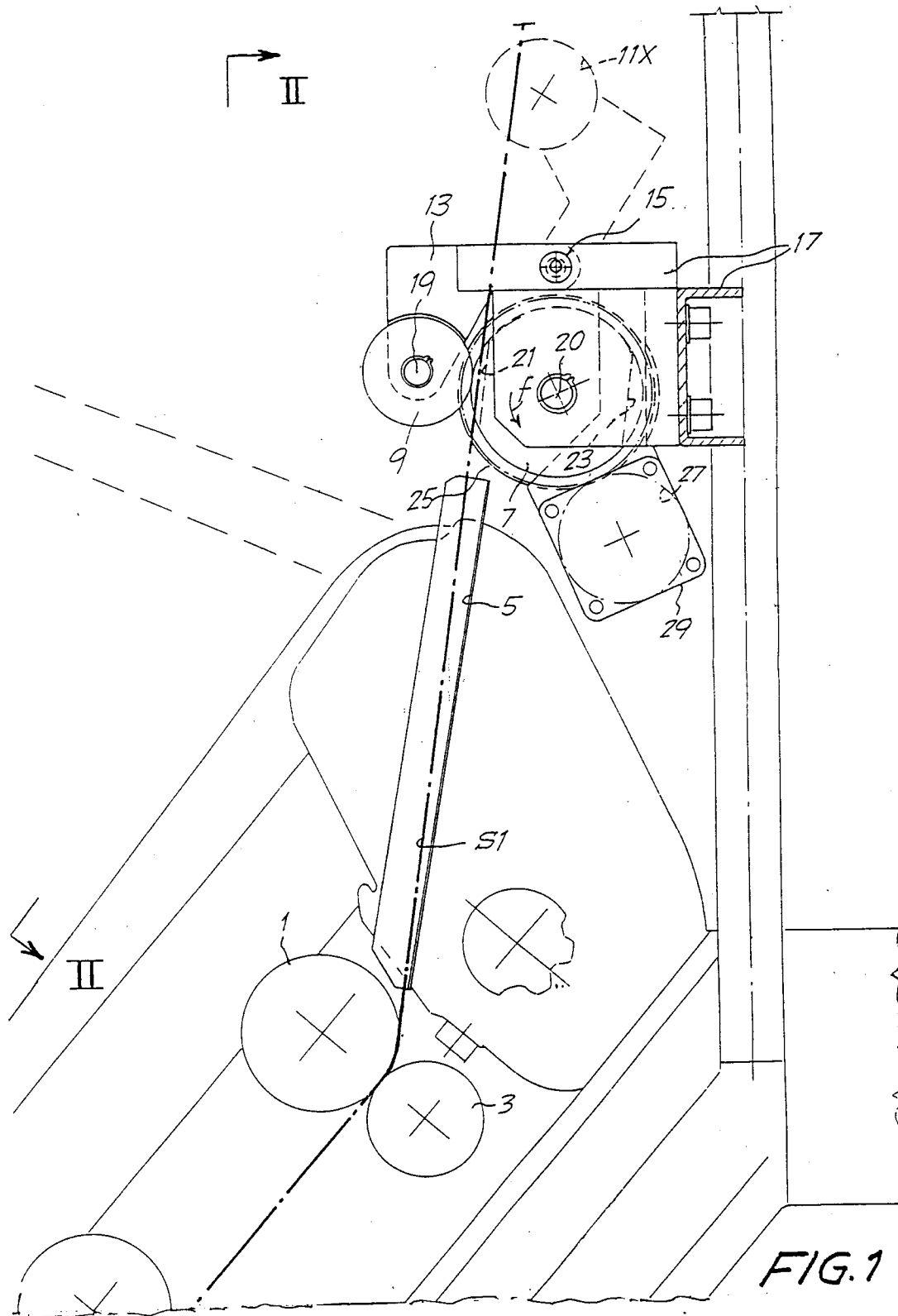
1. Device for the automatic tying of roving in a continuous spinning machine, comprising: detection means (31, 33) for detecting an interruption in the feed of roving (S1) that is being processed, and means (7, 9, 11) for engaging and advancing, in time, reserve roving (SR) when said detection means (31, 33) detect an interruption in the feed of the roving (S1) that is being processed.
2. Device according to Claim 1, in which said means (7, 9, 11) for grasping and advancing in time the reserve roving (SR) comprise a shaped part (7) having two alternative seats (21, 23) for the passage of the roving that is

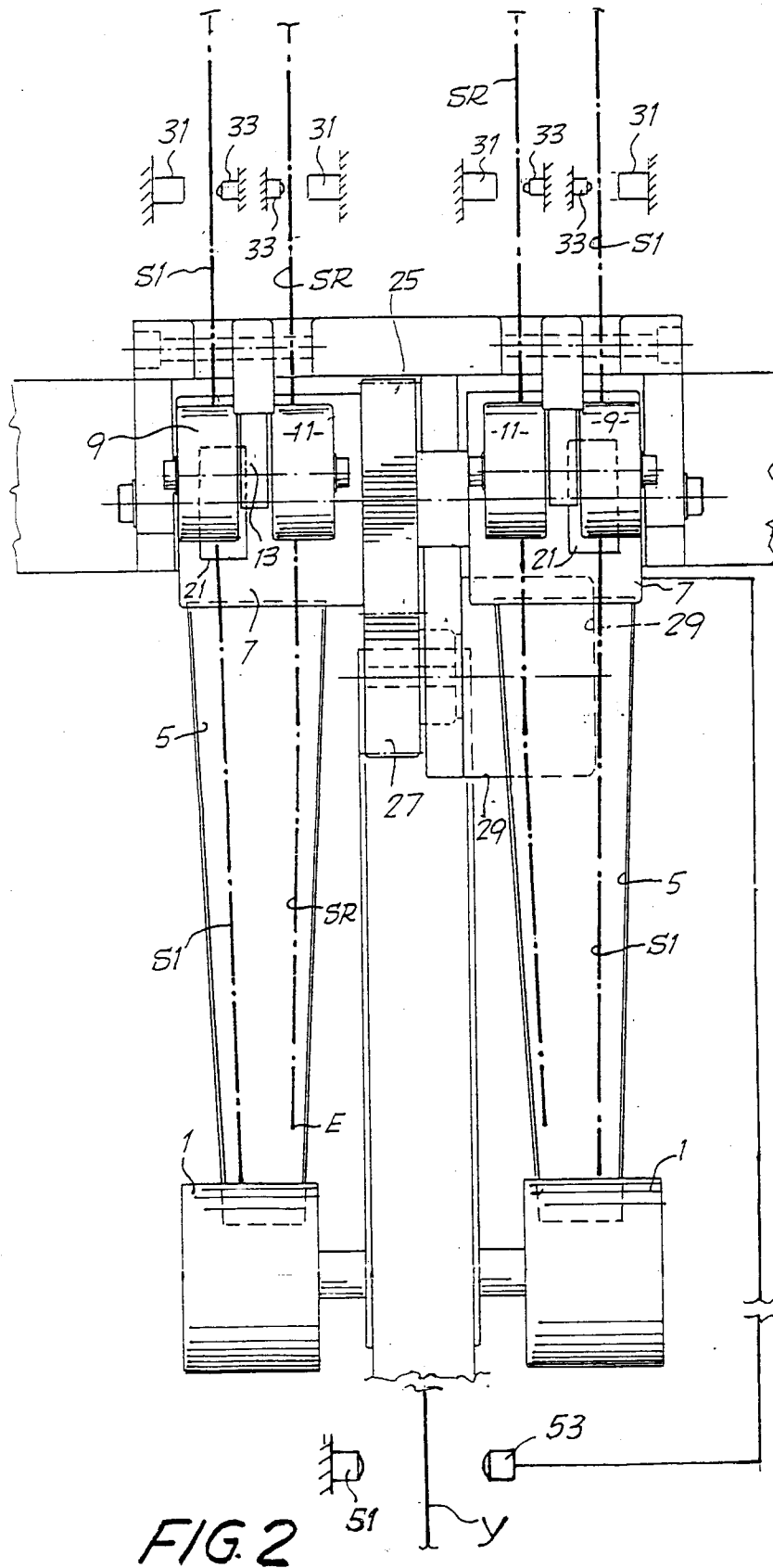
being processed and a surface (C) able to interact with pressure means (9, 11) for engaging and pulling the reserve roving (SR).

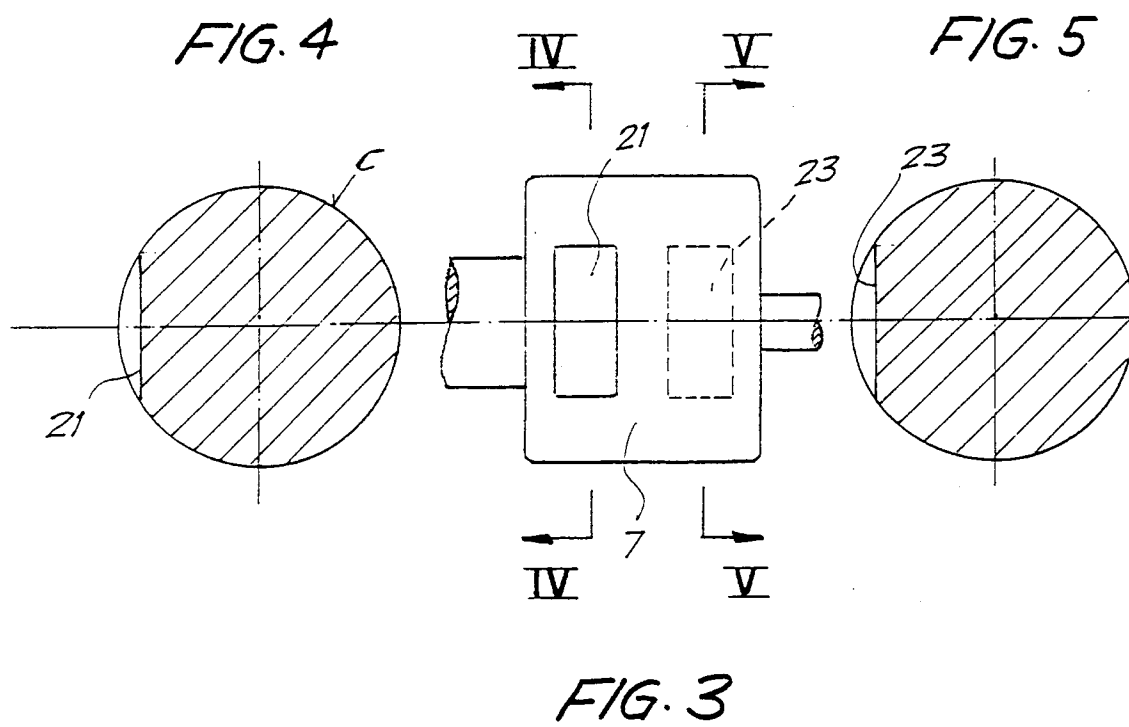
3. Device according to Claim 2, in which said shaped part (7) is a substantially cylindrical part with two flats (21, 23) offset axially and angularly, the cylindrical surface (C) of said part interacting with said pressure means (9, 11). 5  
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4. Device according to Claim 1, 2 or 3, in which said means for engaging and advancing the roving are associated with control means that take their motion from the drive shaft of the spinning machine on which said device is installed. 15
5. Device according to Claim 4, in which a clutch controlled by said detection means controls one or more devices associated with one or more corresponding spinning units. 20
6. Device according to Claim 1, 2 or 3, in which associated with one or more of said means, (7, 9, 11) for engaging and advancing the roving is a motor means (29) controlled by said detection means (31, 33). 25
7. Device according to one or more of the preceding claims, comprising a channel (5) for guiding the roving, arranged between said means (7, 9, 11) for engaging and advancing the roving and the cylinder system (1, 3) of the spinning machine. 30  
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8. Device according to one or more of claims 1 to 7, which further comprises sensor means (51, 53) for detecting breakage of the spun yarn (y), detection of the breaking of the yarn causing a reverse motion of said means (7, 9, 11) for engaging and advancing the reserve roving (SR), said reverse motion causing interruption of the feeding of the roving to the relevant spinning unit. 40  
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9. A continuous spinning machine comprising a creel, to which are attached bobbins of roving, and spinning assemblies to which the rovings are fed, characterised in that it comprises, for each spinning assembly, a device as claimed in one or more of Claims 1 to 8. 50
10. Method for the replacement of exhausted or broken roving with other roving in a continuous spinning process, characterised in that the condition of interruption in the feed of the roving that is being processed is detected and 55

means are automatically activated to engage and advance in time reserve roving towards the spinning area, in which head end of the reserve roving and the tail end of the exhausted or interrupted roving are joined through the effect of the drawing and twisting.

11. Method according to Claim 10, in which the condition of interruption in the feed of the roving is detected, in the case of the roving that is being fed, at each individual spinning unit, and in which the advance of the reserve roving is commanded individually for each individual spinning unit.
12. Method as claimed in Claim 10, in which the spinning units are subdivided into groups of two or more spinning units and in which, when the condition of interruption in the feed of one of the rovings that are being processed belonging to one of said units is detected, all the reserve rovings belonging to all the spinning units of said group are advanced, while the feeding of unexhausted or uninterrupted rovings being processed is stopped.
13. Method according to one or more of Claims 10 to 12, in which the manufactured yarn (y) is checked in order to detect possible breaking thereof, and in which the roving feed is automatically interrupted upon detection of a yarn breakage by reverse motion of the means to engage and advance the reserve roving.











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# EUROPEAN SEARCH REPORT

Application Number

EP 91830349.6

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DD - A1 - 235 085 (VEV KOMBINAT TEXTIMA) * Totality * --	1-13	D 01 H 15/00 B 65 H 67/08
X	DE - A - 2 403 718 (W. SCHLAFHORST & CO) * Totality * --	1-13	
X	DE - A1 - 3 911 505 (W. SCHLAFHORST & CO) * Totality * ----	1-13	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 H D 01 H
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 14-11-1991	Examiner NETZER
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			